



THE ENERGY-WATER NEXUS IN WATER TREATMENT, CONVEYENCE, AND IRRIGATION SYSTEMS



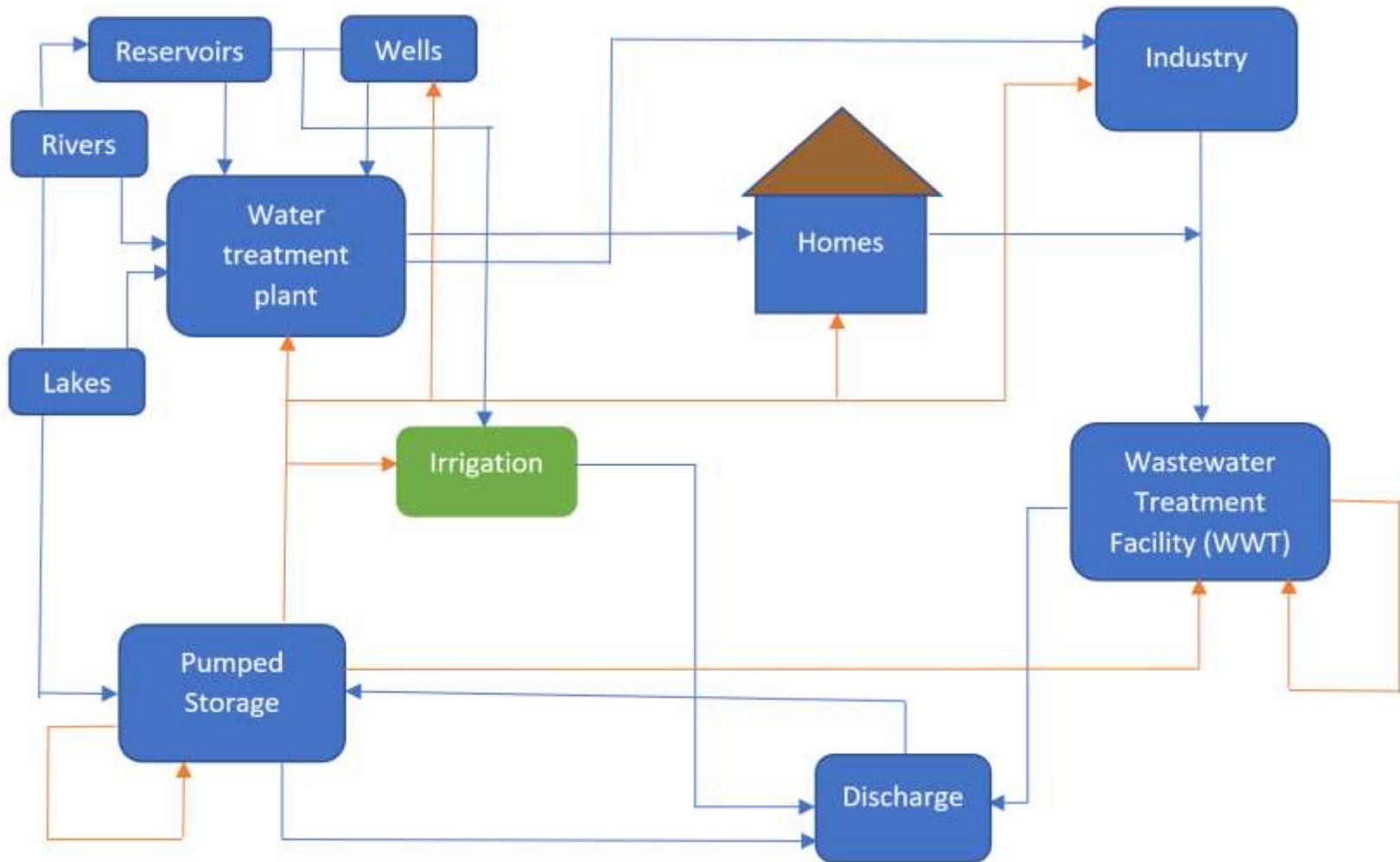
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+ Overview of Paper



- One of a series of three DOE-funded papers looking at various aspects of the energy-water nexus in the United States
 - Water Infrastructure, Treatment, and Irrigation
 - Water Use for Power Generation
 - Water Use in Oil & Gas Development
- Structured to provide an overview of key upgrades that can be made to different areas of water infrastructure systems, the roles that key decisionmakers take during the process of designing policies to support these upgrades, and case studies from states active in improving the nexus in these areas. Main focus is on decisionmaker and stakeholder institutions/actors in contrast to being a technical analysis.
- Case studies from: CA, CO, MO, NE, TX, VA, WI

+ The Energy-Water Nexus in Water Treatment, Conveyance, and Irrigation Systems





Elements of Water Infrastructure and Opportunity Areas



■ Extraction, Conveyance, and Distribution

- *Illustrative Opportunities:* installation of VFDs, correcting pipe sizes, installing in-line turbines, leak reduction

■ Water Resource Recovery Facilities (WRRFs)

- *Illustrative Opportunities:* upgrading pumps and blowers, utilization of CHP, installing renewables on-site, utilizing demand response measures and developing tariffs to incent additional demand response

■ Water Treatment

- *Illustrative Opportunities:* Reductions of energy use up to 28% at desal, installing on-site generation, optimizing treatment schedules, pumps, aeration systems.

■ Pumped Storage

- *Illustrative Opportunities:* upgrading pumps, improve automation and control systems, optimizing generation scheduling

■ End-Uses

- *Illustrative Opportunities:* increasing efficiency of water heaters, installing automated meter reading (AMR) systems, perform water audits, reducing pressure on water systems, increasing appliance standards
- *Agriculture-specific:* irrigation scheduling, drip irrigation, tailwater return systems, better lining and canal structure, remote monitoring and control systems, using rain gauges and soil moisture sensors, including irrigation in demand response pilot programs



Key Decisionmakers and Their Roles in Policy/Program Creation



■ State Agencies

- Department of Natural Resources, Public Health, the Environment, Consumer Affairs, Licensing, Office of State Engineer, State Geological Survey, Public Utility Commissions (PUCs)

■ Water Utilities

- Make decisions around water pricing structures, maintain water infrastructure

■ State and Local Taxing and Financing Entities

- Irrigation districts, environmental infrastructure banks
- Provide financing to water infrastructure projects, determine water use in irrigation areas

■ State Courts

- Impacts water use due to adjudication of water rights disputes

■ Water Brokers

- Buy/sell water rights and make markets, may increase distance for transporting water from sources to end users



State Case Studies



- **California:** Improving Agricultural Water Efficiency and Electric Grid Resilience Through Demand Response Pilot Programs
- **Colorado:** Increasing Electricity Generation from Water Transportation and Delivery Infrastructure
- **Missouri:** Increasing the Use of Supply and Demand-Side Efficiency Measures for Water Infrastructure
- **Nebraska:** Reducing Energy Use on Irrigation Pivot Systems and Improving Efficiency at Water Resource Recovery Facilities
- **Texas:** Enabling Water Efficiency Through Energy Savings Performance Contracts and Leading By Example Through Water Conservation Standards in Public Buildings
- **Virginia:** Supporting the Development of Pumped Storage Projects Through Reform to the Permitting Process
- **Wisconsin:** Focusing on Energy Through Power Generation at Water Resource Recovery Facilities



Cross-Cutting Suggestions for Working to Address Energy-Water Nexus in Water Infrastructure



State Energy Offices should consider a number of lessons learned from the case studies for their own energy-water nexus activities. These include:

- Engaging with a large and diverse group of stakeholders in both the energy and water sectors;
- Exploring all possible avenues available to address the energy-water nexus; and
- Ensuring that key stakeholders and the general public are educated on the key interactions between energy and water resources.

State Energy Offices could pursue a number of options to address the energy-water nexus in water infrastructure, treatment, and irrigation systems, such as:

- Convening stakeholders to discuss coordination opportunities;
- Providing input to legislation that incentivizes energy improvements in water infrastructure;
- Partnering with private sector entities or utilities to pilot new technologies or methods to increase the energy efficiency of water infrastructure;
- Educating stakeholders on opportunities to improve energy and water efficiency; and
- Engaging with PUCs, including, as warranted, intervening in proceedings.

+ Contact Us



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