

# The Joint Staff of the U.S. Senate Committee on Energy and Natural Resources

## Roundtable on the Energy-Water Nexus with Governmental Organizations

### Summary Report

August 14, 2013

On July 18, 2013, in Washington, DC, select staff from the Senate Committee on Energy and Natural Resources convened representatives from federal, state, and local governments to participate in a roundtable discussion on energy-water issues. The participants were convened for their technical expertise and knowledge; their participation and comments did not represent the positions of their agencies or the Administration. Participants represented expertise in water resources, municipal water and wastewater, environmental sciences, agriculture, electricity regulators, and energy research; others represented expertise in development of standards and government efforts at reducing energy and water use. The discussion was organized around four themes: data; research, studies, and assessments; incentives and barriers; and roles and responsibilities.

### Data

This portion of the discussion addressed the availability of data related to water for energy and energy for water. Some participants<sup>1</sup> at Roundtable No. 2 observed how available data are insufficient for making informed energy-water efficiency investment decisions. Participants expressed interest in: more data, more integrated data, and better data warehousing. Participants identified a number of ongoing efforts which could be used as models or starting points for improving energy-water data production and management. Recommendations and observations related to data from Roundtable No. 2 included:

- **Better and More Integrated Data are Needed.**
  - Available data are dated, and more data are needed on:
    - (1) water availability, including soil moisture, stream gages, and snowpack;
    - (2) groundwater withdrawal rates, and not just aquifer levels;
    - (3) energy use and associated costs (e.g., pumping cost) for federal water projects;
    - (4) non-freshwater opportunities, tradeoffs and costs;
    - (5) water lost in distribution systems;
    - (6) risks and opportunities associated with thermal discharges;
    - (7) energy-water footprints for critical suppliers for federal activities;
    - (8) oil and gas produced water and its quality; and
    - (9) water that is used, discharged, and consumed by the energy sector.
  - Data should be produced within the context of an energy-water-food-climate nexus. Federal agencies are increasingly producing information linking energy-water-climate, such as the July 2013 report by the Department of Energy (DOE), *U.S.*

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<sup>1</sup>“Participants” refers to the invited representatives, not the congressional staff or CRS staff in attendance.

*Energy Sector Vulnerabilities to Climate Change and Extreme Weather.*<sup>2</sup> For climate change analyses to inform decision-making, data of higher reliability at the local and project level are needed.

- Participants mentioned how some data, especially groundwater withdrawal data, may be available but not necessarily shared with federal or state entities; some of these data are essential for being able to produce energy-water assessments.
- **Standardized Protocols and Data Warehousing are Needed.**
  - Participants noted that standardized protocols would improve data interoperability. They noted that there are a lot of data, but it is hard to use it to adopt more sustainable practices. They also noted that common frameworks would help facilitate the ability for multiple agencies to be able to connect their data and centralize its warehousing.
  - Providing consumers with data for decision-making (especially real time data) is key to affecting behavior. Producing these data can be facilitated through developing standard protocols. The “Green Button” initiative was identified as a model.<sup>3</sup> The private sector may be able to provide important information and expertise.
  - Access to existing data and ease of its use for decision-making by energy and water utilities remains an issue. No central warehousing is currently available for determining energy opportunities within water and wastewater infrastructure and processes. Specifically, better access to information on how energy can be generated from water sector waste products is needed.
  - A centralized hub of knowledge may assist in the development of innovative ideas (e.g., innovative hydropower and co-generation opportunities).
- **Build on the Many Related Efforts and Resources that Exist.**
  - Efforts to improve decision-making on long-term water management and climate change are underway or have already produced results.
    - The Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), U.S. Geological Survey (USGS), and National Oceanic and Atmospheric Administration (NOAA) developed the Climate Change and Water Working Group; it has looked at user needs for improved tools and information for addressing climate change in long-term water management.<sup>4</sup>
    - Reclamation has basin studies underway; an output is the 2012 Colorado River Basin Water Supply and Demand Study.
    - The President’s June 2013 Climate Action Plan includes a climate data initiative.<sup>5</sup> The National Climate Assessment has addressed the climate and energy-water-land system interaction.<sup>6</sup>

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<sup>2</sup> Report is available at: <http://energy.gov/sites/prod/files/2013/07/f2/20130710-Energy-Sector-Vulnerabilities-Report.pdf>. Participants suggested that the report identified a number of opportunities to enhance information, tools and practice to reduce energy sector’s climate vulnerabilities. Some of the opportunities identified (p. 44) included: better regional and local characterization of climate trends and extreme weather relevant to the energy sector (e.g., water availability, likelihood and magnitude of droughts); better characterization of the aggregate vulnerabilities of the energy sector to climate change and interdependencies with other sectors leading to cascading impacts; improved understanding of potential uses and challenges of advanced cooling technologies and alternative water sources; and additional assessments of hydropower impacts and resilience.

<sup>3</sup> Green Button is an industry-led effort to provide utility customers with easy access to their energy usage information. The utilities are using a standard protocol developed through the Smart Grid Interoperability Panel, a public private partnership facilitated by National Institute of Standards and Technology (NIST). For more, see <http://energ.y.gov/data/green-button>.

<sup>4</sup> <http://www.usbr.gov/climate/userneeds/docs/LTdoc.pdf>

<sup>5</sup> Executive Office of the President, *The President's Climate Action Plan*, Washington, DC, June 2013,

- Some stakeholders noted that a benefit of building on an existing framework or effort is that producing high quality original data can be costly; a reference was made to roughly \$100 million annual cost for data-related activities at the Energy Information Administration (EIA).
- The Corps maintains a Watertoolbox.us website at which it disseminates information on “integrated water resources management.” It collects information from a variety of entities for dissemination on a number of topics (e.g., programs, databases and models; best management practices; collaboration opportunities; state water plans).
- An approach suggested was assisting state efforts. For example, through the national laboratories, DOE has assisted western states’ energy and related water planning.
- Other resources identified included:
  - The California Public Utilities Commission has been collecting extensive data on, and analyses of, energy-water nexus issues.<sup>7</sup>
  - The U.S. Department of Agriculture (USDA) provides access to its life cycle assessment (LCA) tool through the LCA Digital Commons<sup>2</sup> (<http://www.lcacommons.gov/>), an open-access inventory of peer-reviewed, standard formatted LCA data from USDA and EPA.<sup>8</sup> USDA also collects data through the Agricultural Resources Management Survey.<sup>9</sup>
  - The EIA collects data on energy consumption by sector.<sup>10</sup>
- It was noted that, while many federal programs exist, current understanding of these programs and how they could coordinate is not well understood by persons outside of the programs themselves.

## Research, Studies, and Assessments

This portion of the discussion focused on energy-water research, studies, and assessments. Participants were encouraged to suggest research that takes advantage of synergies, improves interoperability, and promotes utilization of efficient technologies and practices. A variety of research topics were suggested including: research to better understand the energy-water nexus in the context of land use and climate; research to support innovations in priority areas; and research on the economics of water. A common theme was that research efforts could benefit by being more integrated and results more widely disseminated.

### Interest Exists for a Wide Variety of Research.

- Interest in the following research activities was expressed:
  - (1) research that helps avoid future conflicts over competing demands for water,

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<http://www.whitehouse.gov/sites/default/files/image/president27climateactionplan.pdf>. The specifics of the initiative have not been clarified, but are likely to build on existing climate data efforts.

<sup>6</sup> The draft *Third Climate Assessment Report* includes a Chapter 10, Water, Energy, and Land Use available at: <http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap10-WEL.pdf>; it was developed based on inputs from an advisory committee and informed by technical submissions such as: Pacific Northwest National Laboratory, *Climate and Energy-Water-Land System Interactions*, Technical Report to the U.S. Department of Energy in Support of the National Climate Assessment, March 2012, [http://www.pnnl.gov/main/publications/external/technical\\_reports/PNNL-21185.pdf](http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21185.pdf).

<sup>7</sup> [http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/Embedded+Energy+in+Water+Studies1\\_and\\_2.htm](http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/Embedded+Energy+in+Water+Studies1_and_2.htm)

<sup>8</sup> For this effort, an LCA provides an assessment of a product’s impacts, from those related to the inputs used in its production through those arising from its consumption and disposal.

<sup>9</sup> USDA’s National Agricultural Statistic Service conducts the survey: [http://www.nass.usda.gov/Surveys/Guide\\_to\\_NASS\\_Surveys/Ag\\_Resource\\_Management/](http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Ag_Resource_Management/)

<sup>10</sup> <http://www.eia.gov/totalenergy/data/annual/pdf/sec2.pdf>

- including behavioral research on how water is used and valued;
- (2) research on valuing environmental and ecosystem benefits associated with different water utility or energy utility investment choices;
  - (3) research on how land use influences water availability (e.g., stormwater recharge);
  - (4) research that facilitates the operation of wastewater facilities as resource recovery facilities is needed;
  - (5) research on co-generation of water and energy (e.g., research that looks for opportunities integrating desalination with energy activities);
  - (6) research on expanding the hydropower generation produced at already developed systems;
  - (7) research on the water vulnerabilities (to water supply shortages and to extreme weather) of electric generation facilities and their fuel supplies, the consequences of this vulnerability, and mitigation actions;
  - (8) research on water efficiency in agriculture (integrated with efforts to improve efficiency per unit of land in production);
  - (9) research to project future water use by all sector so that planning efforts can incorporate anticipated demand; and
  - (10) research on water rights and resolution of water rights conflicts.
- Some participants observed that some of the suggested research has been conducted; for example, Reclamation has assessed hydropower opportunities at its facilities.<sup>11</sup>
  - Others recommended state or national assessments like those conducted in California. California agencies have conducted multiple large studies on energy use by the water sector, which are considered useful for establishing benchmarks and goals.
  - Some participants identified Reclamation research (e.g., desalination) and the competitive grants available through WaterSMART as useful mechanisms for supporting research.
  - **Some Participants Encourage Interest in Related Economic Research.**
    - Some participants recommended research that helps decision makers account for the opportunity costs of using water today (and not having it available for future use); this research may assist in justifying efficiency investments which are currently not possible given the low value and price assigned to water. They noted the current imbalance in the consideration of water and energy because of the low cost assigned to it under current access and delivery arrangements.
    - EPA's National Center for Environmental Economics was identified as a potential resource for research on how to improve water related economic evaluations.<sup>12</sup>
  - **Integration of Research Efforts is Encouraged.**
    - Participants suggested combining research currently being conducted and supported by different sectors; separate efforts on water efficiency of irrigation and energy efficiency of irrigation should be integrated. Also, research often is conducted in ways that miss life-cycle or broader impacts (e.g., on-farm water conservation may affect recharge and stream flows).

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<sup>11</sup> Bureau of Reclamation, *Hydropower Resource Assessment at Existing Reclamation Facilities*, Washington, DC, March 2011, <http://www.usbr.gov/power/AssessmentReport/USBRHydroAssessmentFinalReportMarch2011.pdf>.

<sup>12</sup> In addition to analyzing the economic and health impacts of environmental regulations and policies, it manages EPA's research on environmental economics to improve the methods and data available for policy. The Center provides its technical expertise to EPA, other federal agencies, Congress, universities, and other organizations. For more information, see <http://yosemite.epa.gov/ee/epa/eed.nsf/pages/homepage>.

- Some participants noted the benefits of efforts combining multiple governmental agencies, private entities, and philanthropic organizations for developing a community of practice.
- **Dissemination is Part of the Need.**
  - Agricultural cooperative extension was identified as a means or model for disseminating information to users of information. The Cooperative Extension System is a nationwide educational network, in which each state and territory has a state office at its land-grant university and a network of local or regional offices.<sup>13</sup>

## Incentives and Barriers

This portion of the discussion addressed incentives and barriers to adopting practices and technologies that are more water- or energy-efficient.

- **Data Gaps.** Referencing other discussion at the roundtable, a frequently cited barrier was that data are scattered, and the United States lacks a central location for information on innovations and new technologies, as well as data on energy required to move water or to recover energy from wastewater. Technical support for public agencies on rate issues, such as impacts of water and energy rates on conservation, would be helpful.
- **Barriers to Innovation.** Difficulty in scaling up research on water, energy, and agriculture from bench-scale to commercial implementation is a barrier. For public agencies, lack of financial support for demonstration projects is a barrier, because ratepayers are reluctant to invest in new technologies that are unproven. Federal agencies should analyze the water and energy impacts of their regulations, and there should be some flexibility on standards (e.g., air quality) or permits (e.g., discharge limits) to overcome barriers to pursuing innovations such as clean energy or less water- or energy-intensive technology. Rate structures (water or energy) that fail to send correct price signals to users also are a barrier.
- **Existing Incentives.** Incentives to overcome barriers do exist. For example, the Department of Agriculture provides incentives to farmers to increase efficient energy and water use in the form of technical assistance and information on smart irrigation, seed technology, and conservation programs. The Federal Emergency Management Agency works with communities on annual hazard mitigation plans, which can consider energy-water vulnerability as part of the planning process.
- **Incentives that Are Needed.** Incentives are needed to encourage companies that are early adopters of best practices to share information that might be considered confidential. Organizations that work with companies, such as the Electric Power Research Institute (EPRI), could survey members without revealing proprietary data in order to leverage the information more broadly. Partnerships between industry and others (e.g., environmental markets, trading) should be pursued. Synergies to integrate new ideas are possible if done with “creative packaging” or demonstration projects. One example could be to link electricity generated from wastewater utilities or excess heat from power plants to operating desalination plants.

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<sup>13</sup> USDA’s National Institute of Food and Agriculture is the federal partner. The offices are staffed by one or more experts who provide useful, practical, and research-based information to agricultural producers, small business owners, youth, consumers, and others in rural areas and other communities. More information is available at: <http://www.csrees.usda.gov/Extension/>. One of the programs mentioned during the roundtable was system’s e-Extension efforts to build communities of practice online; energy and water information is available but not explicitly linked through e-Extension. For more information see, <http://www.extension.org/>. It was noted that the financial support for extension efforts has been in decline in recent years.

## Roles and Responsibilities

This portion of the discussion focused on the role of government, especially the federal government, in addressing energy and water issues, both the kinds of things that government already does and how its activities could be enlarged to consider energy-water nexus issues more broadly.

- **Defining the Federal Role.** Several participants said that one useful role that the federal government could play is to provide a portal or hub for information, documents, and technical resources that already exist. A clearinghouse is complex and costly to manage and has the potential to shut out smaller partners that are not federal and/or do not receive funding to participate in the clearinghouse. Putting out good data is expensive and takes a big federal commitment, because, as one participant noted, there is a difference between data dumping and providing a curated platform of data for decision support by highly sophisticated users.
  - Attention to the energy-water nexus issue could be raised by elevating it to a national security concern.
  - The federal government can use existing entities in states (e.g., agriculture cooperative extension, water resource research institutes, and energy research institutes) to leverage information dissemination.
  - Sharing information beyond federal partners is important, for example, sharing information with water end-users (consumers, industry, the energy sector) through programs such as Energy Star and WaterSense, and partnering with state and local governments in new areas (e.g., to develop water efficiency standards, work with states on groundwater issues, or work with utilities on infrastructure and rate issues).
- **Defining a Clearinghouse.** Questions raised by participants about the purpose of a clearinghouse included, would it be to develop data, to disseminate publications, to set standards, or to leverage activities of others? How big, or how small would its scope be? Depending on the framework (e.g., operational or informational), different federal agencies or alternative structures would be appropriate. Prioritizing and deciding what are the key issues is important.
  - One participant suggested that the issue is so big that it might be necessary to separate energy-for-water from water-for-energy. Another noted that, in the absence of a federal water policy, it is hard to approach energy-water issues comprehensively.
- **Models for a Clearinghouse or Other Structure.** Participants described a range of activities addressing energy and water issues that already exist in the federal government and elsewhere and suggested some possible models for an energy-water nexus clearinghouse or other structure, including: the Army Corps of Engineers' Watertoolbox ([www.watertoolbox.us](http://www.watertoolbox.us)), the Department of Energy's OpenEI.org, the U.S. Global Change Research Program, the National Nanotechnology Initiative, the U.S. Water Partnership at the Department of State, and the ANSI standards development process. Some of these are broader than energy-water nexus, some are focused on science or research and development, but they still may be useful models.