

Capitalizing on energy-water nexus opportunities at the utility level

A case study on the collaborative efforts between San Antonio Water System and CPS Energy

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Overview

This case study examines the relationship between San Antonio Water System (SAWS) and CPS Energy, respectively the municipal water, wastewater, and recycled water utility and electric & gas utility of San Antonio, Texas. SAWS and CPS Energy leverage a partnership, achieving synergies and savings that keep rates for both utilities among the lowest in the state of Texas and benefit the community and environment. Each utility recognizes the other as one of its top customers.

Energy and water are inextricably linked—energy is needed to withdraw, transport, and treat water, and water is needed to produce and distribute energy. This relationship between energy and water, referred to as the energy-water nexus, is becoming increasingly important. Any rise in electricity demand that may accompany a growing population requires a greater amount of water resources, which will likely deplete or be stressed in much of the country by mid-century.

San Antonio is on the front-lines of energy-water nexus progress at the utility level. The city has proven a leader in energy-water co-management, embodying best practices that could be adopted and applied to other cities' energy-water challenges.

History

During Texas' drought-of-record from 1949 and 1957, the state received 30 to 50 percent less rain than normal, while temperatures rose above average.¹ This drought set in motion a decades-long push for reliable water supplies for a rapidly growing state, starting with the creation of the Texas Water Development Board.

The drought was also a catalyst for the development of a relationship between the city's Wastewater Management Department and CPS Energy. Facing increasing demand from the growing city, CPS Energy began constructing large gas and coal-fired power plants, which require water for cooling. After the drought, the utility wanted to diversify its water source, which was originally the Edwards Aquifer. CPS Energy decided to build power plant-cooling lakes using treated wastewater effluent, which came from the city's treatment plants. CPS Energy has used this wastewater effluent to cool its power plants since 1962. Initially, this water was free. By the late 1980s, the city became interested in pursuing other forms of reuse, so it formed a new agency, the Alamo Water Conservation and Reuse District (AWCRD), which developed a contract with CPS Energy and commenced a charge for providing wastewater effluent.

In 1992, both the AWCRD and the city's Wastewater Department were combined with the City Water Board to create SAWS, a single agency that conducts comprehensive planning and management of all the city's water resources. The revenue received from CPS Energy for wastewater effluent helped fund SAWS' first major project, The Purple Pipe program, for delivering up to 35,000 acre-feet of recycled water for non-potable uses, such as industrial processes and landscape irrigation. In 2011, a contract expansion and extension propelled an even greater level of communication between utilities.

Simultaneously, there was increasing pressure on the city of San Antonio to ensure ample amounts of water in the Edwards Aquifer due to the Endangered Species Act. In 1993, after a two-year legal battle with the U.S. Fish and Wildlife Service, a federal judge ruled that if unrestricted withdrawals continued, endangered and threatened species would be "taken" as

¹ <http://www.nbcnews.com/id/44138341/ns/weather/t/drought-recalls-long-punishing-dry-spell-s/#.WtT9u01wXIU>

defined by the act. The judge ruled that the Texas Legislature must enact a regulatory plan to limit withdrawals from the aquifer² – and if the local stakeholders didn't solve this problem, the Federal government would step in. The planning process formed a conservation mindset in city leaders, residents, and utilities that has stimulated a broad water conservation agenda.

As climate change and water scarcity advance, and demand on water sources increase worldwide, other places will experience similar constraints. Models show that one in four cities worldwide are “water stressed,”³ and that in most places, even if water is not over-allocated on average, changing climate conditions will induce persistent shortage that may lead to stress.⁴ The type of relationship between utilities like SAWS and CPS Energy will become more important and necessary elsewhere.

Operations

San Antonio is unique from most cities in that it has the jurisdictional advantage of community ownership of both its electric and water utilities. As municipally-owned utilities, and in accordance with state law, both CPS Energy and SAWS each have their own independent boards of trustees, and the City of San Antonio serves as regulator. This structure ensures regular communication and reporting to city staff and the City Council.

SAWS and CPS Energy staff work closely today to ensure the longevity of energy and water resources, identifying projects that are beneficial, sustainable, and economic for the community. SAWS sells water to CPS Energy at a lower rate than any other customer. In return, electrical service is provided to SAWS by CPS Energy at similarly low rates.

Preserving the River

CPS Energy currently spends over \$3 million a year, with a contract for 50,000 acre feet (AF) per year for water diverted from the river for cooling lakes. Because higher levels of reuse can affect downstream flows in the San Antonio River, SAWS and CPS Energy work together closely on legislative and stakeholder initiatives to protect the River. Both utilities recognize the regional economic and environmental importance of ensuring adequate flow in the San Antonio River. All of the city's water-recycling initiatives are designed and sized to leave enough effluent in the River for instream flows, but management is required on an hourly basis.

The San Antonio River is heavily influenced by wastewater plant discharges, resulting in significant swings in the diurnal flow pattern. CPS Energy times its pumping operations to minimize the diurnal changes to the river, return the river to a natural flow pattern during times of low flow, and to ensure downstream flows do not fall below state standards.

Demand management

SAWS and CPS Energy both have extensive demand management programs and interact with some of the same partner organizations to help in the promotion and deployment of such programs. For both, conservation delays the construction of new facilities and investment in large capital projects.

² <http://www.edwardsaquifer.net/rules.html>

³ <https://phys.org/news/2014-06-world-big-cities-water-stressed.html>

⁴ http://water.columbia.edu/files/2013/09/GB_CWC_whitepaper_climate-water-stress_final.pdf

While CPS Energy mostly uses recycled water from SAWS, it has its own groundwater rights to the Edwards Aquifer. Since some of the power plants which once used that water have since been de-commissioned, CPS Energy leases back 1000 AF of its groundwater to SAWS. In return, SAWS has helped CPS Energy by cutting back on electricity consumption during peak hours, shaving peak demand by shifting consumption to off-peak hours. SAWS gets paid for not using that power during peak demand, sometimes receiving close to \$250,000 per year in savings.

Joint rebates and audits

For many years, the two utilities participated in a joint high efficiency washing machine rebate, where the customer could get a rebate from both utilities with just one application. This was discontinued when the market shifted in the direction of more efficient machines. Although no joint rebate program exists today, both utilities are aware of the benefits and would be willing to implement another when it makes sense to do so.

A similar partnership unfolded while CPS Energy was weatherizing homes. CPS Energy evaluated homes for water efficiency as well, and invited SAWS to conduct retrofits for fixtures with high flows. This not only drove conservation efforts, but also helped SAWS pinpoint when the existing home market had reached near saturation of efficient water fixtures, which informed smart rebate design moving forward. CPS Energy still provides low-flow shower heads and faucet aerators in the homes it weatherizes – over 21,800 to date – in addition to the LED light bulbs and energy-saving opportunities report it provides to its customers during in-home energy assessments.

CPS Energy also helped SAWS reduce energy consumption by conducting facility site visits to optimize buildings and systems to use less electricity. From CPS Energy, SAWS received LED lighting rebates and chiller upgrades, and also transitioned from heat pumps to variable refrigerant flow (VRF) HVAC systems, amongst other energy efficiency upgrades.

Dos Rios Water Recycling Center

While he was San Antonio Mayor, Julian Castro saw the importance of raising visibility for the utilities' collaboration at the staff level. He presided over the first joint meeting between trustees of SAWS and CPS Energy in April of 2011 to discuss existing partnerships, as well as upcoming projects that capitalize on the utilities' leadership in managing water and energy resources.⁵

At this meeting, the SAWS Board approved a lease agreement with SunEdison for a 20 MW solar energy installation at the Dos Rios Water Recycling Center. CPS Energy's Board then passed a resolution in support of the project, reinforcing its commitment to purchase 30 MWs of electricity produced by SunEdison. At this facility, SAWS benefits from the revenue stream of leasing its land to SunEdison, and CPS Energy benefits from selling the power produced.

The lease for renewable solar power at the Dos Rios Water Recycling Center came 6 months after SAWS's grand opening of a biogas facility at the Center. This facility captures, treats, and transfers at least 900,000 cubic feet of gas a day to commercial pipeline for sale on the open market. This initiative, along with the recycled water and compost from biosolids, exemplify a "recycling trifecta" and made this plant a pioneer in the nation.⁶ SAWS and CPS Energy both benefit from the innovation at the plant.

Community outreach

⁵ http://www.saws.org/latest_news/Newsdrill.cfm?news_id=750

⁶ https://www.naesco.org/data/casestudies/CS_SAWS.pdf

Both utilities have extensive community outreach efforts that overlap frequently. CPS Energy and SAWS staff are often at the same events, educating the public on energy-water issues. SAWS Conservation invites CPS Energy's Conservation staff to attend their Spring Bloom event and in return, CPS Energy has invited SAWS to table with them at community events.

Water rights planning

CPS Energy and SAWS are both involved with planning future water rights in Texas in the river basins, which ultimately shapes policy. When legislation concerning natural resources is being proposed, the utilities communicate to ensure there is a common voice when it is in their interests.

Current initiatives

The latest collaboration is for homes both utilities serve that have swimming pools. Pools are correlated with high energy and water usage. SAWS is performing a pilot "Swimming Pool Check Up" to assess energy and water needs of pools, and sharing the data with CPS Energy. CPS Energy has a pool pump rebate, while SAWS has a pool filter rebate. If the pilot shows promise for a cost share on a "Swimming Pool Check Up," the two utilities may have their next joint program option for the public.

Additionally, SAWS is considering sharing CPS Energy's existent infrastructure for smart metering. Smart metering in the water system will save both water and energy as it helps the utility and customers better pinpoint leaks and inefficiencies. Furthermore, real-time feedback on water consumption can provide homeowners and businesses with timely usage data, which can increase price signals from the utility. One major traditional obstacle to smart water meters is cost. However, if the existing data infrastructure from CPS Energy's smart electric meters can be utilized by SAWS, a portion of that cost is reduced.

Both utilities have also been actively diversifying their portfolios. SAWS is moving away from its heavy reliance on the Edwards Aquifer to now managing a portfolio of fifteen water supply projects from eight different sources. CPS Energy is transitioning from more water-intensive energy sources – like coal – to others that use significantly less water such as solar, wind, and energy efficiency.

Achievements

The city of San Antonio was the first in the nation to build a large-scale cooling lake to reuse the water required to cool the steam turbines in the city's power plants. 50 years after inception, CPS Energy's use of 2 recycled-water lakes has already saved about 359 billion gallons of water. SAWS's load-shifting during peak hours has saved CPS Energy upwards of \$270,000 per year in demand reductions alone.

Lessons for other utilities

There are unique factors contributing to San Antonio's leadership in energy-water co-management, which can't be seamlessly transplanted into other cities and counties. The regulatory division between electric and water utilities is complex and varies from state to state. As public, city-owned utilities, both organizations have a unique service attitude about their work. If something a good idea for the community, both teams are generally to pursue it. This may not be the case with investor-owned utilities. Nevertheless, San Antonio embodies the best practices that could be adopted and applied to many cities' unique energy-water challenges.

While the drought was the impetus for communication between SAWS and CPS Energy, it was both utilities' recognition of the non-monetary costs associated with failing to conserve that propelled the partnership through the years. While conservation has been viewed by some utilities as detrimental to profits and revenues, these utilities recognize the benefits in delaying construction of new facilities and mitigating payments on the associated high capital costs. In light of an uncertain water future, accounting for the environmental and social costs of not conserving water, which SAWS and CPS Energy both take into high consideration, is crucial. This is a particularly important first step in fostering this sort of partnership between a public water utility and an electric & gas IOU, where return on investment for shareholders is the priority. The broader definition of costs can drive new perspectives on this sort of partnership for other utilities.

Consideration of these non-monetary costs has compelled SAWS and CPS Energy to offer financial incentives for conservation, furthering the energy-water coordination. CPS Energy incentivizes SAWS to load shift during peak demand with monetary compensation. This aspect of the partnership is deemed beneficial because of the forward-looking and broader definition of cost both utilities have adopted.

Additionally, each utility attributes the success of the partnership to communication and collaboration at the staff level. In San Antonio, progress between the two utilities did not come from a board or city council edict, but from staff in similar roles meeting and brainstorming opportunities. Conversations at the staff level facilitates an understanding of different business models, values and priorities surrounding resource scarcity, regulatory issues, and operational needs and constraints of the partner utility. From the staff level, a proposal that benefits both agencies can be developed and implemented with little resistance from upper management and leadership. This collaborative approach is encapsulated by the work that staff members are currently doing for the potential "Swimming Pool Check Up."

Every initiative or achievement that is synergistically implemented will run into challenges and delays, so it is crucial to have staff at both utilities with a long-term vision. For example, dedicated legal departments at SAWS and CPS Energy construct contracts around the risk of joint projects, as opposed to focusing their efforts on entirely eliminating the risk.

Based on the coordination and collaboration between SAWS and CPS Energy, other cities and utilities could follow suit by considering the following:

- Utilities should recognize and include the externalities and non-monetary costs associated with not conserving. This manifests in utilities providing financial incentives to the partner utility for conserving. Such programs include demand management programs that reward the partner utility for load shedding during peak times or conservation during times of water stress, such as a drought.
- Utilities should engage in joint rebates when it makes economic sense to do so.
- Utilities should conduct joint audits of customer's facilities, as well as conduct audits of one another's systems to identify ways to enhance efficiency.
- Utilities should seek communication at the staff level. Utilities can designate at least one staff member as the lead for fostering this collaboration.
- Staff members collaborating on water-energy program opportunities should communicate the benefits of such programs to upper management, in order to foster top-level buy-in and collaboration.
- Utilities should develop unified messaging on energy-water nexus and the importance of conservation and efficiency, and disseminate it at community events. Furthermore, they

should disseminate information to their shared customers on their joint programs and offerings.

Opportunities for further collaboration

While San Antonio's water and energy utilities are making great strides towards collaborative planning, there are other opportunities that can be pursued by utilities in San Antonio and other cities, as well as on the state and national level. Other case studies and reports have investigated similar utility partnerships and have found there are limited examples of true cohesive planning efforts between utilities.⁷ There is growing need and opportunity for partnering due to limited resource supplies and climate uncertainties.

One way to overcome siloes between sectors is better-aligned utility and resource planning. Meeting times, budgeting schedules, and resource allocation plans can be adjusted to the same planning time horizon, which better facilitate collaboration on long-term ventures.

This collaborative planning can also include addressing capital improvement financing issues for water utilities.⁸ With the right incentives, electric utilities can offset the initial capital costs of wastewater facility energy projects in return for additional supply that will strengthen their renewable portfolio in the long term. This is an opportunity for policy change at the state and national level to incentivize collaboration. One example of this is seen in Massachusetts, where wastewater treatment plants install energy projects, and credits are given to electric utilities for including that energy in their portfolios. Water utilities can be incentivized to construct these energy projects through direct investment from the electric utility.⁹

Funding for joint programs can be a challenge, but state grants, public goods charges, and collaboration with a third party can help. Moreover, engaging a third party not only helps with funding, but also aids in program administration for utilities that are pressed for staff time.¹⁰

Conclusion

Many studies have shown that saving water saves energy, and vice versa. Although there are programs in place at different utilities around the country to save water and energy, communication and collaboration between water and energy utilities can achieve greater efficiencies.

San Antonio is a prime example of a city with a working and mutually beneficial partnership between utilities. Although unique in its history, climatic conditions, and city ownership of its utilities, San Antonio serves as a testament to the potential savings and synergies that can be achieved through more coordinated programs. As we move into a water-scarce future, the path that San Antonio Water System and CPS Energy have paved will be invaluable in leading other utilities toward similar successes in water and energy efficiency.

⁷ <http://www.waterrf.org/PublicReportLibrary/4469.pdf>

⁸ https://www.johnsonfdn.org/sites/default/files/reports_publications/CNW_ResilientUtilities.pdf

⁹ https://www.johnsonfdn.org/sites/default/files/reports_publications/CNW_ResilientUtilities.pdf

¹⁰ <https://www.pacinst.org/wp-content/uploads/2013/09/pacinst-water-energy-synergies-full-report.pdf>