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Combine Water and Energy Services Projects… And BENEFIT!

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ABSTRACT

There are tremendous benefits available to Facility and Energy Managers by combining water and energy services. This trend is likely to become common worldwide over the next decade. This article will emphasize how energy managers can use the same requisite skills to address water issues and generate additional savings.

The need to preserve water as a resource is certainly important and, as with any resource that is metered and purchased, there are opportunities to reduce consumption and save money. In fact with water service reductions there are accompanying sewer charge savings as well.

These savings can be significant. A recent university performance contract the author worked on generated $1.5 million in water savings alone over the 10-year term. Of special interest with water, as with electricity, is that the resource can be viewed from both the supply side and demand side.

Energy managers are quickly adopting demand side measures that offer savings, because they are very similar to energy measures. The opportunities for plant efficiency programs that deal with infrastructure will become evident to any energy manager. Motor opportunities have spurred DOE's Motor Challenge to cosponsor an Energy Efficiency Forum with *Water World Magazine*. Water system challenges are "plant" and "infrastructure" oriented, and can be addressed by efficiency programs, thus saving water, energy and money.

The key factor to consider regarding analysis of economics and financing for energy and water projects is that energy managers must look beyond traditional approaches.

Economic analysis for energy projects has been an evolving science for three decades. In the past there was a tendency to focus on short-term approaches such as simple payback, yet a more comprehensive view of economic analysis is becoming much more popular as managers gain more experience with life cycle costing and other more long-term techniques.

This article presents a broad perspective on economic analysis for water projects, and advocates using the results of this analysis to create a compelling story that justifies a combined investment in energy and water efficiency, whether it is funded internally or through external sources. Energy managers know well that an economically beneficial project is much more likely to be implemented whether the money is "in the budget" or not.

Water conservation measures (WCM) can help with the economics of many projects, particularly where many of the "easy" energy projects have already been done. This article will explore trends and tools that owners may expect to see in energy and water management project financing and analysis. Most importantly the intent here is to provide a framework for rethinking how owners manage and reinvest in our facilities.

The process of economic analysis always begins with the premise that cost effective projects are those that generate enough cost savings to repay the investment, and ideally have excess savings left over. Energy managers today are realizing that water continues to increase in value as a resource, and operations and capital budgets present even greater economic value.

The key issue for water managers is to look for efficiency opportunities not cost reductions; how can we deliver the same level of service with less cost?

As a result, improving operating efficiency can mean big dollar and resource savings. Efficiency in this sense means "providing equal or more output (water) for the same amount of input (cost, energy, etc.)." Unlike operating cost reductions, this means that the mission of the organization need not suffer.

The search for opportunities to improve water systems efficiency results in a host of solutions, many of which are technology driven. With efficiency, technologies managers can address water, energy, operations and capital costs, and get some unexpected benefits. Among those technologies that generate supply side savings are: waterline infrastructure restoration systems, SCADA systems, gas-fired pumping, variable speed electric motors and enhanced filtration and purification systems. Demand side projects will seem even more familiar to energy managers. Consider the similarity in these measures: replace a 100 watt incandescent lamp with an 18 watt compact fluorescent or replace a 3.5 gallon per flush toilet with a 1.5 gallon per flush toilet.

The following reviews the synergy between traditional energy projects and these measures for building managers. In particular it reviews the concepts of economic analysis and financing for projects to highlight the synergy between energy and water measures.

This article also addresses the supply side of a water system and the challenges that are faced with this type of infrastructure. These challenges lead to many opportunities for a variety of managers who maintain water systems for such facilities as a university, municipality or industrial complex. In each case, water, energy, operations and capital savings from the technology can allow managers to address high costs, and replace or modify existing equipment. There are countless other opportunities to improve efficiency and reduce operating costs on the supply and demand side of water systems.

STEP 1: ECONOMIC ANALYSIS

To provide a framework for discussing the feasibility of projects it is worthwhile to review some of the most common approaches. Analytical approaches vary widely between private and public sector, as well as from one organization to another. The optimum approach is for some form of cost benefit analysis to be performed before a project is approved. That analysis will typically quantify the costs of the project and assign an economic value to every benefit produced.

There is an opportunity to expand that focus, and consider cost effectiveness impacts on operations, as well as positive impacts on the business via customer service, etc.—particularly where savings from a project can be used to cover its cost and create a revenue neutral opportunity.

Techniques for economic analysis are varied; however, there are a few commonly accepted methods that have been used extensively in the energy industry. In the early days of energy management, the concept of economic analysis was quite simple, It was widely accepted that energy was in short supply, so installing more efficient equipment was a requirement for the future.

This movement, however, was accelerated because there was a financial incentive in the short term to achieve energy efficiency; the owner could save money. The result was economic analysis of projects, and with the obvious drivers, it was not necessary to be especially sophisticated.

Therefore, simple payback was good enough, and the primary factor evaluated was: Could a project pay for it self in three to five years from energy savings? Other benefits were not quantified because it was a given that this was a worthwhile investment, yet there are a tremendous number of added benefits in operations and capital areas.

Expanding economic analysis to include a better estimate of the true project value also requires consideration of operations and capital savings, avoided cost, opportunity cost and the cost of money. It is important to view value from a variety of perspectives, and to include all positive results in the cost-benefit analysis. Conventional wisdom dictates that when an investment is considered, companies complete an evaluation to delineate the monetary value of all costs and benefits of the proposed investment. Energy projects should consider the value of all benefits not simply energy or other commodities alone.

Given that cost savings cover the full spectrum from commodities such as electricity through operations and capital costs, economic analysis must quantify all of these costs. Typically, the operations staff is comfortable with energy savings, but a true cost benefit analysis must attach a monetary value to all of the positive results of a project.

To do this it is necessary to look at the complete project. It may not be feasible to include taking credit for avoiding property damage and other catastrophic losses; however, there are many savings that a focus on the plant may not consider. These include the cost of money, legal and bond counsel costs, and standby rates or other penalties that may be avoided through efficiency projects.

This article cannot provide detailed examples of specific efficiency alternatives. Rather, it will review a number of key areas that are typically overlooked. It also recommends the application of some new management techniques and business practices borrowed from another industry that focuses on scarce resources: **the energy business**.

This article reviews a variety of approaches for financing capital projects. Here, we will focus on **performance contracting**. This technique is used extensively for energy and water efficiency projects by a wide variety of public entities, and the article will review its value for water system owners.

It is important to categorize the areas of analysis listed below.

- Measure commodities such as electricity, natural gas and water,
- Operations savings including labor, materials and purchased services,
- Capital savings including avoided investment due to life optimization
- Finance and other implementation costs due to reductions in project size.

The key to this analysis is to look at the impact of the project on the full organization and determine what the benefits are and how they will appreciate based upon time value of money. Taking the benefit for savings due to cost escalation should be a critical component of the analysis as well. Recognizing that these economic realities do not remain static from year to year is one of the most important reasons that a simple pay back approach is not acceptable.

Commodities

This may be the simplest form of economic analysis. It is possible to look at a current piece of equipment and its operating characteristics to determine how much energy, water, etc. it consumes. In the simplest of analyses where an existing device will be replaced by a new more efficient device, the calculation is very simple. Determine (based upon consumption and hours of operations) how much of each type of commodity a device consumes per year and make the same comparative measurement on the new device. Subtract the new consumption from the old to arrive at the commodity savings and then multiply by the cost per unit for the commodity.

In the simple payback method, the implementation cost is divided by savings per year. At a minimum, more complex methods allow for cost escalation of the commodity over time.

Operations Savings

Looking at the complete impact of a project requires an analysis of operations savings. For example, replacing an older, less efficient piece of equipment that requires more maintenance and may fail intermittently will result in operations savings. The cost to maintain and repair that equipment can be easily quantified and the economic value should be included as a benefit in the analysis.

Operations savings are typically labor and materials savings that result from more reliable process. For example, water pipeline restoration that is accompanied by guaranteed performance that pays for waterline point repair results in a direct savings in both labor and materials.

Another example would be purchased services to hire a specialized firm to conduct repairs on equipment when the expertise does not exist internally.

These savings are often overlooked, yet are very real and should be quantified.

Capital Savings

This is another important area that is sometimes called "avoided cost." If it is possible to engage in efficiency activities that will avoid capital costs, these benefits should be quantified. A program that reduces unaccounted-for water by addressing pipeline integrity and leak detection, for example, may delay the need to expand or upgrade piping systems.

Any efficiency program that can have the net effect of reducing operational hours and thereby extending life to delay the capital cost of replacement should quantify avoided cost savings.

This avoided cost can have a significant impact on budgets and lead to the final area of benefits and finance savings.

STEP 2: FINANCIAL SAVINGS

Step 2 focuses on the reduction in related financial costs on capital projects. In many cases the technical staff do not consider the cost of money. A budget is requested for a project and if it is approved, no one considers where the money comes from and what the acquisition cost is for that money.

Many businesses and governmental agencies make a significant effort to avoid taking on debt. At first glance this may seem like a cost savings measure, however most organizations are becoming aware of the negative impact that deferred maintenance can have on the business.

With the advent of the Governmental Accounting Standards Board Statement Number 34-35 (GASB) the wisdom of such approaches is being called into question for cities and universities as well.

That ruling particularly impacts infrastructure and requires that water utilities depreciate that infrastructure and that they reinvest in the infrastructure to ensure that it remains in good functional order. The actions taken to find cost effective approaches to deal with infrastructure and to optimize other plant equipment can result in **lower capital funding requirements, and therefore financial savings.**

GASB could result in much larger capital programs, yet it should also drive much more creative approaches and help to address the risk associated with operating aging plant. Aging equipment is more likely to fail and cause damage or injury. This financial cost can not be easily quantified but data do exist.

An interesting public works parallel is traffic light conversion to light emitting diodes (LED). The operational savings in that case are dramatic, with 80% energy savings, but one of the additional financial benefits documented in Philadelphia was a liability cost reduction*.

The study documented an annual liability cost reduction savings for the city of $50,000 in litigation costs arising from accidents and lawsuits resulting from burned out traffic lights. The litigation savings were actually a real financial benefit, not unlike the property damage costs that arise from water infrastructure point repairs.

The concept of justifying projects based upon a much more comprehensive benefit analysis is one that holds great benefit for water

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*City of Philadelphia, Light Emitting Diodes for Traffic Signal Displays, Urban Consortium Energy Task Force, December 1995 systems. Another factor that has long been evident to energy managers is to clearly define the benefits for the organization as a whole.

Those who ultimately approve projects are generally focused on key indices that they believe define success or failure for the organization. It is critical to also define how efficiency projects impact those organizational benefits, and present these in conjunction with the economic analysis to show the decision-makers how these projects support the overall mission.

This concept is part of a new approach to manage a water utility that analyzes the full cost of delivering service, as well as the value of the resource. The full cost concept includes calculating all the expenses and system efficiencies associated with various management techniques that are used to make decisions, such as the "do nothing" or "replacement based on "age and break history" used with waterlines.

To bring these ideas into focus, consider a few terms from the electricity business that suggest how management strategies must be developed for both "sides" of the meter. The "supply side" (water system plant and distribution) and "demand side" (end use by the customer) each present challenges and opportunities for cost effective management, yet many efforts aimed at reducing both cost and water use to date have focused on the demand side. **The focus in this article is on the supply side, particularly distribution infrastructure.**

FINANCING FOR ENERGY/WATER EFFICIENCY PROJECTS

The approach to address system enhancements is to develop system master plans, and capital improvement plans—typically for a five- to ten-year period—and to identify sources of funding to complete the plan.

This section will explore some sources of funding for capital projects, and recognizes that a major driver for GASB is to ensure that infrastructure and plant are not ignored even if debt financing is required for capital projects.

Commercial and industrial customers are most familiar with funding from operations or short-term debt instruments such as leases and loans. The most common sources of capital debt financing for government revenue bonds and general obligation bonds are very well understood by public customers.

Revenue bonds are commonly used by water utilities. These bonds are debt and the utility will pledge, or secure the bond, with a promise to use a specific source of repayment, typically from water revenue. The American Water Works Association document M29, Water Utility Capital Financing, is an excellent resource to learn more about conventional approaches.

Bond financing is effective and there is comfort with this approach, however there are some issues as well. First, it is not always a cost-effective way to finance small capital projects as the administrative and bond counsel costs are prohibitive below approximately $5 million. This issue is complicated for many cities that do multiple separate small bond issues to purchase motor graders, SCADA systems, fire trucks, etc.

The up-front cost and staff time required to complete these bond issues is prohibitive, and bonds also require voter approval therefore taking several months to complete. Other types of short-term debt may be used for smaller projects such as bank loans, revenue-anticipation notes and commercial loans.

Leases and certificates of participation are other familiar options. Leases have become common for many types of equipment purchases, including water conservation and infrastructure projects. These instruments may also be taxable or tax exempt.

An exciting alternative vehicle that is being proposed on an increasing basis to water utilities is the guaranteed performance or savings agreement, generally known as "Performance Contracting." Guaranteed performance contracts blend several of the features from the more common vehicles and add a whole set of new services.

The financial instrument used for performance contracting is typically a tax-exempt municipal lease agreement, which can be implemented in around 60 days without voter approval. But there are a variety of other instruments that may be used. When the instrument is a lease, the repayment for these leases can be from operational or capital budgets and can take place over 10 years, thus allowing projects to be implemented with little or no up-front funding and at competitive interest rates.

Enabling legislation exists in nearly every state to allow municipalities to lease-purchase combined packages of equipment and services. However most companies offer the financing to simplify the purchase for the customer, and are open to having municipalities use alternate approaches.

The performance contract approach is unique as a financing vehicle because the seller, a water or energy service company, offers a comprehensive service that combines evaluation, engineering, construction and construction management. This is unique because one service company takes complete responsibility for the project implementation and performance.

These companies complete the evaluation necessary to identify appropriate capital measures, and in some cases this entails proprietary technology. Such technology may be used to analyze infrastructure condition or to calculate the efficiency that may be achieved through implementation of a new technology.

After completion of this evaluation, the service company will then design appropriate infrastructure restoration measures or other technology applications to implement the improvement. The service company will generally provide a firm price to complete the evaluation, implementation and guarantee of performance.

This is particularly desirable for infrastructure, to allow water companies an alternative to full replacement based upon age and break history, yet still get a guarantee of performance. It is also valuable to receive a guarantee that savings will accrue from implementing a variable speed motor on a lift station, or an automated meter reading system.

New technologies combined with new capital financing approaches are being introduced to the water industry on a regular basis. Many of these approaches are proven and have been implemented countless times for such projects as energy efficiency. In fact hundreds of millions of dollars in capital energy projects are done each year by government entities.

This approach has been accepted so well that the federal government launched the *Rebuild America Financial Services Program* last year to try to develop a comprehensive strategy to finance energy-efficiency projects. Programs of this type are being expanded to include water in ever increasing numbers, and are therefore likely to serve as one possible alternative resource for water projects.

As a wrap-up to compare some of the traditional and new initiatives for financing, a comparison was devised to show various approaches. The table below compares the various funding options available to cities, focusing on the impact of payments on city budgets, as well as the size project that may be addressed.

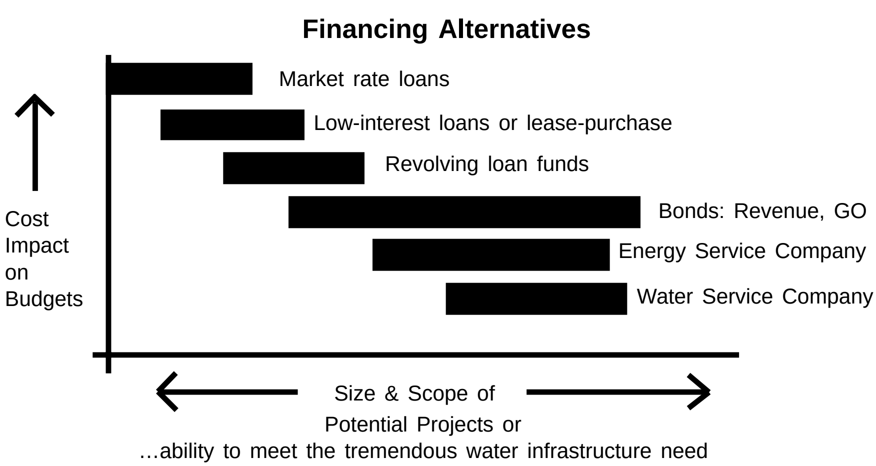
The finance alternative table is general in nature, because a host of factors will determine the cost impact of various financial alternatives on budgets. It is reasonable to note however that the cost of market rate loans will far exceed bond cost.

At the same time, performance contract approaches offered by energy or water service companies will have very limited impact on budgets, as they use savings for repayment. In most cases these approaches save more money than is required to finance the debt and therefore are better than revenue neutral.

Note that energy service companies are common, and use guaranteed energy and operational savings to fund capital projects. A water service company is a new concept, and will likely involve partnerships between companies that provide infrastructure services and others that are willing to guarantee performance and generate savings with this approach.

These companies will finance projects through guaranteed performance of the equipment installed and the resulting savings. No up-front capital is required, and owners can finance energy efficient improvements for an extended period of time.

This approach allows customers to buy equipment over time without spending any more money than they would have budgeted for operations or capital costs. Without question this is a new water infrastructure-financing alternative that bear careful evaluation.



For Further Information:

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