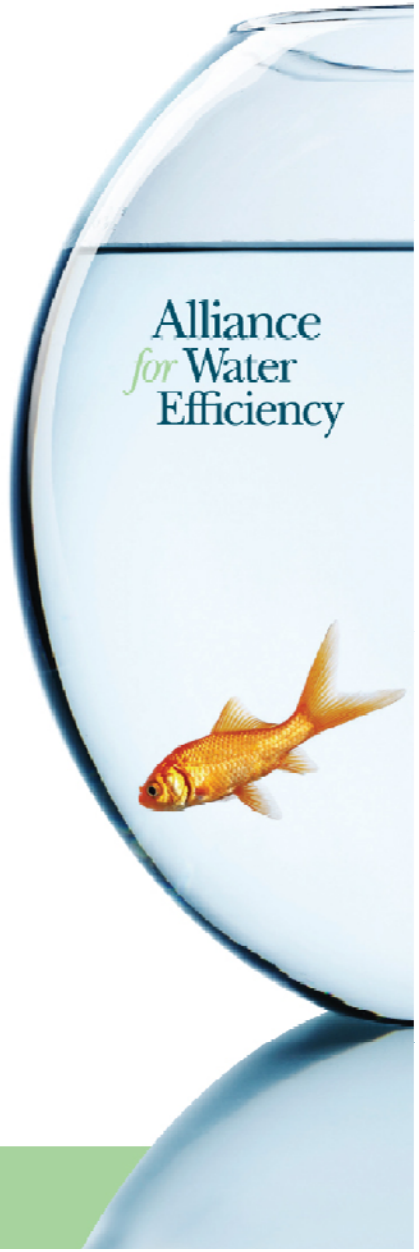
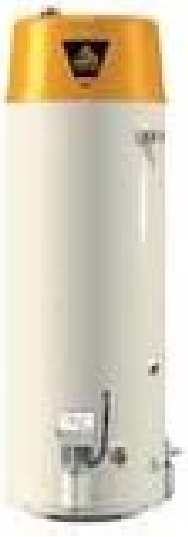
Water and Energy Nexus Research: What Are We Waiting For?

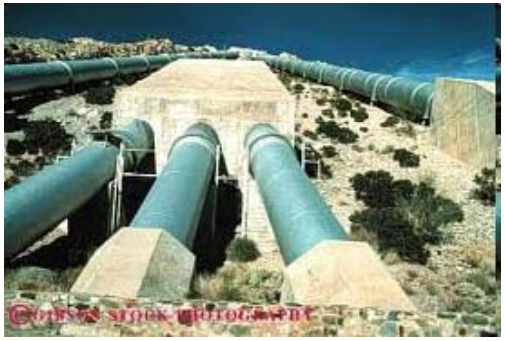
Mary Ann Dickinson
President and CEO

International Emerging Technology Symposium
April 23-24, 2014

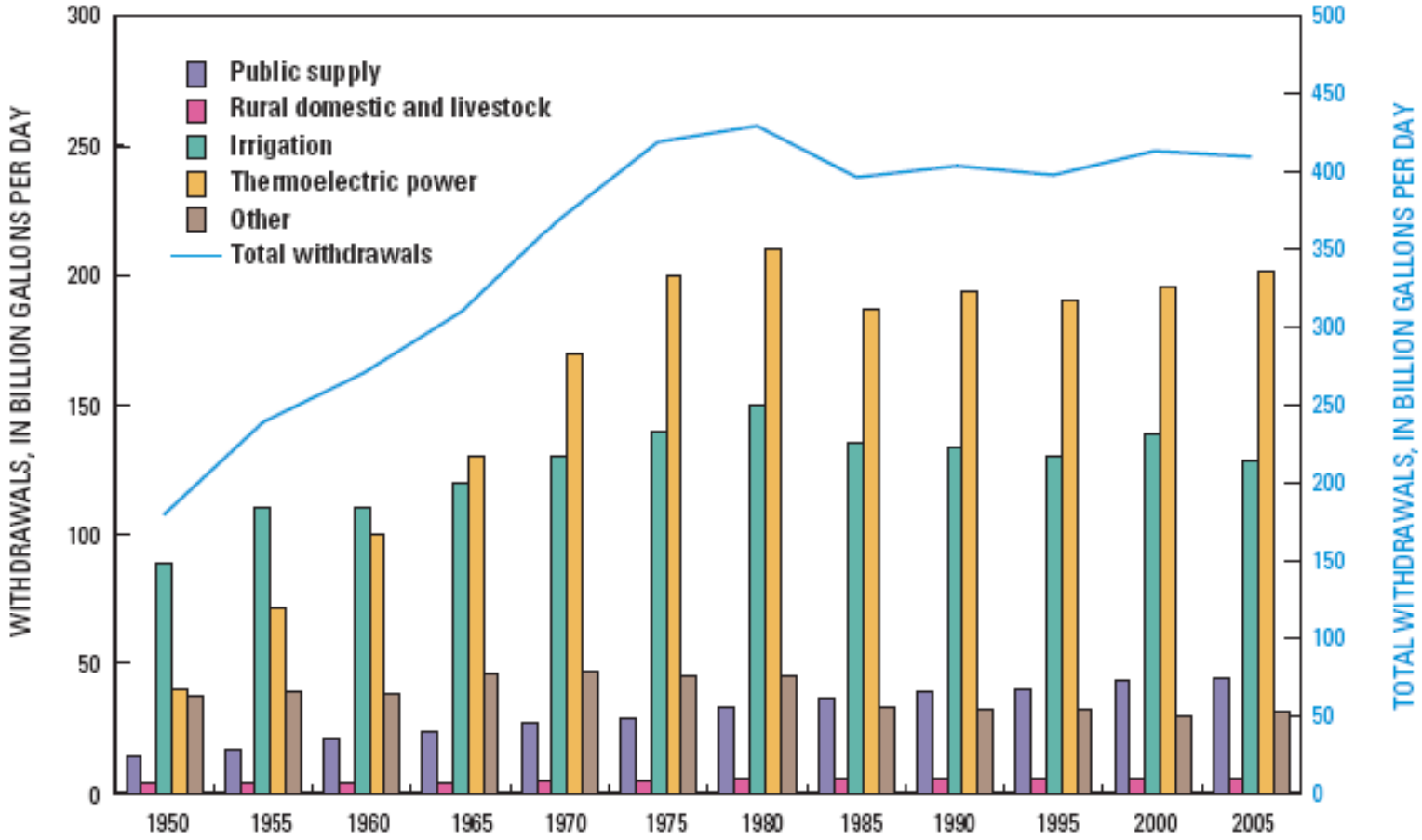


Water and Energy are Linked



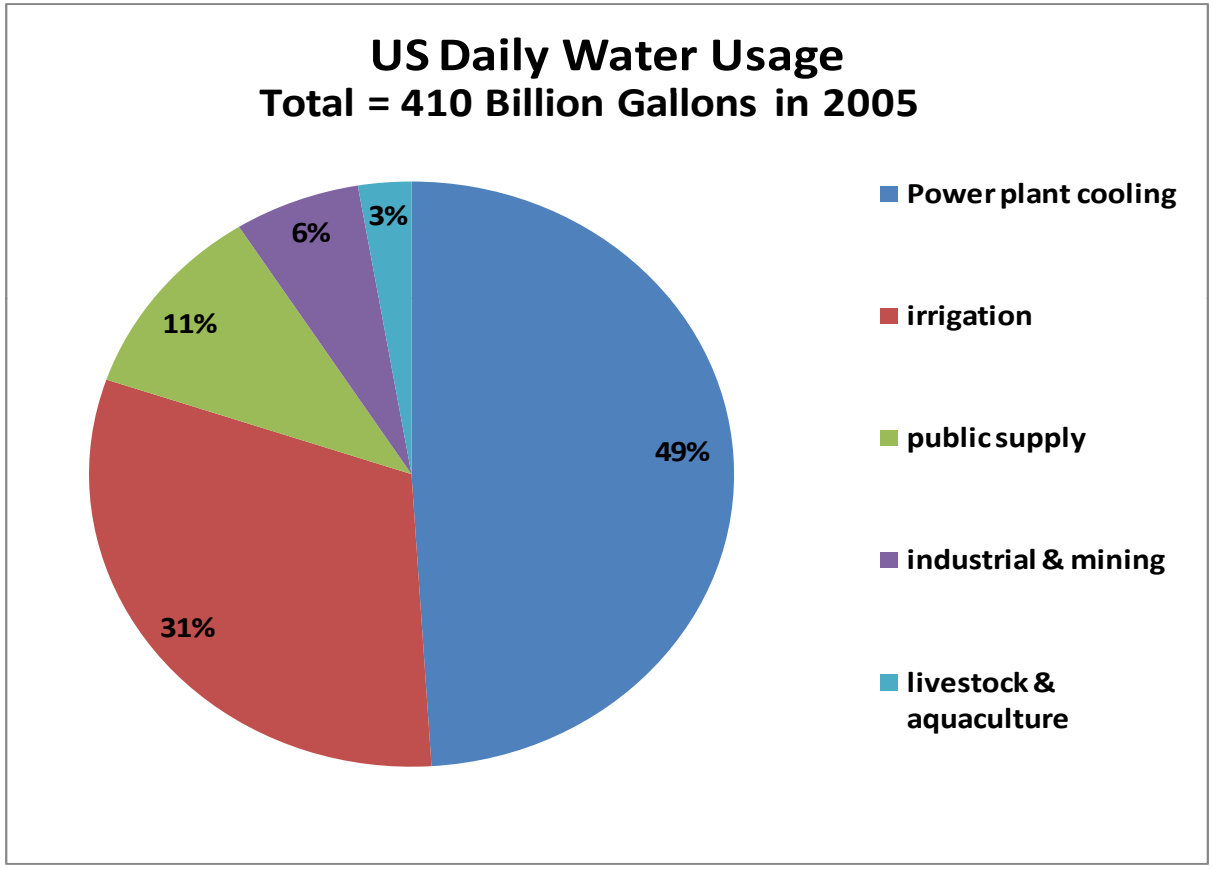


US Water Withdrawals



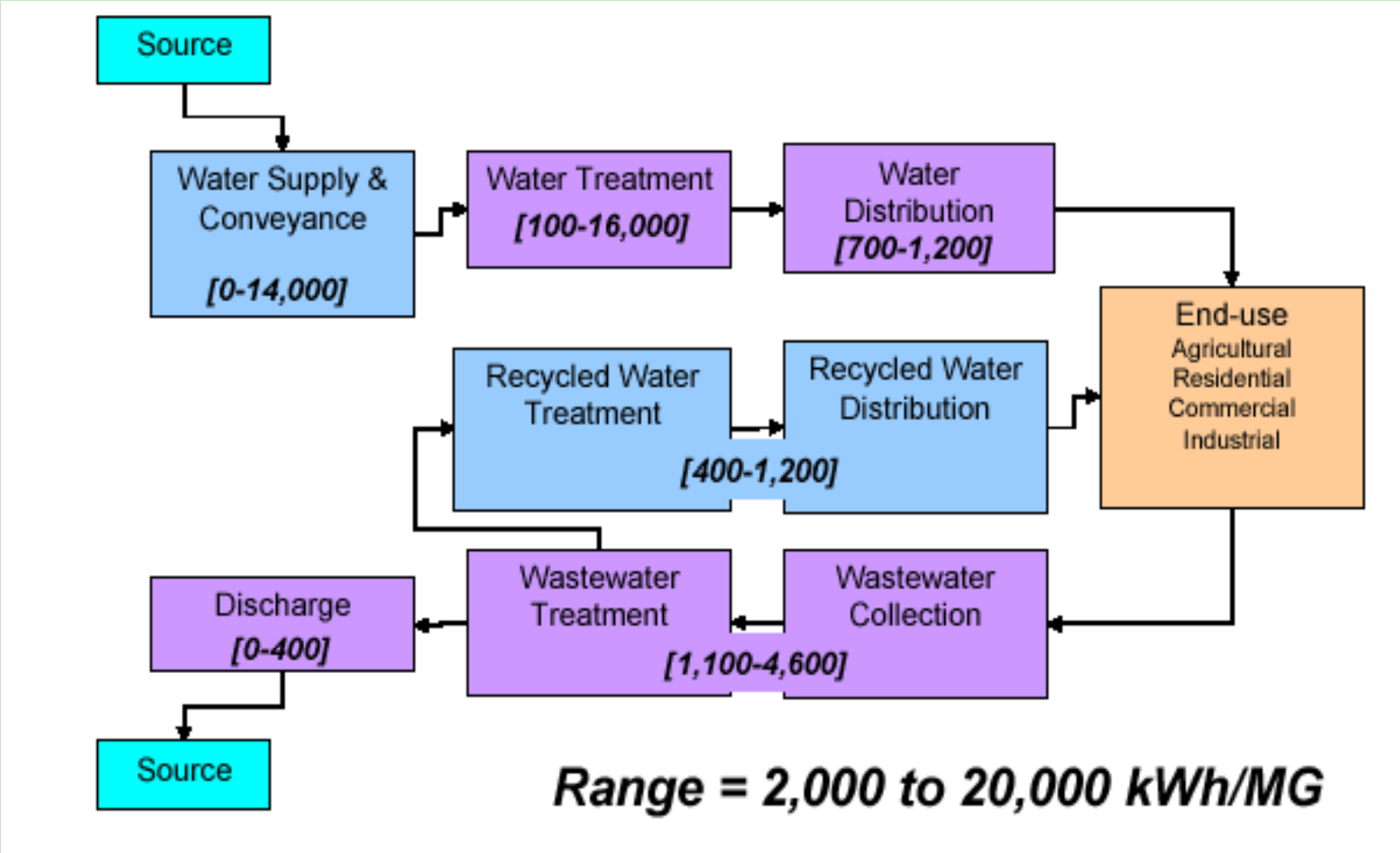
Source: US Geological Survey 2005

Embedded Water in Energy



Source: US Geological Survey 2005

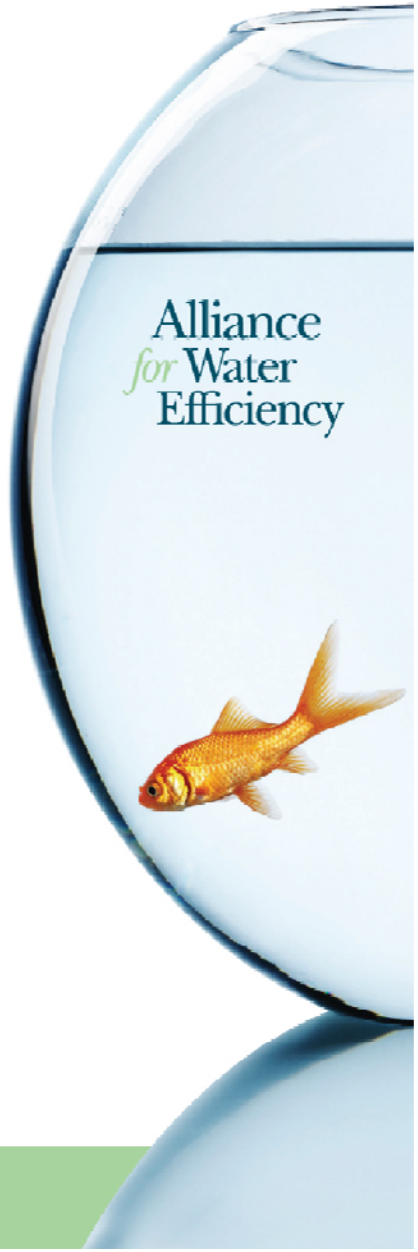
Embedded Energy in Water



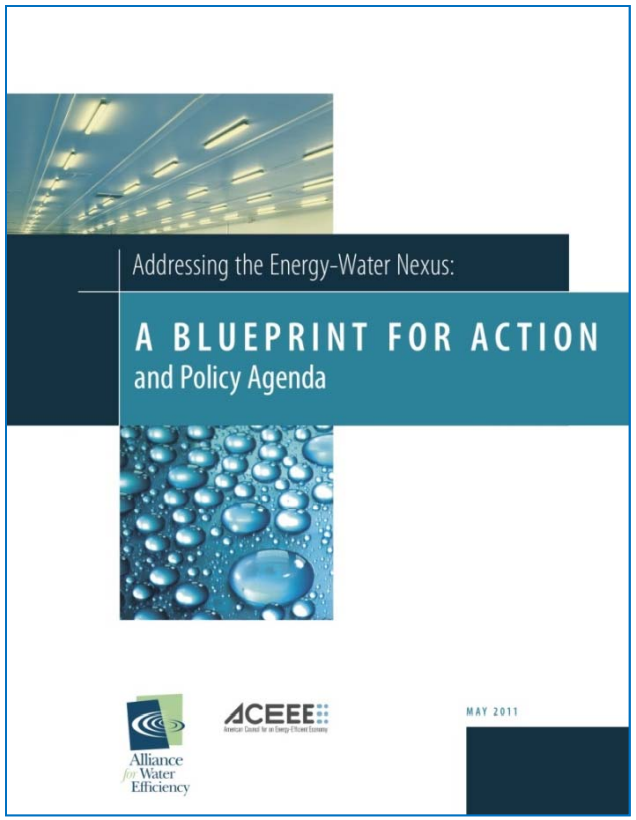
Source: California Energy Commission, 2005 IEPR

Our View

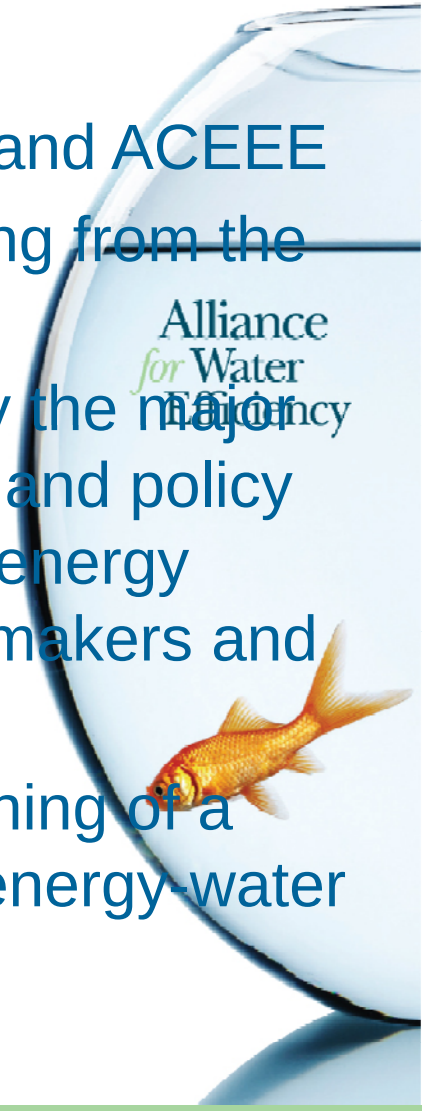
- AWE recognizes the need for collaboration
- Efforts for energy efficient use and water efficient use have historically been separate but parallel efforts
- We are committed to improving joint management of these issues
- Partner in this project is ACEEE (American Council for an Energy-Efficient Economy)



The First Project



- Joint effort of AWE and ACEEE
- Supported by funding from the Turner Foundation
- Purpose: to identify the major research, program, and policy needs of the water-energy nexus for decision-makers and funders
- Establish the beginning of a national long term energy-water community

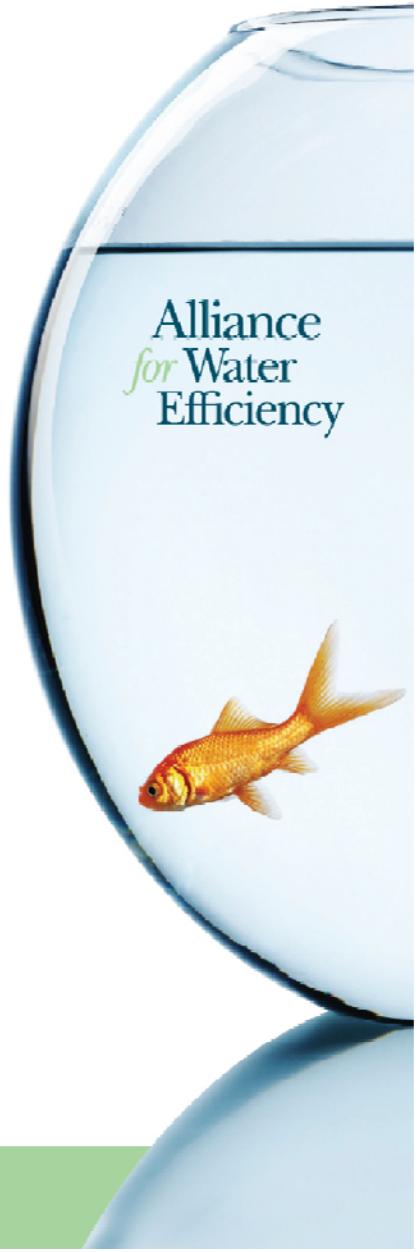


December 9, 2010 Workshop

- 54 individuals from 41 water and energy organizations
- 8 Main Themes identified with recommendations in each
- 5 Priority areas for immediate action
- Blueprint Report published and widely distributed
- Posted at **www.a4we.org**

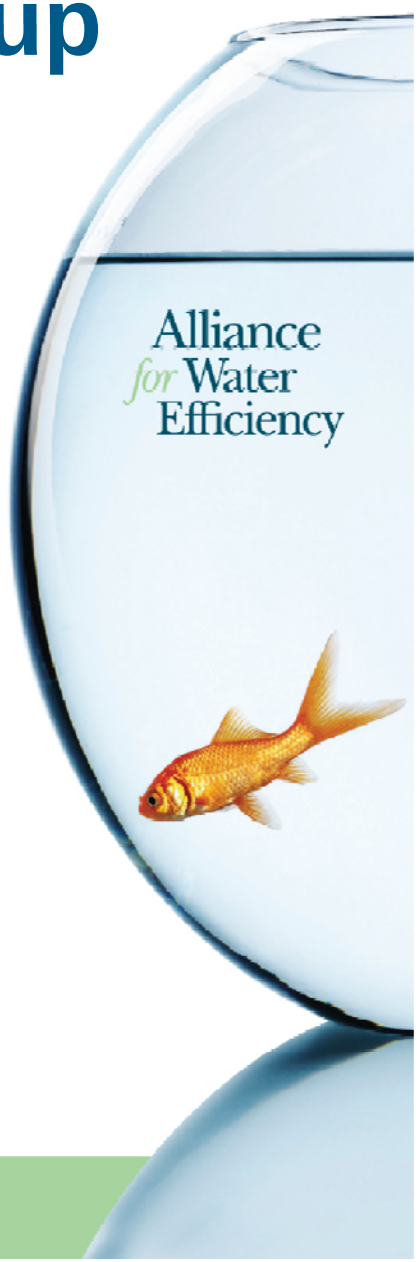
Water-Energy Research

1. Develop a comprehensive database on water embedded in energy and energy embedded in water.
2. Recommend consistent and comparable methodology for measuring embedded water and energy
3. Develop consistent water & energy factors to drive programs, policies, and technology development & implementation
4. Add regional and state-by-state data
5. Develop credible national estimates based on the compiled local and regional data
6. Develop baseline of total energy use by water and wastewater utilities and water use by electric utilities



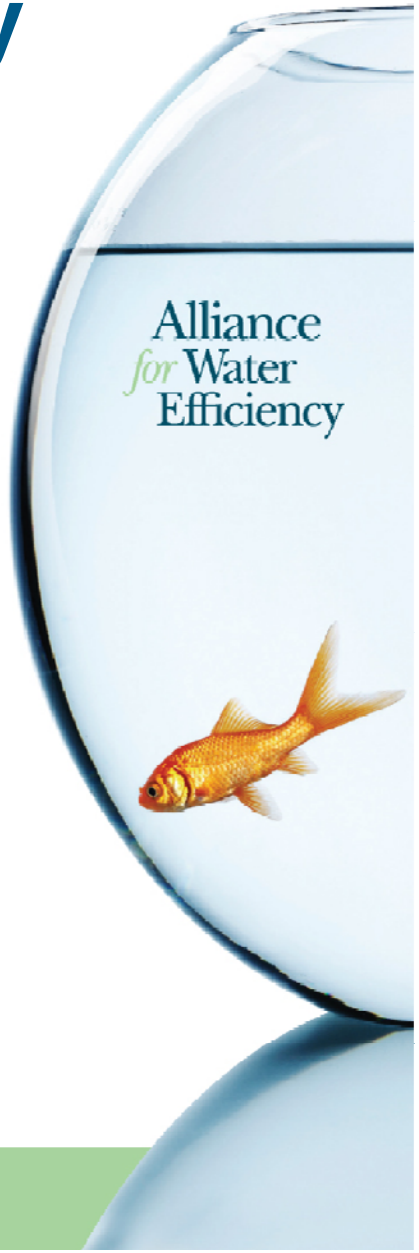
Goals for Research Work Group

- Inventory work already undertaken on embedded water in energy and embedded energy in water
- Inventory and assess current work related to green infrastructure and water-energy efficiency
- Inventory water and energy efficiency studies, research priorities and assessments on water-related energy consumption
- Recommend steps for national and regional research



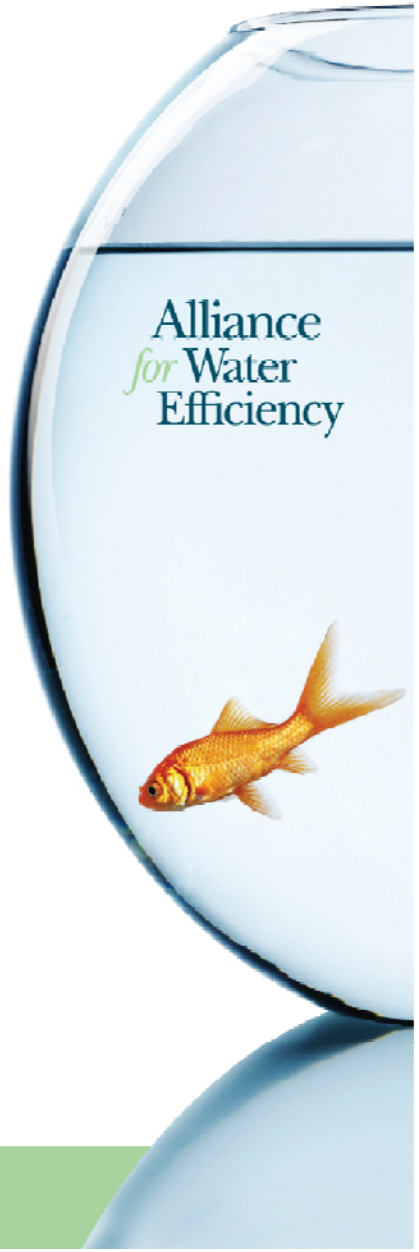
Research Work Group Activity

- 42 representatives from 33 organizations, including public utilities, research organizations, universities, government agencies, and advocacy organizations
- 13 Presentations made
- Research collected and summarized
- White Paper published in June, 2013 on research issues and recommendations
- Both documents posted on AWE web site: **www.allianceforwaterefficiency.org/Water-Energy-Research-Group.aspx**



Research Database

- Catalogued all publicly-available non-confidential research
- Over 200 research documents from Internet searches and recommendations from Work Group members
- Includes Primary research only
- 44-page database that provides Paper Title, Author, Organization, date of publication, link, keywords and key findings as well as types and methods of research, types of technologies, and types of findings and recommendations



Water and Energy Nexus Research Database

This database was compiled by GEI Consultants, Inc. and is sponsored by the Alliance for Water Efficiency and catalogues major, publicly available research that addresses the nexus between water and energy resources.

For more information about this database, please refer to "Water-Energy Research: Recommendations for Future Opportunities", May 2013, at ttp://www.allianceforwaterefficiency.org/.

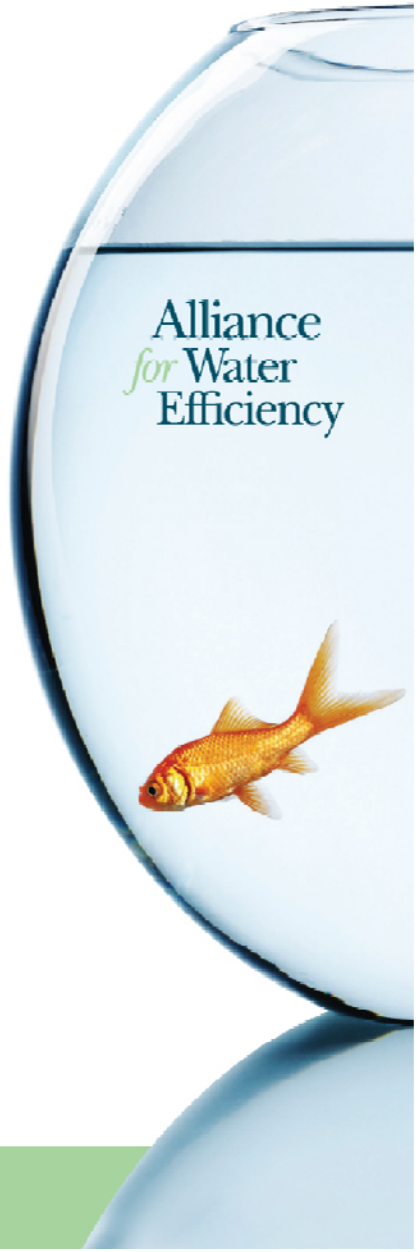
Paper Title	Author	Organization	Date	Link	E-W, W-E or Both	Key Words	Key Findings
Electrical Power Consumption for Municipal Wastewater Treatment	Robert Smith	EPA	7/1/1973	http://nepis.epa.gov/Exe/ZyNET.exe/9100TG7H.TXT?ZyActionD=ZyDocument&Client=EPA&Index=Prior+to+1976&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C70thru75%5CTxt%5C00000014%5C9100TG7H.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL	E-W	Electrical power consumption; conventional, advanced processes, municipal wastewater; unit process basis; power consumption, individual processes, plant utilities; comparison, electrical power	• Electrical power consumed in municipal wastewater treatment is about 1% of the average residential consumption of electrical power when the distribution of treatment schemes given in the 1968 Inventory of Municipal Waste Facilities is used as a basis. If all communities were served by activated sludge plants, the electrical power used will be about twice this amount. This is equivalent to about 15 watts per household. • Thus, for complete secondary treatment, the power consumed is about equivalent to 24 hour operation of one desk lamp per household. • The power consumed by tertiary treatment depends on the processes used, but for the Lake Tahoe system of tertiary treatment, the power consumed is about 40-50% greater than the power consumed in conventional activated sludge treatment.
Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota	Donald J. Hernandez	EPA	1/1/1978	http://nepis.epa.gov/Exe/ZyNET.exe/20007OWW.PDF?ZyActionP=PDF&Client=EPA&Index=1976%20Thru%201980&File=D%3A%5CZYFILES%5CINDEX%20DATA%5C76THRU80%5CTXT%5C00000000%5C20007OWW.txt&Query=&SearchMethod=1&FuzzyDegree=0&User=ANONYMOUS&Password=anonymous&QField=&UseQField=&IntQFieldOp=0&ExtQFieldOp=0&Docs=	E-W	Energy use, advanced wastewater treatment plant, Ely, Minnesota; plant operation; support services; indirect use	• The energy utilized by support services at Ely far surpasses energy utilization in the treatment process. Fuel is the largest single energy use. Regardless of the daily flow or level of treatment used (phosphorus removal) this energy use would not be reduced. An estimate of 205 t1J (57 kHh) per day for primary-secondary plant support services. This is very close to the probable use at the Ely primary-secondary plant. • After fuel the next largest use of energy is indirect use for the production of resources used. This use also far exceeds the energy used in the treatment process. Regardless of where a plant of this type is located, this utilization will remain relatively high. It can readily be seen that the greatest energy use is in the production of lime and electricity. • Of the total 62.37 GJ used per day at Ely, 27.68 GJ are attributable to heating the plant, 12.46 GJ are used in producing the lime, and 12.96 GJ are used in producing the electricity used at the plant. These three items constitute 85% of the plant energy use. • Energy use is a direct measurement of cost, in both dollars and natural resources. A complete and thorough evaluation should be carried out when an advanced wastewater treatment facility is considered, and no such facility should be built unless the study indicates a true need with minimum adverse effects. • Summary of daily energy utilization for AWT plant operation: Plant operation (5.36 GJ, 8.6%), Support services (31.03 GJ, 49.7%), Indirect (26.05 GJ, 41.7%), Total (62.44 GJ, 100%)

What Did We Find?

- The energy used in the water sector has been a concern since the 1970s, whereas the issues surrounding the water used in energy production has only received attention starting in the 2000s
- No comprehensive studies were found that provide a detailed audit of embedded energy demands for an entire local, regional or national water/wastewater system

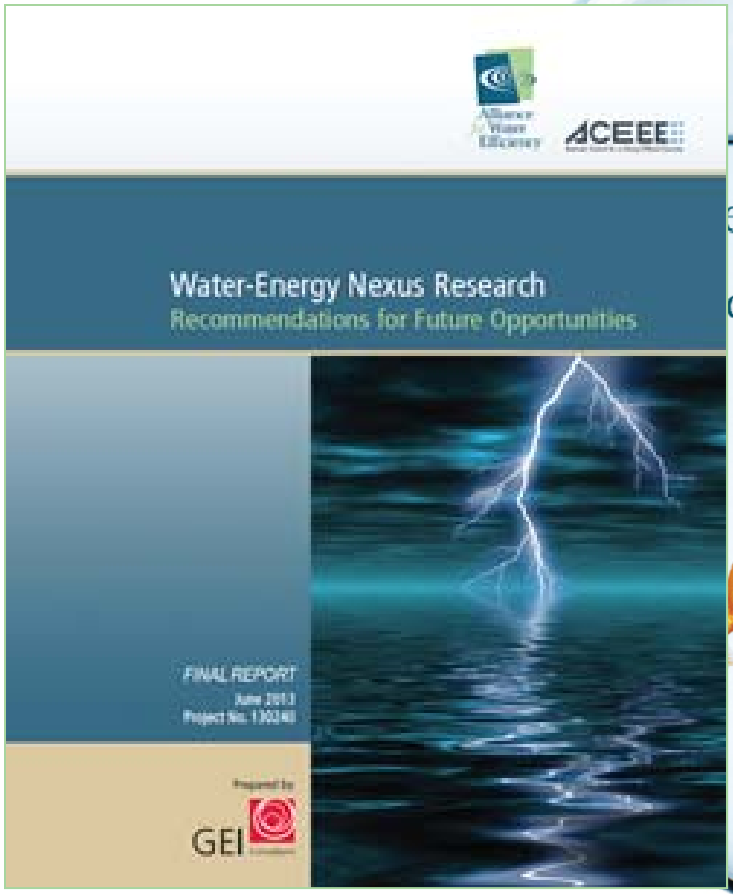
What Did We Find?

- There are more studies related to the energy used in the water system (E-W) than the water used in the energy sector (W-E)
- Most of the available research for either E-W or W-E has been published within the past 10 years
- Public funding of research is needed to spur additional investigations of alternative sources of energy and water



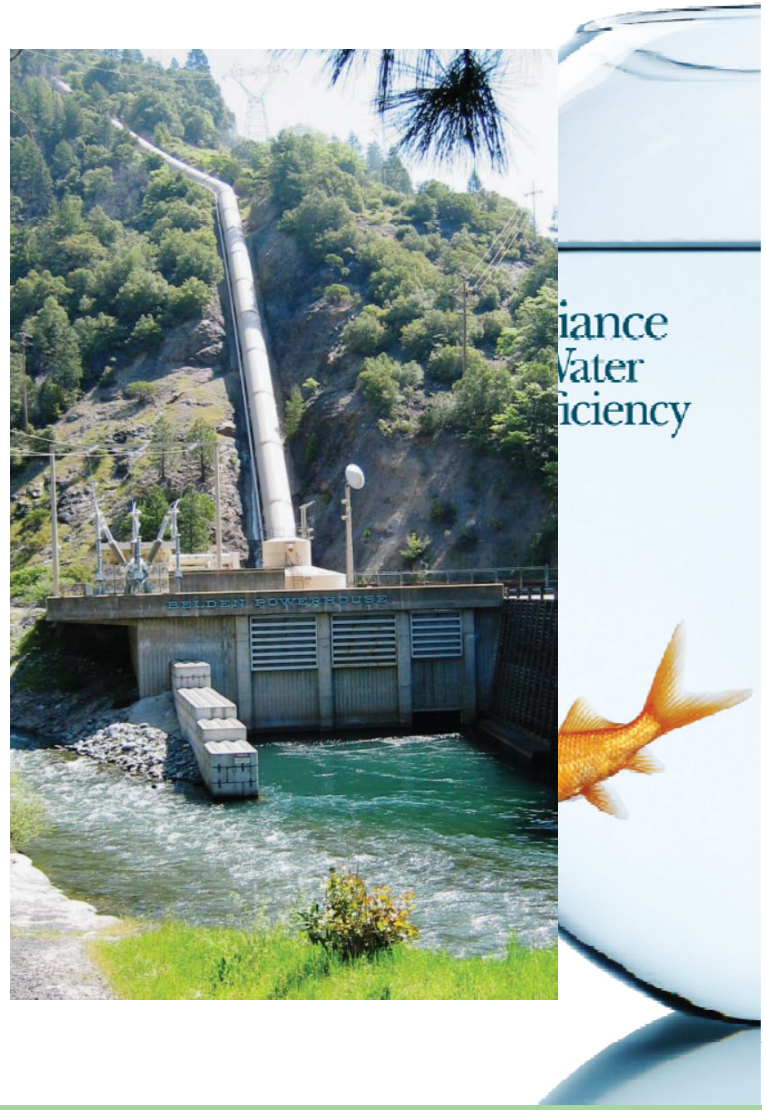
Publication of White Paper

- White Paper accompanies research database
- Published in June, 2013
- Posted on AWE's web site at **www.a4we.org**
- Discusses research findings in detail
- Provides recommendations for further research



Recommendations

1. Develop comprehensive studies and associated guidelines to conduct a detailed audit of embedded energy demands for an entire local, regional or national water/wastewater system for purposes to determining system optimization



Recommendations

2. Assess technical and economic energy efficiency and demand response potential in water and wastewater systems and develop industry accepted guidelines for such studies on individual systems
3. Identify and eliminate regulatory barriers to co-implementation of efficiency programs in the water and energy sectors

Recommendations

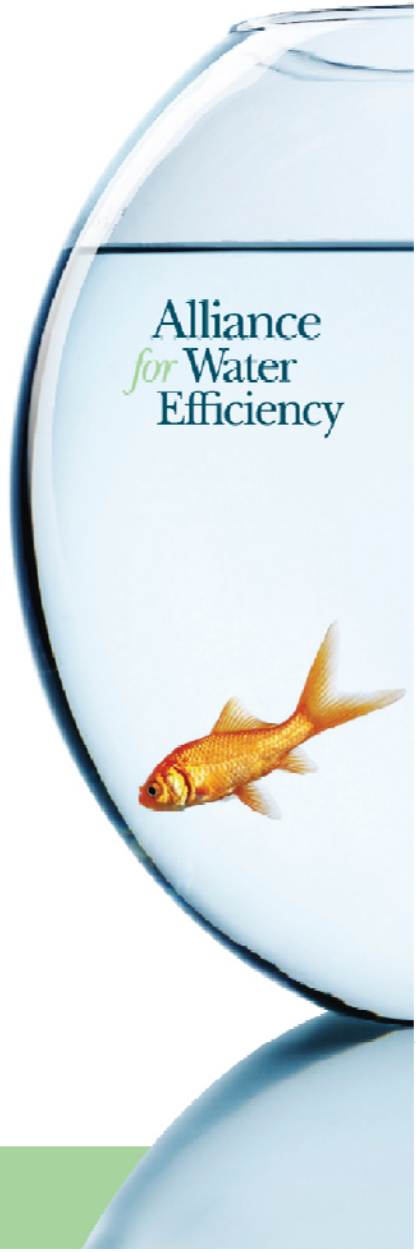
4. Develop water AND energy industry-accepted Evaluation, Measurement and Verification (EM&V) protocols for use in efficiency programs
5. Develop industry standards, protocols and business models for advanced biogas development programs and net zero facilities at wastewater treatment plants

Recommendations

6. Conduct landscape irrigation equipment efficiency potential studies to support establishment of efficiency standards

Recommendations

7. Identify rate structures, price constructs, and financing mechanisms that eliminate the disincentives of efficiency programs and alternative supplies use in the water sector
8. Evaluate technologies and practices that can reduce the energy demand of desalination and lower its costs
9. Continue investigations into the water energy tradeoffs of differing resource development & management choices that can better inform multi-sectoral integrated resource planning

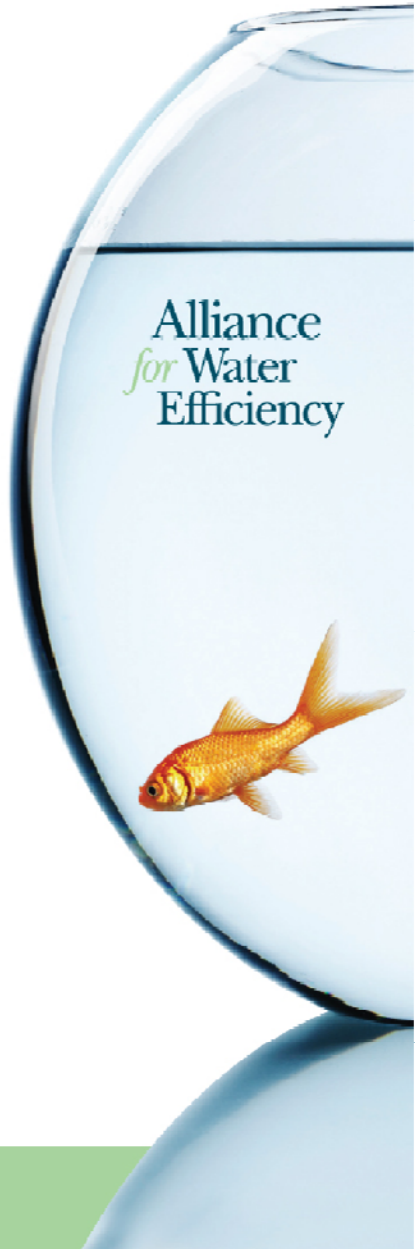


Recommendations

10. Develop technologies and protocols that can increase water use efficiency and re-use, support water supply switching, and reduce water quality impacts of power generation facilities and other energy fuels development

Recommendations

11. Assess potential impacts to water supplies and quality of energy resource development, such as fracturing for natural gas and biofuels development; identify methods, practices and technologies that reduce or eliminate these impacts
12. Develop supply chain and product embedded water-energy evaluations that inform consumers of the energy and water intensity of the products or services they buy

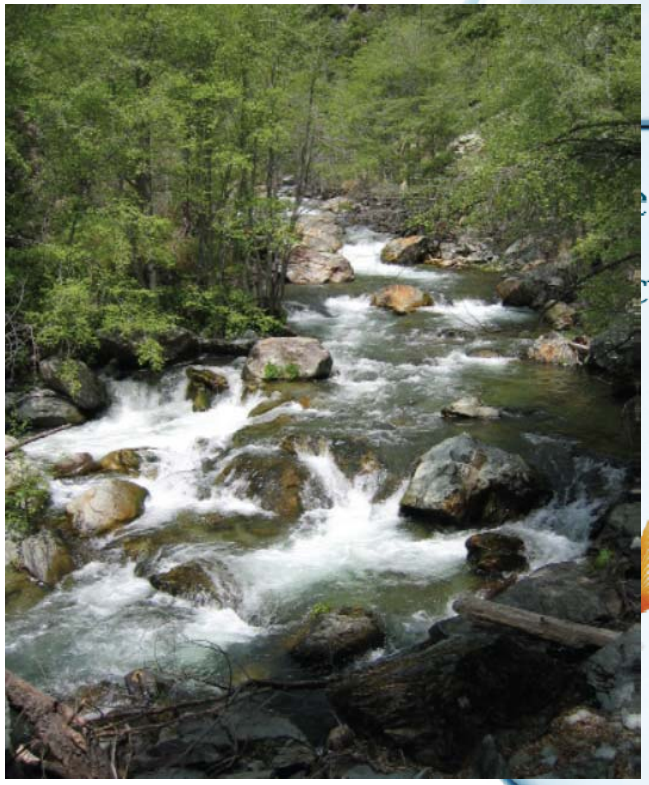


Recommendations

13. Identify effective methods, forums, practices and other mechanisms for communication and engagement by the research and policy communities to ensure commercialization and adoption of research results and technological developments

What's Next?

- Recommendations drawn from the observed findings and the identified gaps in research
- Vetted with Water and Energy Research Work Group
- Next Steps: improve awareness, funding, and better integrated management of water and energy resources on a local, regional, and national basis



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AWE Exemplary Programs Webinar on Innovative CII Water Efficiency Programs

The second webinar in the series showcasing exemplary programs of AWE's members will feature the internationally recognized commercial programs of City West Water in Melbourne, Australia. The webinar will offer practical advice on how to set up these innovative programs in your service area. Learn more here.

AWE Wins 2014 U.S. Water Prize

The Alliance for Water Efficiency has won the 2014 U.S. Water Prize in the non-profit category. The prestigious award is given annually by the U.S. Water Alliance to organizations that engage in sustainable solutions and advance holistic, watershed-based approaches to water quality and quantity challenges. The prize was presented to AWE on April 7 at the National Geographic Society Headquarters in Washington, D.C. Learn more here.

AWE in Time Square!

AWE's Never Waste ad is now running on the CBS "Super Screen" strategically positioned at 42nd St. between 7th and 8th Ave. in the heart of the Times Square Plaza. Our 10 second ad can be seen below.

Calendar of Events

4/23/2014	International Emerging Technology Symposium
5/6/2014	2nd Annual Smart Water Leadership Summit
5/6/2014	AWE Webinar - Exemplary Programs Series: Innovative CII Water Efficiency Programs
5/20/2014	2014 Energy Efficiency Global Forum
5/30/2014	River Rally 2014

How Much Water Do You Use?

Click Here to Learn More

Important Information

- Water Efficiency Watch Newsletter - March 2014
- AWE Webinar Page
- ANSI/AWWA G480-13 Standard
- Colorado River Basin Water Supply & Demand Study Released
- JOBS, INTERNSHIPS, AND RFP/RFQ BOARD
- AWE Water Conservation Tracking Tool
- Water Conservation Program Operations Standard
- AWE-ACEEE Water and Energy Research Work Group
- ISAWWA Water Utility Survey Report March 2012
- FedCenter.gov Announces New Water

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Resource Library

Welcome to the Alliance for Water Efficiency's Resource Library. AWE strives to provide the best on-line resources on water conservation and efficiency. Search through our collection and discover the wealth of useful, technical information assembled. Enter keyword(s) in the search box below or select an library section from the list on the right. Search instructions and tips are available here.

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Definition of Terms

Looking for a quick definition of a water or conservation related term or concept? The AWE Glossary has an extensive list of the most commonly used terms in the biz.

AWE Glossary of Common Water Related Terms, Abbreviations, and Definitions

Help Us Improve the AWE Resource Library

Please send us your ideas for improving the resource library! Let us know what is missing, what needs to be corrected or updated, and what you would like to see. Help the Alliance for Water Efficiency to improve the best water efficiency resource on the web! Please contact us with your suggestions. Thank you.

Recent Library Updates

4/15/2014	Water Demand Management Bulletin Listing
4/3/2014	Codes and Standards Home Page
4/3/2014	0-Water-Efficiency-Stds-Codes-Guidelines-(Indoor)-2014-03-22
4/3/2014	0-US-Water-Product-Standards-Matrix-2014-03-20
4/3/2014	CEE-Residential-Dishwasher-QPL-PDF

AWE Library Sections

- AWE Water Conservation Tracking Tool
- Alternate Water Supply
- Canada, Province Level Water Efficiency Policy Information
- Commercial, Institutional, and Industrial Water Users
- Commercial, Institutional, and Industrial Water Saving Tips
- Drought and Drought Response Introduction
- Green Building and Water Efficiency Introduction
- Home Water Works Consumer Web Site
- Landscape, Irrigation, and Outdoor Water Use
- Metering and Submetering
- Non-Residential Fixtures, Appliances and Equipment
- Residential Water Use, Fixtures, and Appliances
- Residential Water Saving Tips
- Standards and Codes

homewaterworks

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Explore Water Conservation With Our Water Use Calculator

Want to conserve water? Not sure where to start? Our Water Calculator quickly estimates how much water your household uses and compares it to a similar average and a highly efficient home.

The Water Calculator also shows you where to begin your home water conservation efforts. Throughout Home Water Works, you'll find useful tips and resources for saving water and money without sacrificing comfort or convenience.

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Join our Never Waste Campaign. Click Here ▶

Does Your Landscape Have a Drinking Problem?

Read about **outdoor water conservation** for helpful information on how to keep your landscape looking beautiful while staying water efficient.

Quick & Easy Tips For Saving Water at Home and Work

Looking for quick and easy ways to save water? Read our **water conservation and saving tips** to see how easy it can be to conserve water at home and in the workplace!

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