State Insights on the Water-Energy Nexus and Policy Ideas to Achieve Greater Savings

Executive Summary

Governors, state policymakers, utilities and other stakeholders across the country are increasingly aware of the connection between energy and water production and use, and the need to conserve both resources to meet economic and environmental goals. It requires substantial amounts of water to produce energy and considerable amounts of energy to treat and deliver water.

The critical interdependence between energy and water was clearly illustrated during the recent winter storm in Texas and other parts of the South in February 2021. Initial power outages contributed to a longer-term water crisis. Power outages led to water pump failures while water demand increased from frozen water pipes that burst. This caused low water pressure that can lead to harmful bacteria growth in the water. The power outages also prevented water treatment plants from properly treating the water for several days, thereby leaving many residents without clean drinking water and worsening the storm's impacts.[1]

The National Governors Association has been working with states on this connection between water and energy and strategies for conserving those resources for several years. NGA held a Water-Energy Nexus Learning Lab in September 2020. This event invited two leading states in the water-energy nexus space, **Arizona** and **Wisconsin**, to showcase some of their model policies and programs to other states, **Maryland, Nevada, North Carolina, North Dakota**, and **Washington**, looking for greater savings opportunities.

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This paper provides an overview of challenges that states are facing in developing integrated water and energy conservation policies; provides background on Arizona and Wisconsin's innovative water-energy policies and programs; and summarizes action items the participating state teams identified for their respective states. The main categories of policy solutions identified by states at NGA's Water-Energy Nexus Learning Lab were:

- **Funding & Financing** – providing financial incentives for water efficiency modeled after established energy efficiency programs, and an emphasis on financial support for small water and energy utilities.
- **Education & Technical Assistance** – providing more education and training opportunities about ways to achieve cost-effective energy and water savings, and the needs of resource-constrained small and medium utilities for training and other assistance.
- **Structural Changes to Encourage Conservation** – developing ways to incentivize agricultural conservation such as through water allocation strategies; adopting water reuse or water loss standards; and requiring electric utilities to consider water impacts as part of their integrated resource planning process.
- **Communications & Data** – conducting energy audits, reviewing water data provided to state agencies, and developing data benchmarking tools to measure and better manage energy and water use.
- **Climate Strategy** – establishing a multi-agency working group or other collaborative approach to determine ways to integrate energy and water savings in state policies and help meet the state climate objectives.

Background

Water and energy are two resources critical to daily life. Different entities and authorities are often responsible for oversight and stewardship of these resources, yet they are closely intertwined. Water systems, including the transportation and treatment of water, requires substantial energy use: approximately 13 percent of U.S. energy is used to pump, treat, and deliver water to end users.[2] Conversely, the processes involved in energy extraction, generation and power delivery consume substantial water resources. The U.S. Department of Energy reported in 2014 that electricity production consumes 4 percent of water, mostly by evaporation and leakage, while thermoelectric power plant operation and cooling accounts for 40 percent of freshwater withdrawals; although the amount of freshwater withdrawals varies by state.[3]

Water and energy are clearly closely interconnected across a variety of uses and industries. The term "water-energy nexus" aims to capture this interconnected reality, which regulatory agencies do not always consider. Attempting to improve water and energy efficiencies is challenging, but there are many opportunities to conserve these resources. Public utility commissions, oil and gas commissions, environmental and energy offices,

health and transportation agencies, agricultural and natural resource departments, clean and drinking water authorities, and others all have a role to play in regulating water and energy, and therefore should all be involved in state efforts to address the water-energy nexus and conserve energy and water resources.[4]

State policymakers are uniquely positioned to address major issues like water and energy conservation. Governors can bridge regulatory silos, bringing key actors together to collectively drive efficiency on nexus issues, preserving limited resources and securing significant cost savings for consumers. NGA has worked in recent years with state policymakers on ways to achieve greater water and energy savings. Most recently, NGA held a Water-Energy Nexus Learning Lab in September 2020. During this event, two leading states in this space, **Arizona** and **Wisconsin** showcased some of their efforts to five states that want to improve their water-energy practices: **Maryland, Nevada, North Carolina, North Dakota, and Washington**. This paper provides an overview of some of the best practices to conserve both water and energy resources showcased at this Learning Lab, and actions the five participating states are considering for achieving greater water and energy conservation.

State Challenges

Obstacles to achieving better integrated water and energy policies vary and include issues such as a lack of financial incentives or budget constraints, administrators who lack information or understanding of ways to implement more efficient processes, complex regulatory systems, and siloed authorities, competing priorities, difficult-to-reach rural communities and infrastructure shortcomings.

Some of the challenges states identified prior to participating in NGA's Water-Energy Nexus Learning Lab include:

- The need for additional dedicated funding sources for water and energy conservation projects.
- The high costs for utilities, especially small utilities, to design and implement innovative solutions that conserve water and energy at wastewater treatment plants.
- Western water rights laws that penalize water rights holders who do not use their allocation. This shifts the ince[5]ntives for water users out of alignment with conservation since producers capable of generating the same yield from crops while using less water will be concerned about losing the right to that excess water in the future. The future use of water from retiring thermal generation in the west is also a challenge and how utility water rights should be handled as older coal plants shut down and are replaced with solar and wind generation.
- Current state policies and programs that do not incentivize energy or water conservation. For example, many wastewater treatment plants are not required to perform baseline energy audits or to include energy/water savings in grant funding requirements or awards.

- Gaining cultural buy-in for program/policy changes from key water and energy decision-makers and those in charge of operations and maintenance such as utility board members, elected officials, utility operators and staff.
- Lack of capacity or dedicated staff trained and working on achieving greater water and energy savings, particularly at small-scale utilities in rural municipalities that have very small staffs that sometimes struggle to meet the basic operational and maintenance needs of their systems.
- Lack of communication and peer-to-peer learning networks and avenues where participants can share helpful information such as cost-savings data.
- Regulatory constraints, complex permitting processes, and the absence of financial incentives or regulations that encourage conservation projects. For example, regulations that would allow for water-energy nexus projects to qualify as "Special Environmental Projects."

Arizona & Wisconsin Water-Energy Conservation Best Practices

In September 2020, the National Governors Association convened a Water-Energy Nexus Learning Lab. The Learning Lab highlighted several best practices from Arizona and Wisconsin, states that face different challenges associated with achieving greater water and energy savings. Arizona has limited water resources, growing metropolitan areas, and is increasingly transitioning to an energy portfolio that relies less on water resources and more on solar and battery storage. In contrast, Wisconsin is a water rich state with a substantial industrial sector that is the largest consumer of energy in the state. Most electricity in Wisconsin is produced from fossil fuel-fired power plants that require water for cooling.[6] Arizona adopted innovative water reuse practices and stakeholder-driven water planning practices; Wisconsin adopted an innovative energy efficiency program for wastewater and water treatment facilities and a data benchmarking program that helps users improve water and energy savings by identifying resource loss areas such as leaks. This paper presents an overview of these innovative Arizona and Wisconsin programs, which NGA highlighted during the Learning Lab and the five participating states examined to identify next steps to promote greater water and energy savings in their states.

i. Arizona Initiatives

Water Conservation Enabling Legislation

The Groundwater Management Act of 1980 is the underlying law that drives many of Arizona's water planning and conservation efforts. This Act established five water regulatory zones known as Active Management Areas to transform water management in the state's high population, heavy water-use areas and achieve "safe-yield" by 2025.[7] Safe-yield requires that groundwater withdrawals not exceed natural and artificial groundwater replenishment each year. The Active Management Areas developed a series of

management plans for sustainable water use, each with more stringent requirements than the previous, to achieve the safe-yield goal. While the Groundwater Management Act of 1980 did not immediately address rural areas outside of the five management areas, the legislation and management activity focused on groundwater led to a decrease in Arizona's water use since 1980 even as the state population continues to grow.[8]

Stakeholder Collaboration

Arizona communicates that water is a priority for the state through Governor-led actions. The Governor's Water Augmentation, Innovation and Conservation Council (GWAICC) gathers Governor-appointed state, tribal and local government representatives together with water and energy providers, watershed groups, and other industries like agriculture, mining, agribusiness, and home building. Council committees evaluate and report on issues like desalination, water rights, regulatory structures, groundwater use best management practices, and long-term water supply augmentation possibilities to inform water use planning efforts across the state. Through the GWAICC, Arizona has a formal and inclusive entity devoted to charting a course for successful water conservation and ensuring an adequate and resilient supply for all Arizona's water users.[9]

Utility-Driven Water and Energy Efficiencies

Local governments partner with several major utilities in Arizona to create water and energy efficiencies that provide significant resource and cost savings. The Sub-Regional Operating Group of the cities of Glendale, Mesa, Phoenix, Scottsdale and Tempe jointly own the 91st Avenue Wastewater Treatment Plant, a regional treatment plant that receives wastewater from the owner cities. The treatment plant adopted multiple water-energy nexus innovations, converting waste to biogas energy by recycling wastewater through an on-site renewable natural gas plant.[10] The plant also supplies recycled wastewater to the Palo Verde Generating Station, the largest nuclear energy plant in the United States and the only nuclear energy plant that is not located near a water source. To enable the use of wastewater for powerplant cooling, the state first adopted reclaimed water quality and use regulations in 1972.[11]

Water providers like Scottsdale Water participate in their electric utility's (Arizona Public Service) demand response program.[12] By reducing their electricity load during peak demand times, Scottsdale Water saves hundreds of thousands of dollars annually. Scottsdale Water has power optimization controls enabling the utility to shift from electric to natural gas pumps for water transport. The Scottsdale Water Campus also provides recycled water to local golf courses through a public private partnership, avoiding increased costs for local ratepayers.[13]

The Salt River Project (SRP) is a water and energy company that provides services to more than two million people living in the water constrained Phoenix area and Central Arizona region. The utility set aggressive corporate sustainability goals for decarbonization, water

use and waste reduction, and supply chain sustainability.[14] Water and energy strategies include investing in renewable generation, battery storage projects, water recycling, aquifer recharge to meet safe-yield groundwater standards, water loss reduction, smart metering, and demand response. In 2017, SRP saved nearly 1.9 billion gallons of water by conserving energy and relying on less-water-intensive types of energy generation such as solar and wind.[15] The utility also protects water quality and supply reliability by leveraging federal and state funding to implement forest health management measures through the U.S. Forest Service programs and partnering with non-governmental organizations on a tree planting initiative.[16]

The City of Phoenix also participated in the Department of Energy's Sustainable Wastewater Infrastructure of the Future (SWIFt) program, achieving the program's short-term energy savings goal of 5 percent.[17]

ii. Wisconsin Initiatives

Focus on Energy

Wisconsin passed legislation in 1999 establishing the Focus on Energy program and directing a small "public benefit fee" be applied to energy investor-owned utility ratepayer bills to fund the program. Each utility pays 1.2 percent of their gross revenues annually to fund the program. Although not required to participate, all of the municipal utilities and nearly half of the electric cooperatives in Wisconsin also help fund the program, paying $8 a year per meter.[18] Wisconsin officially launched the Focus on Energy program that provides funding for energy efficiency and renewable energy projects in 2001.

The Focus on Energy program's energy efficiency incentive programs promote adoption of efficiency measures in various sectors, including an emphasis on the water sector. The program developed a best practice manual titled, *Water and Wastewater Industry Energy Efficiency Best Practices Guidebook* that local governments used to drive efficiency and save money.[19] Focus on Energy can target outreach and funding to areas of greatest need using energy use data from the Compliance Maintenance Annual Report (described below). Wisconsin estimates that the $100 million dollar Focus on Energy program delivered $3.66 in direct economic benefits for every dollar spent—including some $90 million in avoided annual electricity costs—and prevented more than 28.5 million tons of carbon dioxide from being pumped into the atmosphere.[20] Today the best practices manual serves as a successful case study for other state agencies and national nonprofit programs with similar goals.

Data Driven Energy Conservation

Wisconsin's innovative state revolving fund loan program, the Clean Water Fund Program, has led to significant water and energy savings in the state. Like other state revolving funds, the Clean Water Fund Program provides fixed, reduced interest rate loans (ranging from zero percent to a portion of the set market value depending on project type and eligibility

factors) to local governments and sanitary districts in the state.[21] The fund supports planning, design and construction of publicly owned wastewater and storm water infrastructure projects so municipalities can comply with pollutant discharge permit requirements. Wisconsin's revolving fund program is unique in that it incentivizes energy efficiency by prioritizing principal forgiveness for projects that include a Focus on Energy incentive.[22]

Wisconsin launched a multi-agency effort to advance data-driven conservation by developing clear resource use baselines against which the state water and energy sectors can measure improvements. For wastewater facilities, Wisconsin has a Compliance Maintenance Annual Report (CMAR) rule, Chapter NR 208, Wis. Adm. Code.[23] CMAR is an annual self-evaluation reporting requirement for public and privately owned wastewater treatment facilities.[24] The state revised its CMAR process in 2016 to include a set of specific energy and energy-related process questions.[25] The CMAR evaluates the status of a wastewater treatment works, informs treatment operators planning, and helps identify any adjustments needed to maintain compliance with pollution permit requirements. These new CMAR energy questions, though not mandatory, are answered by most operators and the data reported enables the Wisconsin Office of Energy Innovation to prepare an energy use baseline for each water utility, measure efficiency improvements over time and, in conjunction with the Focus on Energy program, identify systems requiring assistance.

Wisconsin's Department of Natural Resources (WDNR), Office of Energy Innovation (OEI), and Focus on Energy program (Focus) formed a team to create the CMAR energy questions and then conducted significant outreach to maximize the effort's effectiveness. A network of regional energy advisors from Focus, a representative from OEI, and WDNR wastewater engineers provided technical guidance to wastewater system operators, and reached out to Public Works Departments, elected officials, city clerks and other decision makers to communicate the potential for energy efficiency projects in their water and wastewater systems and the benefits those water and energy savings could bring to their towns and budgets.[26]

Leveraging Federal Assistance & Stakeholder Collaboration

Wisconsin also participated in the Department of Energy's Sustainable Wastewater Infrastructure of the Future (SWIFt) program to achieve a short-term energy savings goal of 5 percent. DOE highlighted that three of Wisconsin's water resource recovery facilities (WRRF) met or exceeded the of 5 percent energy savings goal.[27]

Takeaways and Strategies from the Water-Energy Nexus Learning Lab

States attending the Water-Energy Nexus Learning Lab identified policy and regulatory solutions across five key categories described below. These categories include examples of innovative policies and programs in other states, the Arizona and Wisconsin examples highlighted during this event, and federal programs that may help serve as a model for Learning Lab participants.

1. Funding & Financing:

- *Create financial incentives (tax credits, depreciation, or tax exemptions) for water efficiency and conservation investments based on successful renewable and energy efficiency tax incentives.* **New York** law allows municipalities to authorize tax exemptions for green buildings, meeting efficiency and environmental standards, for up to 10 years.[28] **Virginia** has several energy-related tax incentives, including ENERGY STAR and WaterSense sales tax holidays that allow products (energy efficient appliances, water faucets, etc.) that meet efficiency program certifications to be sales tax exempt.[29]
- *Include water efficiency projects in legislation authorizing Property Assessed Clean Energy (PACE) programs.* **Colorado**, **Utah, Maryland** and **Michigan** Property Assessed Clean Energy (PACE) programs include water efficiency and energy efficiency measures in project eligibility requirements.[30]
- *Provide financial and technical assistance to small, rural wastewater utilities to encourage the use of energy savings performance contracts (ESPCs) to reduce their energy use and costs.* State and local government facilities in **Oklahoma, Maryland, Minnesota, New York,** and other states, have used Energy Savings Performance Contracts (ESPCs) to fund energy and water efficiency measures.

  <u>Other Solutions Discussed:</u>

  - *Prioritize energy savings in Clean Water State Revolving Loan Fund criteria.*
  - *Examine water rate designs that support conservation while maintaining utilities' financial stability.*
  - *Provide financial incentives for energy efficiency measures at water and wastewater treatment facilities, particularly rural facilities with limited resources.*

2. Education & Technical Assistance

- *Invest in training and workforce development programs, state agency technical assistance capacity, and other mechanisms to provide resources and staff capacity to enable rural facilities to invest in efficiency measures.* Recognizing that there are workforce challenges in the drinking water and wastewater sectors, the U.S. EPA launched *America's Water Sector Workforce Initiative* in October 2020. This initiative will coordinate support and training efforts across the federal government and with states, tribes and water associations to increase the water workforce.[31] More recently,

EPA released a funding opportunity to help develop innovative water workforce development and career opportunities in the drinking water and wastewater utility sectors. Applications for this initial round of funding were due March 26, 2021.[32]

- *Offer regular workshops, continuing education and technical training opportunities.* State energy agencies offer technical assistance to promote energy efficiency improvements in wastewater treatment plants in states including, **Arizona, New York, New Hampshire, New Mexico, Tennessee, and Wisconsin** (Focus on Energy). **Tennessee** implemented the Tennessee Plant Optimization Program to provide support to water and wastewater operators for reducing energy use and optimizing nutrient removal using low- and no-cost measures. Members of this free program benefit from technical assistance, flexible and informed regulatory oversight, and cost savings.[33]
- *Provide more focus and education opportunities to small- and medium-sized utilities' needs and coordinate third-party outreach to give those stakeholders access to information on efficiency opportunities.* **Indiana's** Utility Regulatory Commission has a webpage devoted to highlighting educational resources for small utilities. This page provides managerial, financial, and technical/operational guides and other resources for small utilities and includes postings of open positions at these utilities in the state.[34]

3. Structural Changes to Encourage Conservation

- *Incentivize agricultural practices such as upgrades to leaky conveyance systems, soil moisture sensors, irrigation scheduling and automated irrigation systems that will result in water and energy savings*. **Arizona**'s Active Management Areas organize how water will be allocated throughout the region and how much water farms receive. The water allotments provide a framework through which best management practices, including irrigation systems and practices, conveyance system improvements and other water conservation practices, can be incentivized.
- *Include criteria for water minimization considerations in electricity generation and transmission permits.* Both **Arizona** and **Colorado** consider water usage when evaluating applications for power and transmission projects and infrastructure. Both also include water usage in utility integrated resource plans.[35]
- *Require water audits for drinking water utilities to encourage replacement of leaky water pipes and consider the adoption of a water loss standard, which will also reduce the energy costs of pumping water through leaky infrastructure.* Several states including **Arizona, Georgia**, **Massachusetts**, **New Mexico** and **Tennessee** have prioritized water audits and water loss prevention efforts, in some instances using the American Water Works Association's M36 tool.[36]

Other Solutions Discussed:

- *Create a best practices manual, provide technical assistance, and use a regulatory mechanism to benchmark energy use in wastewater treatment plants. Also share low-cost/no-cost solutions.*
- *Shift programmatic reward emphasis from permit compliance to innovation.*
- *Think about proposing state water reduction goals or water reuse standards as part of a legislative proposal.*
- *Consider the creation of a water council directed to identify and propose water savings measures.*

4. Communications & Data

- *Establish centralized resource repositories where state staff, utilities and other stakeholders can access water-energy best practices, data and other resources such as state and federal financial assistance available for conservation activities.* **Massachusetts's** Department of Environmental Protection developed a webpage devoted to providing information on energy efficiency at water utilities. There are case studies available of innovative projects within the state, a list of available financial resources and incentives, and guidance documents and technical assistance.[37] The U.S. Department of Energy has also compiled tools, resources and best practice examples from wastewater facilities participating in the Sustainable Wastewater Infrastructure of the Future program (SWIFt) on their Wastewater Energy Management Toolkit website.[38]
- *Better utilize benchmarking tools and data from state agencies to identify opportunities for efficiency improvements.* **New Hampshire** used DOE State Energy Program grant funding to conduct energy audits and develop an energy benchmarking tool for state wastewater treatment facilities.[39] The **California** EPA and The Climate Registry, a nonprofit entity, jointly established a Water-Energy Nexus Registry for organizations with operations in California. This registry was developed to help water agencies and utilities understand the energy and greenhouse gas (GHG) emissions associated with water management and use. Several organizations signed up to participate in this registry including the California Department of Water Resources, Los Angeles Department of Water and Power, Metropolitan Water District of Southern California and others.[40]
- *Create data-informed partnerships with relevant stakeholders such as utilities and local units of government.* **Wisconsin**'s Compliance Maintenance Annual Reporting (CMAR) program identified above and the **California** Data Collaborative are two examples of data-informed partnerships. The data collaborative is a nonprofit organization that connects water professionals to create tools and research supporting planning and analysis of water resources in the State to ensure water reliability.[41] Member agencies include East Bay Municipal Utility District, The Metropolitan Water District of Southern California, the City of Sacramento Department of Water Utilities, and others.[42]

- *Tailor communications strategies for various audiences like utilities, environmental staff, funders, and others; and ensure there is a state authority to elevate energy and water concerns to Governors and cabinet officials.* **Michigan** Governor Gretchen Whitmer created the Office of the Clean Water Public Advocate by Executive Order in 2019. This office operates as an agency within the Michigan Department of Environment, Great Lakes, and Energy, and connects with the Governor's office to elevate drinking water concerns.[43]

5. Climate Strategy

- *Establish a multiagency and stakeholder working group to identify how the state can better integrate energy and water considerations in state policies with an expectation that these conversations lead to climate strategy actions.* **Colorado** state government brings multiple agencies and entities together to execute state water and climate plans that target water use savings through renewable energy improvements.[44]
- *Identify the type, composition, role and authorities of a coordinating council that would carry forward actions identified in state climate report.* In **Rhode Island,** the Executive Climate Change Coordinating Council, was established in 2014. This Council sets specific greenhouse gas reduction targets and incorporates the consideration of climate change impacts into the powers and duties of all state agencies.[45]
- *The Governor's administration can direct state agencies to quantify greenhouse gas (GHG) emission reductions from water and energy conservation efforts.*

  Minnesota released their *Climate Change Trends and Action Plan* in September 2019. This Plan identifies the GHG savings due to soil and water conservation grants; along with quantifying the GHG reduction benefits of other statewide programs.[46] **Maryland** in their *Greenhouse Gas Emissions Reduction Act Draft Plan* touches on the water-energy nexus and highlight's **Massachusetts's** 20 percent GHG reduction goals for drinking water and wastewater utilities.[47]

Conclusion

Governors and states are increasingly recognizing the importance of both water and energy conservation in helping to meet their climate and environmental goals. Looking at savings opportunities from both sides, from the energy sector and water sectors, and considering the interactions between these two resources in state policies and programs can increase conservation considerably. Arizona and Wisconsin are two states that others can look to when considering adopting energy efficiency and water efficiency programs. There are also other state examples of innovative energy and water savings practices that can be used as a model for states. As data and technology enables easier and more accurate information sharing on resource use, Governors can drive greater collaboration across state agencies to consider the water-energy nexus in any new state policies or programs.

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