ENERGY AND WATER CONSERVATION: UNCOVERING HIDDEN OPPORTUNITIES

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Abstract. Uncovering and exploring the nexus between water and energy will provide solutions for resource protection. We, in the United States are just beginning to explore this critical resource relationship. Countries around the world have been focusing on energy/water solutions for years. The International Water Association (IWA) has had this nexus as their key theme for the past two years. In any region or state where water use exceeds reasonable demand, where water shortages threaten the economy and where the well being of our citizens and the sustainability of our environment are threatened- water use efficiency can play a key role.

This presentation will explore the relationship between water demand management and energy conservation. It will focus primarily on the steps needed to reduce the demand for water and subsequently energy use in residential, commercial, industrial and institutional settings. Both operational and user efficiency will be outlined, together with describing the benefits to both suppliers and users from a comprehensive approach to auditing and implementation.

The presentation will develop the steps necessary for understanding the auditing process and implementation opportunities available to meet common resource management goals. Placing these opportunities in perspective with lessons learned from throughout the nation, this presentation will outline both future opportunity sectors, as well as an array of funding and financing options available to public water suppliers and local governments.

Finally, a set of action steps will be outlined, providing a path for successful achievement of program goals.

INTRODUCTION

The role of water and water management in the future will be much different than in the past- no longer will water be treated as an inexpensive commodity, nor will it be treated in a vacuum. Water in the future, and that future is upon us in Georgia, will have to be treated as a resource along with another important resource- energy. When we speak of water management, we must incorporate the reasonable use of the resource in our calculations. Since water requires energy for withdrawal, transmission, treatment, distribution and collection, and more energy to treat and convey wastewater, we must calculate the life cycle energy costs of all the water we demand. Saving water saves energy, and the conservation of both resources adds to the protection of our environment and quality of life. We must focus on both energy and water to provide an effective approach to water conservation and resource management. We must support the profound retooling of our institutions of water management both here in Georgia and throughout the country. Major uncertainties we will face in the future will demand effective institutional transformation. Water conservation will play a key role, in combining and reconciling water management objectives between the economy and the environment. The base standard we have set is that our water resources should be used as efficiently as possible. Water supply and use efficiency, tailored to the unique characteristics of a watershed, can play a significant role in both water and energy resource management.

OBJECTIVES OF THE APPROACH

Uncover the Hidden Energy in Water. As noted above, most water users are not aware of the embedded energy in the water they use. More effort needs to be undertaken to bring consumer awareness to this issue.

Tie Energy Projects to Water Efficiency. Many projects are undertaken to assess the opportunities for both supply and demand management of the water served to users. Far too often these efforts are exclusive to either water or energy. The nexus between these resources needs to be explored simultaneously. It just makes sense, to combine efforts in a "one stop" analysis.

Calculate Through Water Utilities. Probably the one venue where both energy and water efficiency efforts should start is the water utility. Not only is the water utility the main point of municipal energy demand, but also the source for the provision of effective communication/education of its customers.

OVERVIEW

Water conservation is both supply and demand management. Both the suppliers and users of the resource have responsibilities to be as efficient as possible. Water supply utilities have long addressed efficiency measures

as calibration, metering, loss accounting and pressure regulation in an effort to provide a safe and adequate supply to customers. Yet, with the exception of many large industrial, commercial and institutional customers, most users don't understand the true cost of exceeding reasonable demand. If energy costs are added to excessive and peaking demands on the utility, the cost becomes a burden to rate makers trying to hold rates and charges to reasonable levels.

Given the current state of water uncertainty in Georgia, suppliers are hard pressed to contain costs in light of resource uncertainty, elevating energy costs, and interstate competition for Georgia's economic development and prosperity.

WHY WATER CONSERVATION?

We are entering a new era of challenges to water suppliers, given the following list of impacts:

* Challenging growth patterns- Housing and industry patterns are changing, complicating the demand calculations for water supply
* Service area expansion- The center city distribution system has always enjoyed an ease of design and water distribution. New development areas, including exurban service demands will tax the energy side of reaching new customers.
* Revenue instability- Water shortage constraints have reduced the revenues of suppliers, while changing the demand characteristics of pumping to demand- thus increasing energy costs to the utility.
*Changing water resources availability- More distant and expensive, deeper sources not only add to treatment costs but increase energy cost of water production.
* Federal and state mandates- The cost of treatment and disposal are rising due to regulatory requirements for water and wastewater treatment. Many new standards are energy intensive or additive to production costs.

A CAUTION

While the water sector has learned quite a few lessons from the energy industry, there remains one flaw in trying to apply programs across resources. That flaw is nested in the fact that, while energy is national- if not global- in scope, water is predominately local, or regional at best. The experiences at load distribution, sourcing and rate making often do not translate from energy to water. In addition, local and interstate- if not regional- politics often play a more powerful role in water.

PLACING WATER COSTS IN PERSPECTIVE WITH ENERGY COSTS

It is almost universal that water costs are far less expensive than energy costs to the consumer. These ratios vary by use sector. Residential water costs range between 30-50% of residential energy costs to the typical homeowner. Commercial water costs are about 10% of commercial energy costs, with the range greatly varying by type of business. And industrial water costs are of the lowest range at around 2%, except where water is part of the finished product.

While appealing to a water user to reduce energy costs, with these ratios, a water supplier might not succeed in garnering interest. Combining water and energy costs savings using a combined audit/analysis might give the customer good reason to listen and act.

THE PROCESS

Uncovering the hidden savings in both water and energy involves the auditing process. In order to achieve any marked savings, which are reliable and can be shared with other entities, the project must first start with an audit of use characteristics. The initial step is to create a baseline of use and costs which can be compared to the effects of any measures recommended and implemented. Without a baseline, efforts cannot be compared either within the utility's operation or among colleagues in the industry.

The auditing process can: reduce operating costs, maximize design parameters, explore peak efficiency, and help to institute innovative "BMPs". The use of "Third Party" independent analysis removes any stigma of internal bias, or supplier bias for the operation. Investment Grade Audits can be used to secure bonding or market financing as well as form the basis for performance contracts at no cost to the operator.

Through auditing, the operator can plan for a range of implementation alternatives such as energy and water conservation measures, demand response opportunities and LEED certification. Data developed in the audit can be used for "capacity buy-back" opportunities with energy suppliers.

AUDITING-OPERATIONS

The auditing checklist for the water supplier consists of analyzing:

-Design vs. Operations
-Pump Curve Analysis
-Peak Shaving/ Shifting
-Mechanical Changes in Treatment Processes and Components
-Variable Frequency Drives/ Controls
-Pump to Storage Shifting
-Communication and Control- Load Shifting and Smoothing

-Chemical/Fuel Source Selection and Alternative Energy
-AMR- Goal Billing, Leak Detection, Demand Response

AUDITING-CUSTOMERS

The auditing checklist for a utility's customers consists of analyzing:

- Design vs. Use
- Load Shifting
- Goal Billing
- Goal Based Conservation Planning
- Water Conservation Based Pricing/Rates
- Capacity Buyback via Retrofitting
- Ordinances
- Stimulus Funding
- State Loans
- Energy/Water Resource District Financing

OPPORTUNITY SECTORS

Beyond getting its own house in order, a water supplier who explores and implements not only energy, but also water efficiency, leads by example. Customers of the supplier will become motivated by the utility's leadership in combining both resource conservation measures.

By addressing water and energy efficiency the water supplier can start discussions with its energy supplier on concepts such as joint programs and projects, and capacity buyback of unused power /unnecessary peak demand capacity.

Additional focus needs to be placed on large use sectors where the most capacity can be conserved such as; Hospitals, Schools and Universities, Military Bases, Hotels and Resorts, Office Complexes, Restaurants and QSRs, Supermarkets, Warehouses and Commercial establishments. A more complicated use sector is the intensive water use industrial sector. Proprietary water and energy use within this sector provides a challenge to the initiating water suppliers and local governments.

LESSONS LEARNED

- Up to 20% of a municipality's energy bill goes for water service to the community,
- Up to 16% of water used is for energy production,
- Up to 40% of a region's freshwater can be reserved for energy production,
- Substantial water and energy savings can be made through combined energy and water efficiency auditing.