STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
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STAFF SUBMITTAL

COMMISSION ON WATER RESOURCE MANAGEMENT

November 19, 2014
Honolulu, Hawaii

Request to Authorize Chairperson to Enter Into a
Agreement to Investigate the Water-Energy Nexus in Hawaii

SUMMARY OF REQUEST

Staff requests that the Commission authorize the Chairperson to enter into a consultant contract agreement to investigate the water-energy nexus in Hawaii. Staff also requests that the Commission authorize up to $200,000 in funding to complete this project.

BACKGROUND

Under the Hawaii State Constitution, art. XI, sec. 7, and the Hawaii Water Code, Haw. Rev. Stat. chapter 174C, the Commission on Water Resource Management ("Commission") is responsible for conserving and protecting the fresh water resources of our State and for developing programs to conserve water across the State. Water conservation is a critical and fundamental resource management strategy. It must be pursued aggressively. Hawaii faces an uncertain climate future. Rainfall and stream flows have both decreased over the past 30 years. If these trends continue (and there is no evidence to suggest otherwise) the availability of fresh water to meet the current and future needs of our growing population will be in jeopardy. Some areas of the State have already reached the limits of available ground water. There is increasing competition for surface water to maintain ecological health and protect traditional and customary gathering rights. It is imperative that we use limited fresh water wisely and efficiently.

The Commission recently completed a statewide Water Conservation Plan ("Plan") and is in the process of implementing priority actions. The Plan identified water conservation best management practices for various sectors of water use that may be independently undertaken by water users. Due to the relatively inexpensive and underpriced water, there are often insufficient financial incentives for users to invest in additional water conservation measures based on water cost savings alone. However, while water is relatively inexpensive in Hawaii, energy is not.

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Water and energy are inextricably linked. Reducing potable water use can reduce the amount of energy needed to provide this water to end users. Energy cost-savings can be a powerful incentive for water and wastewater utilities to improve the efficiencies within their systems. Similarly, water is needed in the production of energy, and thus a reduction in energy production may realize water savings.

There is a need to accurately quantify the water and energy consumption by water and electrical utilities. There is also a need to understand the nexus between water and energy in Hawaii and to determine energy's contribution to the cost of supplying drinking water and treating wastewater.

Energy demands are embedded in the production of drinking water and in the treatment and disposal of wastewater. Conversely, water demands are embedded in the production of energy. While the water-energy nexus is fundamentally understood within the water and energy industry, the actual energy demands (and costs) of a utility to produce and deliver water to its customers are not fully understood. Likewise, we do not know precisely how much water is used to generate energy in Hawaii. The amount of energy required to produce a given unit water is called the energy intensity of water.

Other states estimate water intensity for their water utilities and report the results in kilowatt-hours per million gallons of water (kWh/MG).

One study reported that lifecycle energy-intensity (water supply + wastewater treatment) in California ranged from 4,000 kWh/MG in Northern California to 12,000 kWh/MG in Southern California[1]. Another study reported that Illinois drinking water utilities' average energy intensity ranged from around 1,800 kWh/MG for large systems to around 2,100 kWh/MG for small systems[2]. There are many factors affecting the energy intensity of water including the source, treatment, topography, and distances to deliver water service to customers.

Using limited data and simple analysis, staff estimates that Honolulu Board of Water Supply's energy intensity is approximately 1,700 kWh /MG. The City and County of Honolulu Department of Environmental Services' energy intensity is approximately 2,000 kWh/MG (treatment and disposal of wastewater). These figures may be due to short distances (certainly not due to the cost of energy in Hawaii). More work needs to be done to refine and verify these estimates.

Given Hawaii's high energy prices, it is imperative to understand the costs of producing and treating water and how reducing water use and wastewater disposal can affect energy consumption. The results of this audit/analysis will provide decision-makers with valuable information to better design programs and projects to reduce in both water and energy consumption statewide.

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[1] California Energy Commission, *California's Water-Energy Relationship, Final Staff Report*, November 2005.
[2] The Illinois Section American Water Works Association (ISAWWA) Water Efficiency Committee, *Water-Energy Nexus Survey Summary Report, Pilot Project*, March 2012.

By learning the true cost of water production and disposal, the Commission can better understand the benefits and costs related to implementing water conservation programs and measures by a water utility. This will help the Commission and the utilities make informed decisions related to water and energy conservation in Hawaii. In addition, as Hawaii embarks on a cleaner energy future and considers clean energy options to the imported fossil fuels that currently support over 90 percent of all energy use in Hawaii, there is a need to understand the water requirements for various energy alternatives to ensure a smooth and sustainable transition.

PROJECT OBJECTIVES

This project would research Hawaii's water-energy nexus by conducting detailed audits and analyses to achieve the following objectives:

- Identify, consult, and collaborate with industry experts, utility representatives, relevant regulatory agencies and other stakeholders for study guidance, information, and recommendations.
- Develop a methodology for determining:
    a. The energy embedded in water for each of the county municipal water and wastewater departments as well as PUC regulated private utilities; and
    b. The water embedded in producing all forms of energy in Hawaii (petroleum, coal, natural gas, bioenergy, geothermal, hydropower, pumped storage, solar, and wind).
- Apply the methodology to determine:
    a. The water sources (e.g. ground water, surface water, salt water, R-1 water, etc.) and water quantities currently being used for the generation of the various forms of electricity (embedded water), including the range and average for each energy production type; and
    b. The energy demands to provide drinking water and treat wastewater (embedded energy), including the costs of withdrawal, conveyance, treatment, and distribution of potable water and the costs associated with conveyance, treatment, and disposal of wastewater.
- Identify appropriate classes (e.g. small, medium, large users) and metrics (e.g., total annual energy costs, energy cost as a percent of annual total operating expenses, energy intensity of water production/treatment) to assess the water-energy nexus.
- Benchmark utilities on their energy intensity of water production and energy intensity of wastewater treatment and disposal. Electrical utilities would be benchmarked on their water use intensity for energy production.
- Identify both opportunities and barriers/constraints to co-implement water and energy efficiency programs.
- Based on these findings, recommend development of programs and policies to optimize water and wastewater systems.

In 2011, the Alliance for Water Efficiency partnered with the American Council for an Energy-Efficient Economy to collaborate on water and energy efficiency. This resulted in the report *Addressing the Energy Water Nexus: A Blueprint for Action and Policy Agenda* (Exhibit 1). The

first two themes identified in the blueprint are (1) Increase the level of collaboration between the water and energy communities in planning and implementing programs; and (2) Achieve a deeper understanding of the energy embedded in water and the water embedded in energy.

This project will help address both themes and lead toward a greater understanding of how water affects energy and vice versa in Hawaii. Results will be used to design and evaluate future water and energy efficiency programs and projects for water and wastewater utilities in Hawaii.

PREVIOUS STUDIES AND RELATED WORK

There have been no previous studies of the water-energy nexus in Hawaii. University of Hawaii's Economic Research Organization is developing a framework to look at how water-energy-food-environmental security relate and react to climate change and economic development. Hawaii Energy developed its *Water and Wastewater Energy Management Best Practices Handbook* to help these utilities improve their energy efficiency. The Commission produced its own *Hawaii Water System Audits and Loss Control Manual* for water utilities to assess the condition of their systems and find ways to reduce their non-revenue water amounts. A study linking water and energy does not exist.

There is a growing body of reports and white papers looking in to the water-energy nexus across the continental U.S. Agencies and organizations examining this matter include the U.S. Department of Energy, Alliance for Water Efficiency, Congressional Research Service, Water Research Foundation, California Public Utilities Commission, California Energy Commission and many others. There is a need for Hawaii-specific water-energy data and analysis given the uniqueness of being an island state.

The Water –Energy Nexus was the focus of the September 2014 International World Water Week ("WWW") in Stockholm, Sweden. http://www.siwi.org/prizes/worldwaterweek/. See http://www.worldwaterweek.org/. The International WWW concluded:

> UNDERSTANDING OF LINKAGES IS CENTRAL
>
> Water and energy are closely interdependent. At the same time they rely on vastly different institutional frameworks, policy settings and governance structures. The energy sector is to a large extent market-based, run by private companies acting on global and national markets. The water sector on the other hand is dominated by public, small utilities acting within regulated markets at the local, municipal level.
>
> While water is needed for almost all forms of energy production, such as cooling, biofuels and hydropower, energy is an important component in the extraction, treatment and transportation of water. Restraints in one of the resources will often affect the other. Therefore, there is an increasing recognition of the importance to understand the energy-water linkages and strengthen collaboration between the two communities. Without sustainable energy and water management we cannot

satisfy basic human needs, produce food for a growing population and achieve sustainable growth.

To successfully develop the water-energy synergies to their full potential, we must take action on several fronts. There is no silver bullet. We need to build an understanding of the overarching water and energy picture and make the effort of better understanding the critical linkages, in order to efficiently address the multitude of challenges we face. Unintended consequences of energy development for water, and vice versa, often have their roots in fragmented policies, e.g. energy subsidies contributing to unsustainable groundwater overdraft through excessive pumping.

Further it is essential to translate local knowledge into global policy. The 2014 Stockholm Water Prize laureate Professor John Briscoe argues that policy must be formed by practice. And the same is valid for the other direction: global policy must be formulated in a way that allows it to be applied on the local level.

There are, however, substantial differences between the energy and water sectors, not only in how they are structured, but in how they are perceived. And here the water community finds room for development: to counter the challenge of increasing water demand we must manage it in a far smarter way. There is a need to create a raised general awareness of water efficiency and sustainability.

Overarching Conclusions (p. 8): http://www.worldwaterweek.org/wp-content/uploads/2014/09/2014-Overarching-Conclusions-web.pdf.

PROJECT PARTNERS AND STAKEHOLDERS

Commission staff is already working with "Hawaii Energy" to promote public water system water audits and energy efficiency best management practices for water and wastewater utilities. The staff and its consultants will reach out to Hawaiian Electric Company, Kauai Island Utility Cooperative and public and private water supply and wastewater utilities asking for their participation in this study. Other project partners may include the Department of Business, Economic Development and Tourism, and the Public Utilities Commission.

FUNDING AND TIMELINE

Staff requests that the Commission approve up to $200,000 in funding to complete the project described above. The source of funding will be the Commission's general fund, special fund, or a combination of both, subject to the availability of funding. Staff may also seek funding from key agencies, organizations, stakeholders or partners. The Project will require approximately 18-months after notice to proceed.

ENVIRONMENTAL REVIEW (CHAPTER 343, HRS)

The planning study described here is exempt from Hawaii's environmental review process under Hawaii Administrative Rules §11-200-5(d) since it does not affect any future projects which have not been approved, adopted, or funded. No testing or other actions which may have a significant effect on the environment are involved. Therefore, the proposed action is exempt from Hawaii Revised Statutes, Chapter 343.

RECOMMENDATION

1. Staff recommends that the Commission authorize the Chairperson to enter into consultant contract agreement and to approve funding not to exceed $200,000 to complete an investigation of the water-energy nexus in Hawaii. Commission funding would be from general funds or special funds or a combination of both, subject to the availability of funding.

2. Staff also recommends that the Commission authorize the Chairperson to further amend or modify these contract agreements provided that such amendment or modification does not include any additional funding.

The agreements will be subject to the approval of the Chairperson and the Attorney General's office.

Respectfully submitted,

WILLIAM M. TAM
Deputy Director

Exhibit 1: *Addressing the Energy Water Nexus: A Blueprint for Action and Policy Agenda*

APPROVED FOR SUBMITTAL:

WILLAM J. AILA, JR., Chairperson

Addressing the Energy-Water Nexus:

A BLUEPRINT FOR ACTION and Policy Agenda

Alliance for Water Efficiency

ACEEE
American Council for an Energy-Efficient Economy

MAY 2011

Exhibit 1

Acknowledgments

This blueprint is the result of input from more than fifty involved individuals from the field of energy and water efficiency. Most of the contributors attended a Dec. 7, 2010 workshop in Washington, D.C. In addition, we solicited input from individuals who could not attend that meeting. We thank all of the participants for their time and input. We also thank the Turner Foundation for funding this project and for recognizing the need for collaborative actions on energy and water efficiency.

We also thank key staff who brought this effort to this point: Neal Elliott, Eric Mackres, and Steven Nadel from ACEEE; Mary Ann Dickinson and Bill Christiansen from AWE; and Kenneth Mirvis from The Writing Company, who facilitated the workshop and helped draft the blueprint.

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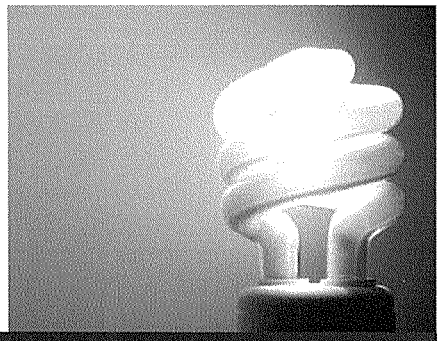
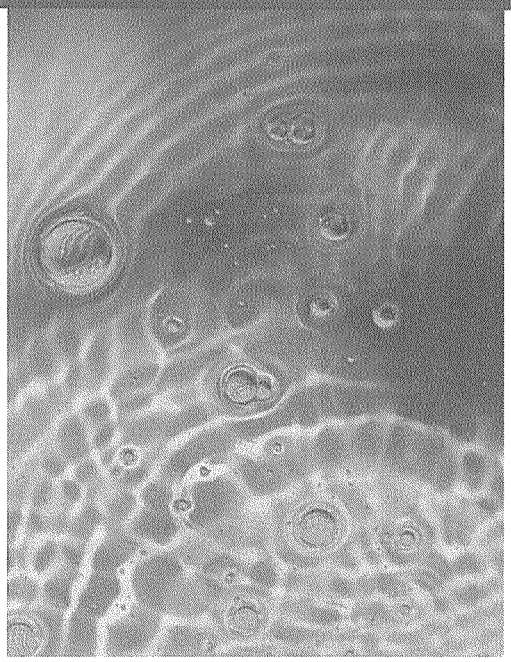


Addressing the Energy-Water Nexus:

A BLUEPRINT FOR ACTION and Policy Agenda

MAY 2011



Contents

About AWE

The Alliance for Water Efficiency is a stakeholder-based 501(c)(3) non-profit organization dedicated to the efficient and sustainable use of water. Located in Chicago, the Alliance serves as a North American advocate for water-efficient products and programs, and provides information and assistance on water conservation efforts.

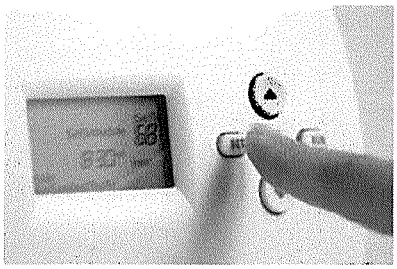
The Alliance has embarked on seven key tasks to support and enhance water conservation efforts, providing benefit to water utilities, water conservation professionals, planners, regulators, and consumers:

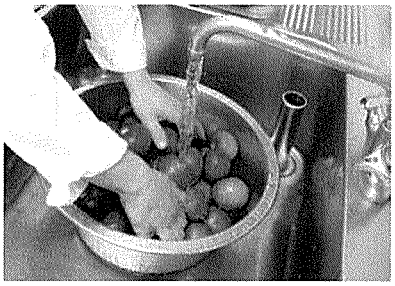
- Stand as a clear and authoritative national voice for water efficiency.
- Provide comprehensive information about water-efficient products, practices, and programs—what works and what doesn't.
- Represent the interest of water efficiency in the development of codes and standards.
- Transform the market for fixtures and appliances.
- Coordinate with green building initiatives to institutionalize water efficiency.
- Train water conservation professionals.
- Educate water use.

About ACEEE

The American Council for an Energy-Efficient Economy is a 501(c)(3) nonprofit organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. ACEEE carries out its mission by:

- Conducting in-depth technical and policy analyses.
- Advising policymakers and program managers.
- Working collaboratively with businesses, government officials, public interest groups, and other organizations.
- Convening conferences and workshops, primarily for energy efficiency professionals.
- Assisting and encouraging the media to cover energy efficiency policy and technology issues.
- Educating businesses and consumers through our reports, books, conference proceedings, media outreach, and Web site.



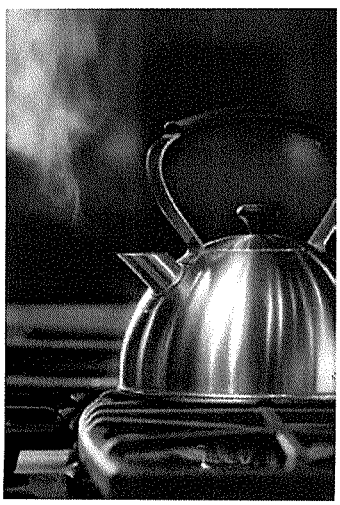


Introduction

In the simplest of terms, every drop of water saved in the U.S. saves energy, and every unit of energy saved saves water. That overlap between energy and water has come to be known as the "energy-water nexus."

In 2005, the California Energy Commission found that sourcing, moving, treating, heating, collecting, re-treating, and disposing of water consumed 19 percent of the state's electricity, 30 percent of its natural gas, and 88 billion gallons of diesel fuel each year, and those amounts grow each year (CEC 2005). Similar detailed analyses have not been done elsewhere in the country, but additional such research on a regional level is needed. Nationally, the River Network's 2009 report entitled *The Carbon Footprint of Water* estimated water-related energy use accounts for 13 percent of the nation's total electricity consumption, at least 520 million megawatt-hours annually (River Network 2009).

Likewise, the U.S. Geological Survey, in its report entitled *Estimated Use of Water in the United States in 2005,* estimated that 49 percent of the nation's total water use and 53 percent of fresh surface-water withdrawals went into the production of thermoelectric power (USGS 2009). Much of that water use is termed "non-consumptive" because water is returned to its original source, even though its qualities have changed, especially temperature and pollutant levels. Some of that withdrawn water, however, becomes "consumptive" when it is lost to evaporation. Estimates of the amount of water lost to consumption in energy production ranges widely because of variances associated with climate and with thermoelectric generation versus hydroelectric generation. Nevertheless, an approximate average of 23 gallons per kilowatt-hour at least provides a rough indicator of quantity (USGS 2009).



For the past 30 years, strategies to conserve energy and increase the efficiency of energy use have been widely pursued. Similar efforts in the conservation and efficient use of water have occurred over the past 20-plus years. However, the two communities have historically not worked together in a coherent, collaborative manner, and instead generally created separate but parallel efforts. These separate activities could realize significant benefits from coordination.

Recognizing this need for collaborative actions, the American Council for an Energy-Efficient Economy (ACEEE) and the Alliance for Water Efficiency (AWE) secured a grant from the Turner Foundation to bring these two communities together to establish a blueprint for future joint efforts and to envision a policy agenda that could drive actions at the federal, state, local, and watershed levels.

During November and early December 7 of 2010, workshop invitees completed a priority-setting survey. The results of that survey appear in Appendix 1, and helped shape the agenda for the workshop that followed. On December 9, 2010, 54 individuals representing 41 diverse organizations convened for a full-day meeting in Washington D.C. to create the basis of this blueprint. This document represents the outcome of that effort. Appendix 2 contains the full roster of attendees.

The workshop addressed three broad elements: policy/codes, research, and programs. Participants contributed via plenary discussions, breakout discussion groups, and posts to organized flip charts. In total, participants at the meeting identified 11 themes related to policy and codes, 12 related to research, and 8 related to programs. Each theme included a large number of specific suggestions. At the end of the day participants voted on priority areas. (See Appendix 3 for the raw output of the meeting.) ACEEE and AWE staff then distilled the many ideas advanced at the workshop and integrated the priority areas identified into this blueprint document.

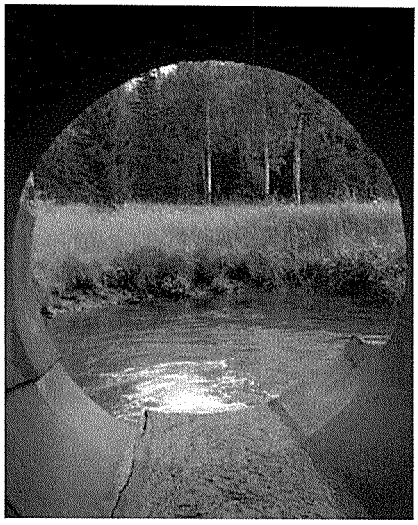
This document uses the words "energy" and "electricity" interchangeably, and our use of the word "water" generally refers to treated water and wastewater. The terms do not include all possible forms of energy or water. For example, those resources used in agriculture and processes related to extractive and industrial endeavors are not part of this blueprint. However, water used in electricity generation is included.

Appendix links:

Appendix 1:
http://aceee.org/files/pdf/blueprintappendix01.pdf

Appendix 2:
http://aceee.org/files/pdf/blueprintappendix02.pdf

Appendix 3:
http://aceee.org/files/pdf/blueprintappendix03.pdf



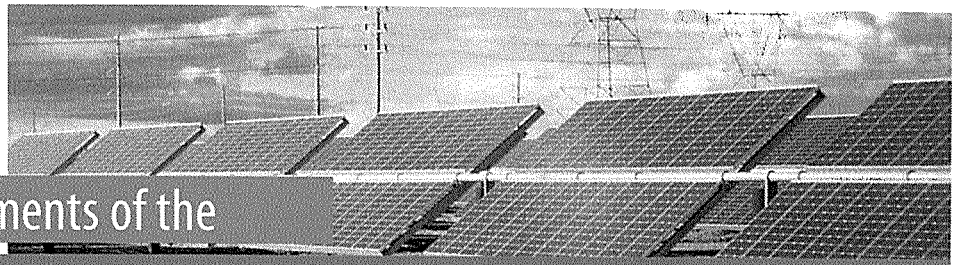
Developing the Blueprint and Policy Agenda

In preparing this blueprint, ACEEE and AWE have attempted to capture the directions set by the workshop participants but have analyzed and consolidated the group's contributions to make them more coherent and easier to follow. Upon completing an initial draft, all workshop invitees and participants received a copy for review and comment. We hope this process of developing a consensus blueprint and policy agenda will provide a framework for collaborative action, funding, and policy development well into the future.

This blueprint contains eight broad thematic elements, each including a number of action strategies. Virtually all of the elements will require complex collaborations. Collaborators will include funding sources, advocates and nonprofit organizations, government agencies at every level, trade associations, energy and water utilities, consumer groups, business, regulatory agencies, universities, national laboratories, policymakers, and the U.S. Congress.

In addition, at the end of this document we provide an agenda for federal and state policy actions that draws from all of the elements of the blueprint, as well as some recommended initial priorities.

The blueprint outlines bold, innovative new directions that can begin immediately. As its elements are implemented, they will change the way water and energy are used, measured, and managed, and they will change the relationships and actions of stakeholders, creating new, more active and visionary coalitions.



Thematic Elements of the BLUEPRINT FOR ACTION

1. Increase the level of collaboration between the water and energy communities in planning and implementing programs.

2. Achieve a deeper understanding of the energy embedded in water and the water embedded in energy.

3. Learn from and replicate best practice integrated energy-water efficiency programs.

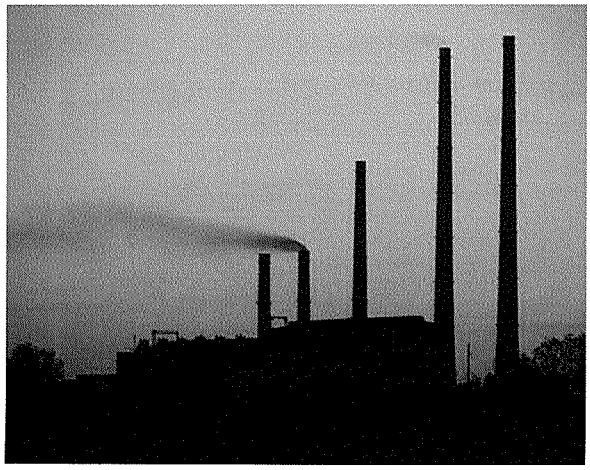
4. Integrate water into energy research efforts and vice versa.

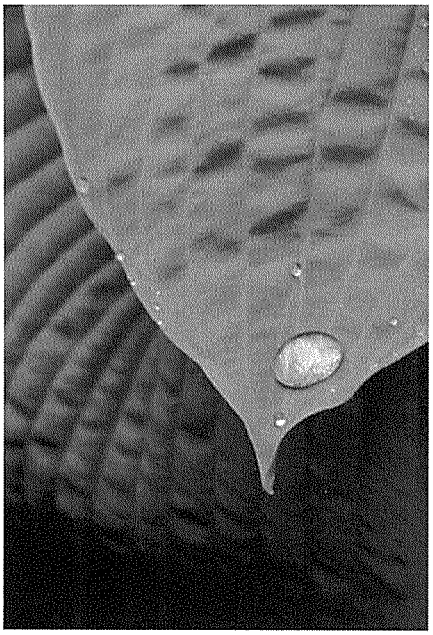
5. Separate water utility revenues from unit sales, and consider regulatory structures that provide an incentive for investing in end-use water and energy efficiency.

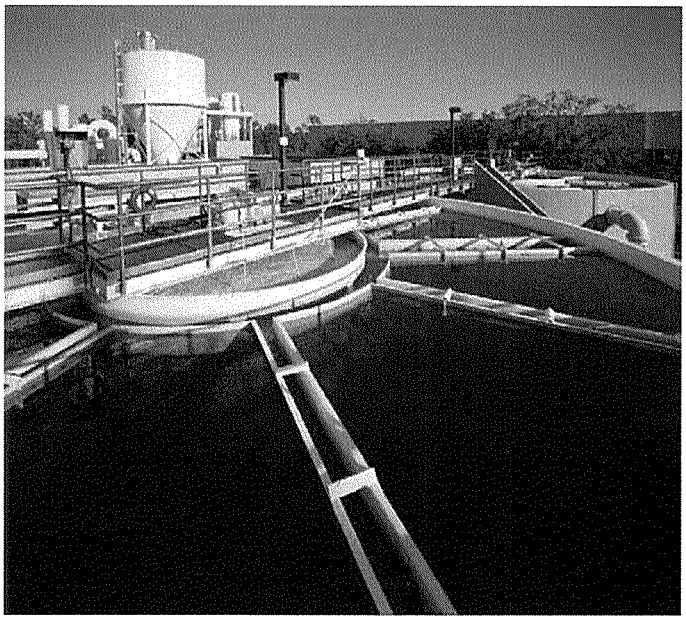
6. Leverage existing and upcoming voluntary standards that address the energy-water nexus.

7. Implement codes and mandatory standards that address the energy-water nexus.

8. Pursue education and awareness opportunities for various audiences and stakeholders.







1.

Increase the level of collaboration between the water and energy communities in planning and implementing programs.

The water and energy efficiency communities do not share a common language or appreciation of existing efficiency efforts. In addition, the two communities frequently operate under different regulatory business models and existing structures that do not recognize the benefits of both energy and water savings.

We need to develop mechanisms to encourage communication and help guide the two communities and their regulators.

1-A. Establish ongoing water and energy working groups to increase cooperation among energy and water agencies, utilities, and communities, to share best practices and recognize the nexus as the first step toward working together.

1-B. "Just add water:" Integrate water and wastewater into existing energy efficiency programs, and integrate energy into existing water and wastewater efficiency programs.

1-C. Incentivize residential and business efficiency programs to gain additional savings related to embedded water and energy, and develop methodologies that fairly attribute the savings and costs of both energy and water efficiency programs.

1-D. Integrate energy and water audit practices, and provide integrated retrofitting recommendations, rebate programs, and outreach and education efforts.

2.

Achieve a deeper understanding of the energy embedded in water and the water embedded in energy.

This need revealed itself in the workshop not only as being a high priority, but also as a theme that spanned the domains of both policy and research. There are only limited data available on the contribution of water to energy use and vice versa. A deeper understanding will help to lay the foundation for the other elements in this blueprint.

2-A. Develop consistent and comparable methodologies for measuring embedded water and energy, and for developing consistent water and energy factors to help drive programs, policies, and technology development/implementation.

The foundation for this effort can be provided through the development of a comprehensive database on water embedded in energy and energy embedded in water. This information should be enhanced over time with regional and state-by-state data that will provide tools for working locally. Credible national estimates should be developed based on the compiled state, local, and regional data.

2-B. Develop baseline estimates of total energy use by water and wastewater utilities of different types, as well as estimates of water use by electric generation technologies.

This effort would include the creation of a tool for ensuring that the information will be readily available to inform future actions. Data should include energy use in raw water transmission and treatment; treated water distribution; and wastewater collection, treatment, and disposal energies, not just energy use at the plant level.

3.

Learn from and replicate best practice integrated energy-water efficiency programs.

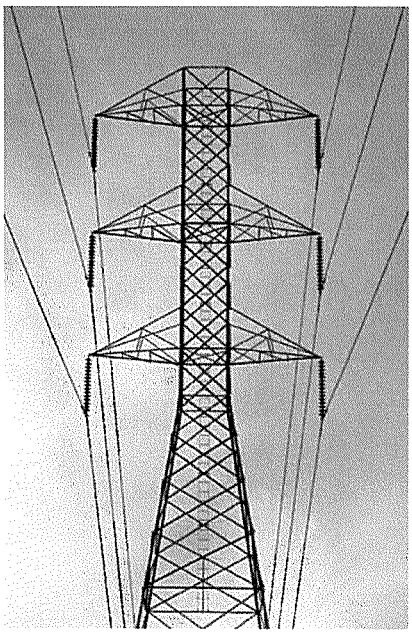
The energy efficiency community has a legacy of more than three decades of identifying, documenting, and replicating successful program models. Capturing a knowledge base of what works and what doesn't work will provide an important element of building successful combined programs. Though not yet plentiful, a number of successful programs that can become models for future efforts currently exist.

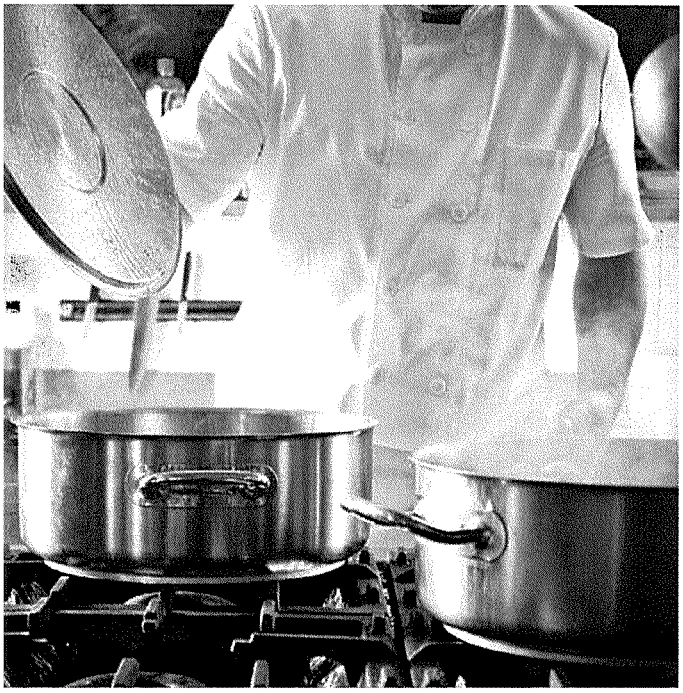
Other programs that might be examined include benchmarking and labeling programs, such as Energy Star and WaterSense, and utility optimization programs, such as Watergy.

3-A. Survey existing programs that clearly address the energy-water nexus to identify examples of best practice programs that are exploring the water-energy nexus. Identify the elements contributing to success of these programs so they can be replicated by other programs. Distinguish between performance measured as expected savings (i.e., presumed via standards and certifications) and performance measured as demonstrated savings (i.e., using metered water and energy consumption data).

3-B. Develop a framework for collecting integrated data on energy and water savings. Develop a uniform format and uniform metrics for adding energy and water savings calculations to existing efficiency programs. Having commonly agreed upon terms will facilitate communication with policymakers and the public about systemic approaches to combined energy and water efficiency.

3-C. Inventory and assess current work related to green infrastructure and water-energy efficiency, such as that done by the River Network, the Natural Resources Defense Council, American Rivers, and the Environmental Protection Agency. Use this information to identify Best Management Practices and needs for future research and analyses.





4.

Integrate water into energy research efforts and vice versa.

A significant amount of research has taken place related to nexus issues, but a great deal more remains to be done. The participants were clear that while there is always a need for new technologies, the pressing research needs are to better understand what is currently happening in the marketplace and to find ways to foster increased collaboration.

4-A. Identify the highest priority research needs by building a database of existing nexus-related research. This work should help disseminate research foci and findings; determine gaps in need of filling; and assist policymakers, analysts, researchers, program developers, and administrators to better incorporate energy into water and water into energy.

Provide this research information in user-friendly formats, perhaps building on existing and familiar platforms.

4-B. Assess the need for combined water and energy efficiency in various regions of the country given the imperative of addressing water and energy resource constraints.

4-C. Develop water and energy footprinting methods for use in facility management, land use planning, and new development permitting.

5.

Separate water utility revenues from unit sales, and consider regulatory structures that provide an incentive for investing in end-use water and energy efficiency.

Water supplies are generally priced just as they were when systems were built: water utility revenue is based on selling discrete unit blocks of water. Until recently, a large percentage of water utilities still charged on a declining block basis, thus providing a disincentive to water-use conservation and efficiency. Energy-related rate setting is both more mature and more progressive than that of water.

Progressive forms of collecting water utility revenue remain rare; a full third of water utilities nationwide still have declining block rate structures. Thus, water utilities are caught between the whipsaw of the "boom or bust" cycles. In times of drought when supplies are short, utilities need customers to be efficient. In times of abundance, utilities beg customers to use more water in order to meet fixed system costs. This antiquated way of collecting revenue needs to be revamped much like many energy utilities are doing.

5-A. Prepare a report for local and state policymakers and water utilities that identifies lessons learned from energy experiences, addresses rate-related barriers to efficiency program implementation, and helps to clarify utility disincentives for encouraging efficiency.

5-B. Conduct an energy-water decoupling pilot study to help identify options, issues, opportunities, and recommendations for separating revenues and sales volumes.

5-C. Provide technical assistance related to rate setting for utilities, including wastewater. Develop educational materials for water utilities.

6.

Leverage existing and upcoming voluntary standards that address the energy-water nexus.

Voluntary water and energy standards specify test procedures, performance levels, labeling, and practice frameworks. They provide the foundation for implementing programs and policies that encourage efficiency, while also forming a foundation for regulatory building codes and appliance and equipment performance standards.

Both the water and the energy fields already have robust standards that address the issues facing their respective communities. This blueprint establishes the framework for bridging the two communities' standards, allowing improved coordination.

6-A. Leverage existing and upcoming national standards that fully link energy and water management, building on ANSI/MSE 2000-2008[1] and ISO 50001,[2] and provide incentives that encourage their implementation by consumers.

6-B. Develop recommendations for better integrating water and energy efficiency, including long-term building maintenance, into "green" codes, stretch codes, and whole building rating systems.

6-C. Develop model land-use and planning codes that take water and energy efficiency into account.

[1] American National Standards Institute (ANSI), *Management System for Energy,* Standard MSE 2000 (revision 2008), **http://www.mse2000.net/.**

[2] Pending energy management standard under development of by the International Standards Organization (ISO) Technical Committee 242, **http://www.iso.org/iso/pressrelease.htm?refid=Ref1399.**

7.

Implement codes and mandatory standards that address the energy-water nexus.

The Department of Energy implements mandatory minimum efficiency standards for equipment. All relate to energy; some also relate to water. More can be done to save water using these standards.

Building codes, plumbing codes, and electrical codes also provide opportunities to promote combined water and energy improvements. Because codes are developed nationally but adopted locally, they provide a functional avenue for widespread change.

7-A. Explore opportunities to expand the products covered by Department of Energy equipment standards to include more water-using products and to take into account direct and indirect water impacts when assessing efficiency opportunities.

7-B. Modify national model building codes to better incorporate water efficiency. Develop proposed amendments for ASHRAE 90.1-2013 and IECC-2015, to provide specifically for energy and water efficiency measures, such as hot water distribution architecture guidelines and standards for both commercial and residential applications.

8.

Pursue education and awareness opportunities for various audiences and stakeholders.

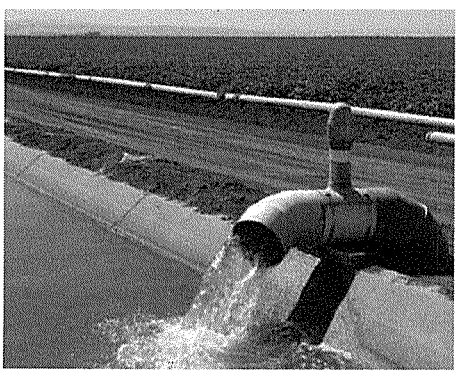
The average American consumer has little awareness of the relationship between their energy consumption and water consumption. Educating consumers, planners, policymakers, utility managers, and energy and water efficiency contractors and professionals will be a critical component to bringing about change.

8-A. Undertake utility education, outreach, technical assistance, and training programs to educate water and wastewater utilities on energy efficiency tools and technologies that exist and can be readily employed.

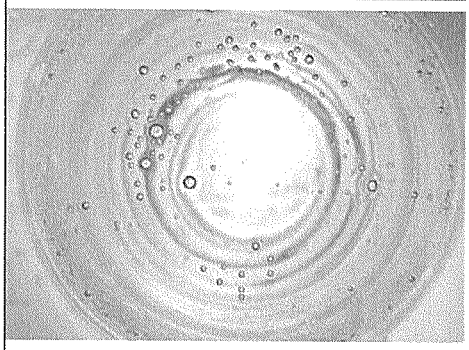
8-B. Create partnerships between energy and water utilities, industry organizations, and nonprofit organizations for joint public messaging and education programs. These partnerships could address areas of common savings, such as clothes washers, dishwashers, shower systems, and commercial food services, and that includes social marketing and community engagement: "When the lights are on, water is flowing somewhere; when the water is flowing, fuel is burning somewhere."

8-C. Develop knowledge sharing programs on high-performance systems and designs to educate such groups as system operators, land use planners, and engineers about strategies for optimizing energy and water efficiency.

8-D. Convene seminars for policymakers and their staffs on energy and water nexus issues.



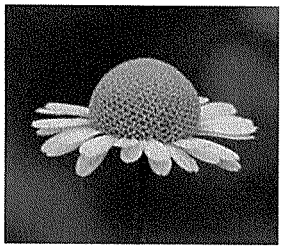
The Policy Agenda



Negotiating the demanding changes outlined in this blueprint will not only require intense collaboration among stakeholders and advocates, it will also require government engagement and leadership. As a first step, an effort should begin immediately to identify specific policy opportunities, assess appropriate sources of authority, and identify sources of funding. This policy agenda has emerged from all of the preceding blueprint elements, and it includes important policy directions at the national, state, and local levels.

- Encourage the implementation of regulatory structures and incentives that reward water and energy efficiency, including by establishing mechanisms to recognize the benefits of water and energy savings by programs, and consider setting water-saving targets for utilities, just as many states have energy-saving targets for utilities.
- Encourage the Department of Energy to implement appliance and equipment standards for water-using appliances and equipment, and provide appropriate credit for direct and indirect water impacts in setting performance standards.
- Develop, enact, and implement building codes that recognize water and energy efficiency.
- Develop and propose specific energy-water elements to add to existing federal legislation, such as the Water Resources Development Act, the Federal Water Pollution Control Act, the Safe Drinking Water Act, the Energy Policy and Conservation Act, and the National Energy Conservation Policy Act.
- Develop and propose tax incentives for water and energy efficiency, preferably performance based.
- Direct and provide resources to such federal bodies as the Energy Information Administration, national laboratories, the Federal Energy Regulatory Commission, the Census Bureau, the Department of Interior, and the Environmental Protection Agency to collect water and energy end-use data from across sectors and to extend existing and future energy policy analyses to include water impacts where possible.
- Identify a platform enabling energy and water regulatory and governance bodies to communicate with each other readily.
- Encourage increased collaboration among federal, state, and local agencies in such areas as the integrating of water and energy efficiency through the use of grant funding, research, regulation, and technical assistance from the Department of Energy, the Environmental Protection Agency, the Department of Agriculture, and the National Oceanic and Atmospheric Administration.
- Require coordination between energy and water regulatory authorities when considering siting of new power plants or significantly expanding existing power plants.

In addition to these policy items, there are critical initial research and collaboration items. In the next section we discuss the highest priority initial efforts including policy, research, and collaboration.

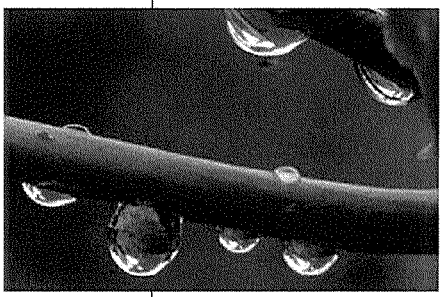


Moving Forward

The completion of this blueprint represents an important first step in a long-term dynamic process. The blueprint is not intended to be comprehensive or all-inclusive. Rather, it is informative and direction setting, and we hope that the energy and water conservation communities will learn from it and be motivated to act.

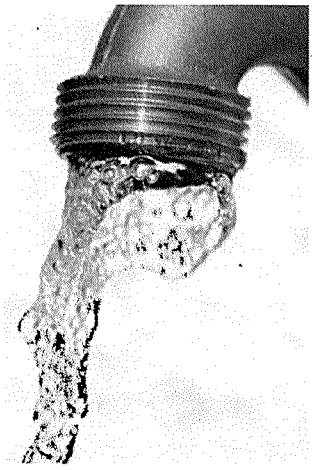
In terms of next steps, we recommend that the following initial priorities be implemented over the next year:

- Work to incorporate cost-effective energy and water efficiency measures into building codes, equipment standards, and tax credits (Policy Items 2, 3, and 5). Work on codes, standards, and tax incentives is now taking place. It is important that energy and water efficiency both be integral parts of these discussions, including work on national model residential and commercial building codes, Department of Energy efficiency standards, and tax incentives that will likely be discussed by Congress in the fall of 2011.
- Survey existing programs that clearly address the energy-water nexus to identify examples of best practice programs. Identify the elements contributing to success of these programs so they can be replicated by other programs (**Blueprint Item 3-A**).



- Prepare a report for local and state policymakers and water utilities that identifies lessons learned from energy experiences, addresses rate-related barriers to efficiency program implementation, and helps to clarify utility disincentives for encouraging efficiency (**Blueprint Item 5-A**). This report will be a key foundation for Policy Agenda Item 1.
- Develop a baseline of total energy use by water and wastewater utilities and water use by electric utilities, which would include raw water transmission and treatment; treated water distribution; and wastewater collection, treatment, and disposal energies, not just energy use at the plant level (**Blueprint Item 2**). Such a study would compile existing data in one place and provide a good foundation for education efforts on the importance of water for energy use and energy for water use.
- Establish ongoing water and energy workgroups to increase cooperation among energy and water agencies, utilities, and communities, to share best practices and recognize the nexus as the first step toward working together (**Blueprint Item 1-A**). Such workgroups can coordinate both initial and ongoing efforts and facilitate information sharing.

These five steps will get energy and water cooperation efforts off to an excellent start and provide a foundation for further efforts.



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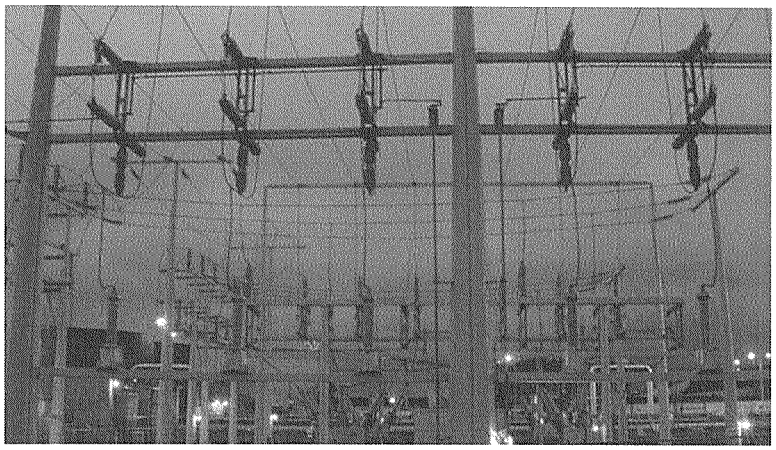
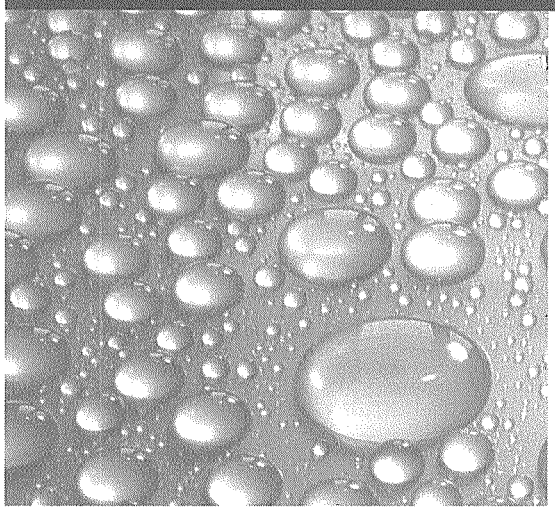


Addressing the Energy-Water Nexus:

A BLUEPRINT FOR ACTION
and Policy Agenda



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