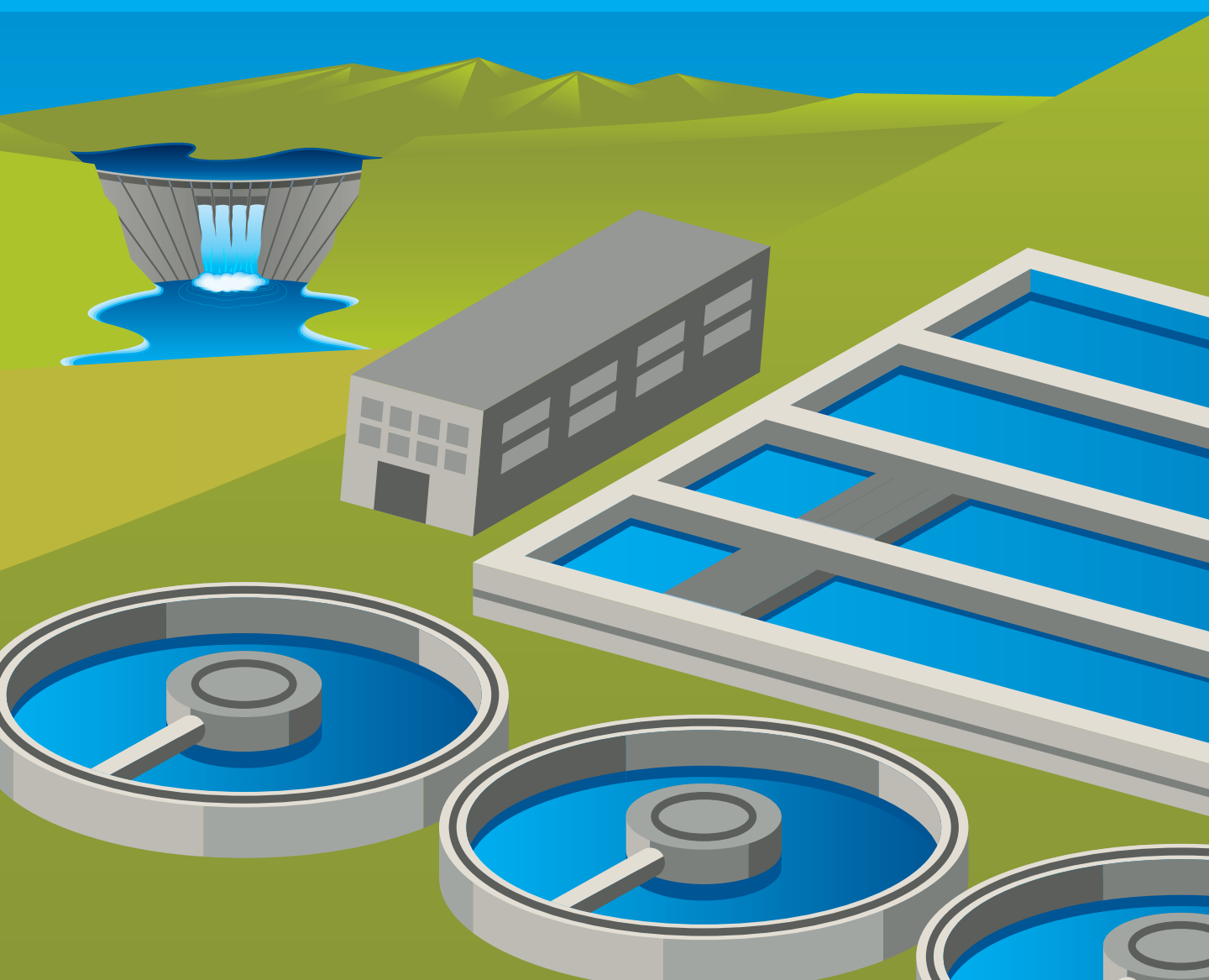

2012 STRATEGIC DIRECTIONS IN THE U.S. WATER UTILITY INDUSTRY

A BLACK & VEATCH REPORT



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INTRODUCTION

Welcome to the inaugural *Black & Veatch Strategic Directions in the U.S. Water Utility Industry Report*. This report serves to provide insights on the common challenges and opportunities facing the water and wastewater industry based on the analysis of survey responses from water utility leaders.

As we reviewed survey results and conducted subsequent analysis, common themes emerged that centered on financial issues, sustainability and optimized asset management practices. What is unique is that these are not stand-alone themes. Rather, each is intertwined with the others in terms of alleviating challenges or hindering future opportunity.

The survey results confirm that the financial needs of water utilities truly are the overarching challenge for the industry. Funding is grossly inadequate to upgrade infrastructure that, for the most part, is well past its useful lifespan. Sustainability and asset management are key solutions to the financial puzzle. By reducing energy needs, conserving water, prioritizing capital and implementing asset management frameworks, utilities can do more with less. The challenge is that all of these

solutions still require funding and force the continuous cycle of “do what you can” prioritization.

New thinking is needed to break this cycle and boost infrastructure spending and invest in the future of our nation’s infrastructure. This report not only demonstrates the current views of industry and utility leaders related to key issues but also provides recommendations and opportunities to propel the industry forward.

Black & Veatch is grateful to everyone who participated in our inaugural survey. We would also like to acknowledge the Black & Veatch professionals who contributed their insights and analysis for this report. To continuously improve our products for the industry, we welcome your questions and comments regarding this report and other items. You can reach us at ConsultingInfo@bv.com.

Sincerely,

CINDY WALLIS-LAGE | PRESIDENT
Black & Veatch’s global water business

JOHN CHEVRETTE | PRESIDENT
Black & Veatch’s management consulting division

This report is available electronically on the Black & Veatch website, www.bv.com/survey.

THE BLACK & VEATCH ANALYSIS TEAM

INDUSTRY OVERVIEW

Cindy Wallis-Lage is President of Black & Veatch's global water business and is a recognized thought leader within the industry. Throughout her 25-year career, Cindy has worked with water and wastewater utilities to develop sustainable water and wastewater solutions. She has been involved in industrial and municipal projects worldwide, and has authored more than 50 papers, 20 technical articles and 10 textbook chapters. In addition, Cindy is an active leader in numerous industry forums and associations.

SUSTAINABILITY OVERVIEW

Steve Tarallo is the North America Business Lead for Sustainable Water and Energy Solutions within Black & Veatch's global water business. Steve has more than 21 years of experience in municipal wastewater treatment research and development, design and project development. Steve works with utilities in assessing treatment deficiencies, developing process alternatives, energy optimization studies and sustainability assessments.

Bob Hulsey is the Director of Water Treatment Technology in Black & Veatch's global water business where he leads a group of Ph.D.- and Master's-level process engineers and scientists in implementing advanced treatment technologies such as desalination, micro-contaminant removal, high-rate sedimentation and flotation, membrane and biological filtration, ozone, and UV disinfection, among other solutions.

FINANCIAL OVERVIEW

John Kersten is a Vice President in Black & Veatch's management consulting division and has extensive consulting experience associated with municipal electric, natural gas, water, wastewater and reclaimed water utilities. His experience encompasses a full range of utility finance issues, including wholesale and retail ratemaking, revenue bond financial feasibility reports, valuations studies for acquisitions and mergers, capital financing analyses, economic feasibility studies, and strategic and business planning.

ASSET MANAGEMENT OVERVIEW

Will Williams is a Director within Black & Veatch's management consulting division where he leads and provides a full range of strategic and tactical asset management services for global water and power clients. Will has more than 21 years of experience in asset management planning, including asset failure analysis, risk assessment, performance benchmarking, maintenance optimization and business change management, among other areas.

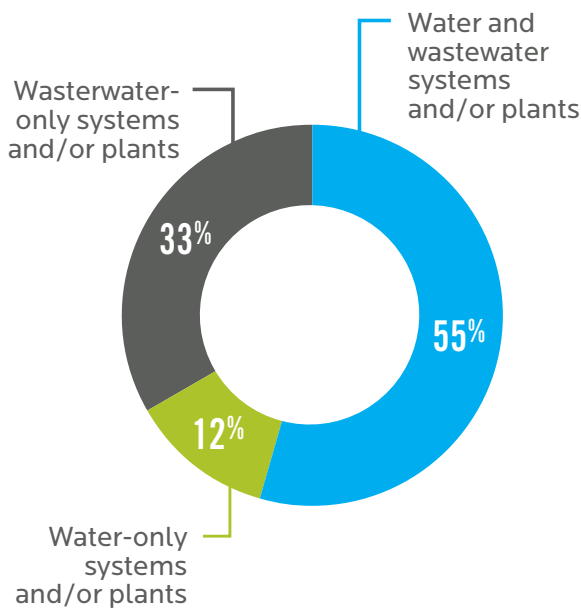
CONCLUDING THOUGHTS

John Chevrette is the President of Black & Veatch's management consulting division and leads the company's efforts to address key challenges affecting today's water, electric and gas utilities. Chevrette has more than 20 years of industry consulting experience, and has worked with domestic and international clients in the electric utility, energy technology, gas pipeline, telecommunications and water industries.

ABOUT THE 2012 SURVEY

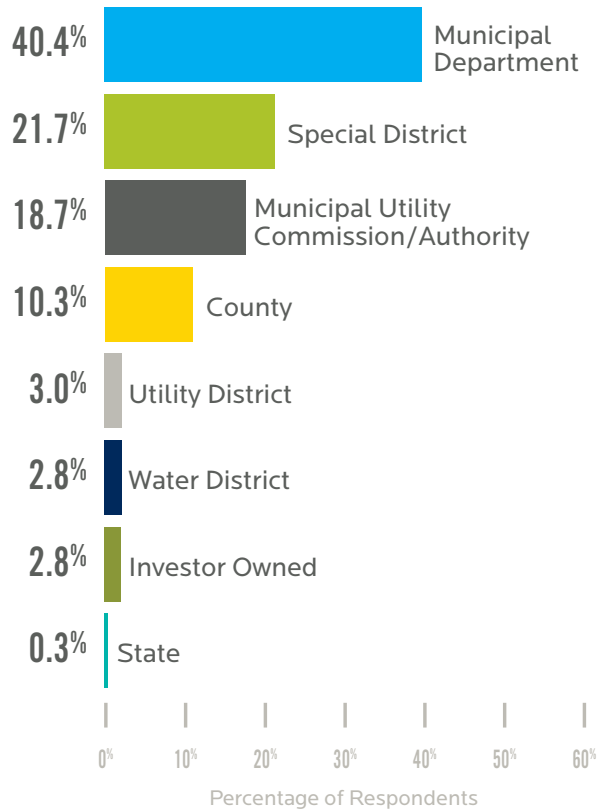
Black & Veatch's first water utility industry survey was conducted from 22 February through 13 March 2012. Analyzed survey responses are from qualified water utility industry participants. Statistical significance testing was conducted, and represented results have a 95 percent confidence level.

FIGURE 1
SURVEY PARTICIPANTS BY TYPE OF SYSTEMS/ASSETS MANAGED



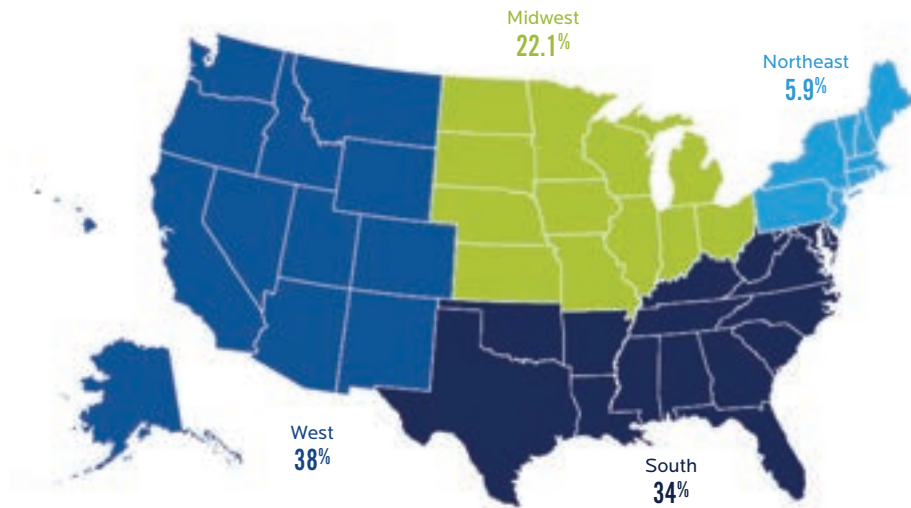
Source: Black & Veatch
 Utility respondents represented a broad cross section of the industry and country. Responses represent utilities serving customers in 45 states and the District of Columbia.

FIGURE 2
SURVEY PARTICIPANTS BY ORGANIZATION TYPE



Source: Black & Veatch
 Utilities that are municipal departments or special districts represented more than 60 percent of qualified respondents.

FIGURE 3
SURVEY PARTICIPANTS BY REGION



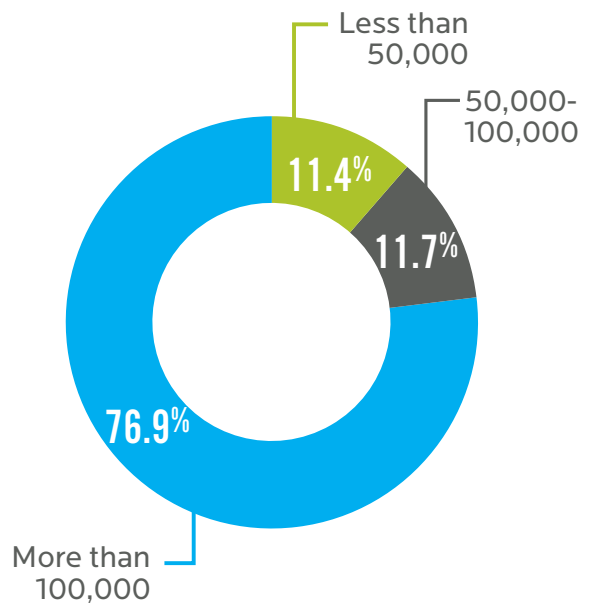
Source: Black & Veatch

Survey participants have also been classified by region. Where statistically valid and relevant, survey responses were analyzed for regional differences. Figure 3 provides an overview of how each region is classified and the percentage of respondents for each (based on the number of respondents who provided this information).

FIGURE 4
SURVEY PARTICIPANTS BY POPULATIONS SERVED

Source: Black & Veatch

Survey participants represented a broad range of populations served. Where statistically relevant, survey analysis provides insights on specific discrepancies or differences in results based on sizes of populations served.



INDUSTRY OVERVIEW

BY **CINDY WALLIS-LAGE**

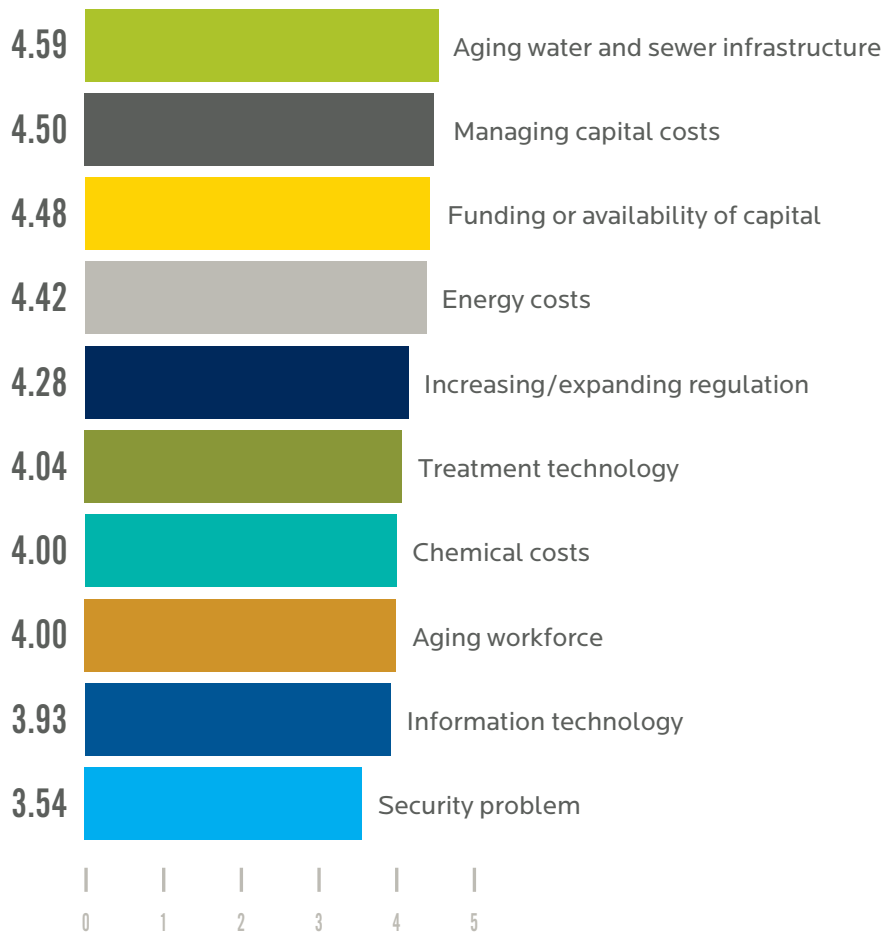
Black & Veatch's first water utility survey confirmed much of what the company's water industry leaders and specialists have seen unfolding over the past few years. In the following report, we've summarized the water industry survey findings and expanded the analysis to address the three overlapping mega-issues impacting utilities today: financial challenges, sustainability and asset management.

FINANCIAL CHALLENGES

First and foremost the survey confirms that financial issues, and all issues that drive investment or costs, are front and center with water utility leaders. When asked to rate the importance of major industry issues, survey respondents considered aging water and sewer infrastructure as the most important issue facing our industry, with managing capital costs, funding or availability of capital, and energy costs following closely behind. Increasing or expanding regulation, treatment technology, the aging work force and chemical costs are also comparatively important (Figure 5).

Considering the massive expansion of U.S. water systems in the immediate post-World War II era, followed by wastewater treatment projects spurred by the Clean Water Act in the 1970s, with comparatively limited investments since that time, it is not surprising that aging infrastructure is viewed by the industry as the top challenge. Nor is it surprising that aging infrastructure and associated replacement and rehabilitation demands have a strong impact on the financial health of water utilities (Figure 6 on page 8).

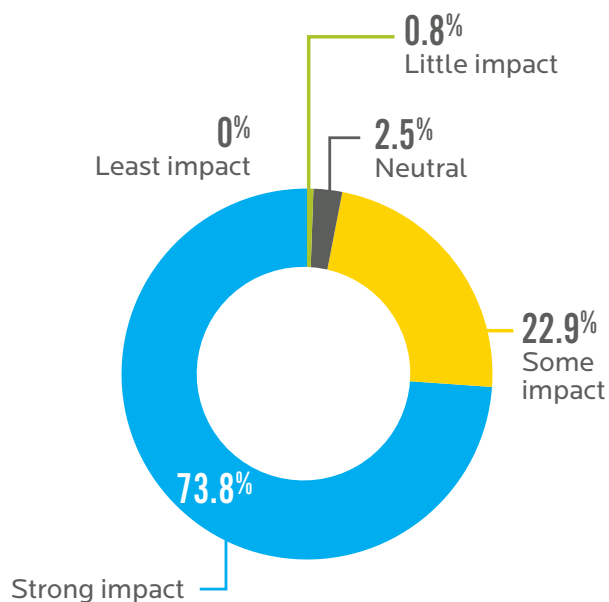
FIGURE 5
IMPORTANCE OF INDUSTRY ISSUES



Source: Black & Veatch

Survey participants were asked to rate the importance of each of the above referenced issues to the water industry based on a scale of 1 to 5, where 1 indicates "very unimportant" and 5 indicates "very important." The results above show the average response for each issue.

FIGURE 6
IMPACT OF INFRASTRUCTURE REPLACEMENT AND REHABILITATION ON FINANCIAL HEALTH



Source: Black & Veatch

Nearly three-fourths of all respondents stated infrastructure replacement and rehabilitation has a "strong impact" on the financial health of water utilities. This highlights the challenges of aging infrastructure and the investment needed to modernize critical water and wastewater systems.

This fact has not been overlooked by investors and credit rating agencies. In August 2011, Standard & Poor lowered the AAA ratings of thousands of municipal bonds tied to the federal government. Additionally, *The Wall Street Journal* reported more than 190 super downgrades on municipal bonds, where ratings were cut by more than three grades, have occurred since June 2010. According to *The Wall Street Journal*, "The rating firms say multi-notch downgrades are extremely rare and when they do happen they are often tied to bonds where investors already expect volatility, such as bonds that depend on property tax revenue at a time when the real estate market is depressed ("Downgrades Felt at Local Level." *The Wall Street Journal*. August 18, 2011)."

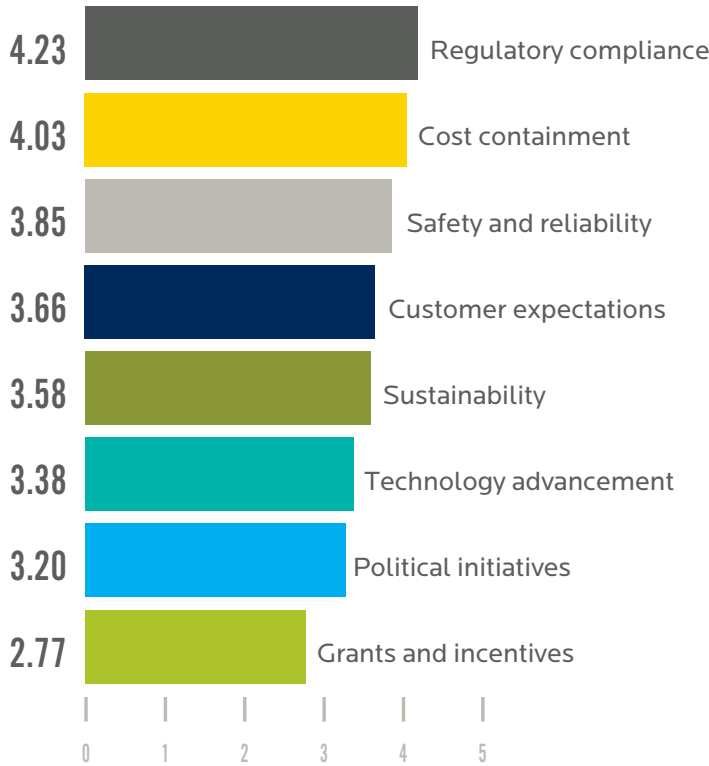
Little has changed with respect to drinking water, wastewater, and stormwater needs since the American Society of Civil Engineers assigned the nation's infrastructure nearly failing grades in its 2009 Report Card on America's Infrastructure (www.infrastructurereportcard.org). Except, of course, that the gap between system needs and funding has continued to expand since the economic downturn.

Public utilities have always been challenged to make the most of limited budgets without the benefit of being able to significantly raise rates, a situation truer today than just five years ago. The vast majority of survey respondents doubt the sufficiency of their future funding to manage and maintain their systems. (See Figure 12 on page 18).

THE GAP BETWEEN SYSTEM NEEDS AND FUNDING HAS CONTINUED TO EXPAND SINCE THE ECONOMIC DOWNTURN.

Prioritizing precious capital is essential for ensuring safe, clean and reliable water and wastewater services. When asked how specific issues are driving ongoing infrastructure investments, survey respondents indicated that regulatory compliance was by far the strongest driver, with cost containment emerging as the next strongest factor (Figure 7). Recently, due to increased wet weather, nutrient reduction and disinfection regulations, regulatory compliance issues most heavily impact utilities with wastewater responsibilities.

FIGURE 7
INFRASTRUCTURE INVESTMENT DRIVERS



Source: Black & Veatch

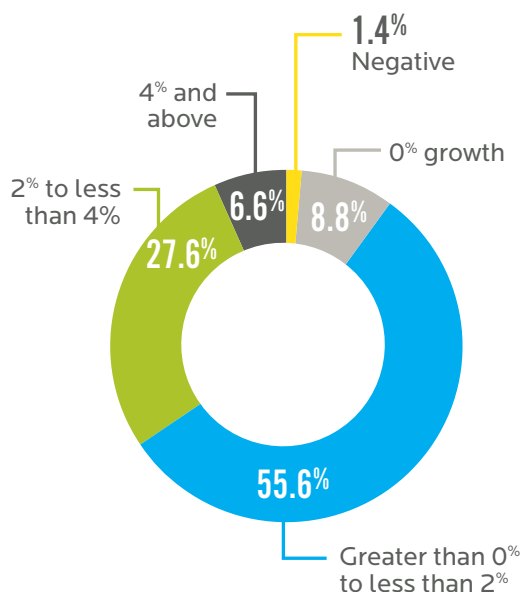
Survey respondents were asked to rate on a scale of one to five how each of the identified issues drive ongoing infrastructure investment within their respective organizations, with 1 meaning “very weakly” and 5 meaning “very strongly.” Figure 7 provides the average rating for each issue.

The expectation of some system growth by approximately nine of 10 respondents reflects economic optimism as well as anticipated population growth that could further stress existing systems (Figure 8 on the next page). The majority of respondents expect growth of less than 2 percent, which is in line with the average growth currently seen among Black & Veatch water and wastewater clients. Anticipated growth is less than the typical average growth of 2 to 4.5 percent prior to the 2008 economic meltdown but reflects a step up from the zero growth experienced in recent years.

According to the survey results, industry type and location particularly affect expected system growth. For example,

more utilities in the Northeast expect no change in system size compared with utilities in other regions. The anticipated growth pattern within the United States is significantly different from the last several decades; for example, high-growth areas such as the West have seen a significant reduction in growth. Meanwhile, many cities, particularly those hardest hit by the Great Recession have experienced significant population loss. The challenge for all utilities is finding a financial solution to pay for the infrastructure investments outside growth- and use-based revenue models.

FIGURE 8
EXPECTED ANNUAL SYSTEM GROWTH



Source: Black & Veatch

SUSTAINABILITY

The Nexus of Water and Energy

Sustainability is important to the vast majority of survey respondents, and energy use is the overriding sustainability issue. The water-energy nexus affects water utilities in many ways; it takes a lot of energy to produce, move, treat and distribute water. Energy costs can account for as much as 30 percent of most utilities' operating budgets.

The effects of energy use and cost on the Triple Bottom Line (economic, environment, social/community) performance of water and wastewater utilities are impossible to ignore. Rising energy costs are putting additional pressure on utilities' finances. The economic impact on water and wastewater utilities is particularly stressful during challenging times when budgets are being squeezed through decreased revenues and funding constraints.

More than three-fourths of respondents' utilities have taken basic steps to reduce energy consumption through efficiency, optimization or similar planning and management measures (See Figure 17 on page 24). Some utilities strive to become energy neutral, and at least one has recently become a net energy producer by recovering more energy from the treatment process than what is needed to power facilities.

ENERGY COSTS CAN ACCOUNT FOR AS MUCH AS 30 PERCENT OF MOST UTILITIES' OPERATING BUDGETS.

Water is Water

Water conservation and water reuse present direct opportunities for achieving economic, environmental and social sustainability. Although there is some variation in survey responses based on specific utility functions, the overall analysis emphasizes that water is water. Water utilities are all essentially managing the same water resource, diverted from nature's one-and-only water cycle. In addition, utilities are increasingly finding it necessary to manage and balance other resources along with water. Sometimes the management of multiple resources is synergistic; sometimes it requires more complex planning or investment; and sometimes tradeoffs are necessary.

The ongoing practice of classifying water into different categories (i.e., potable, stormwater and wastewater) creates division about water value and its potential uses. These divisions also contribute to communications challenges with public and government entities that can confound capital projects and resource recovery efforts. Globally, organizations that integrate water and wastewater functions find it easier to balance their water portfolios and gain public and financial support for investment in water infrastructure.

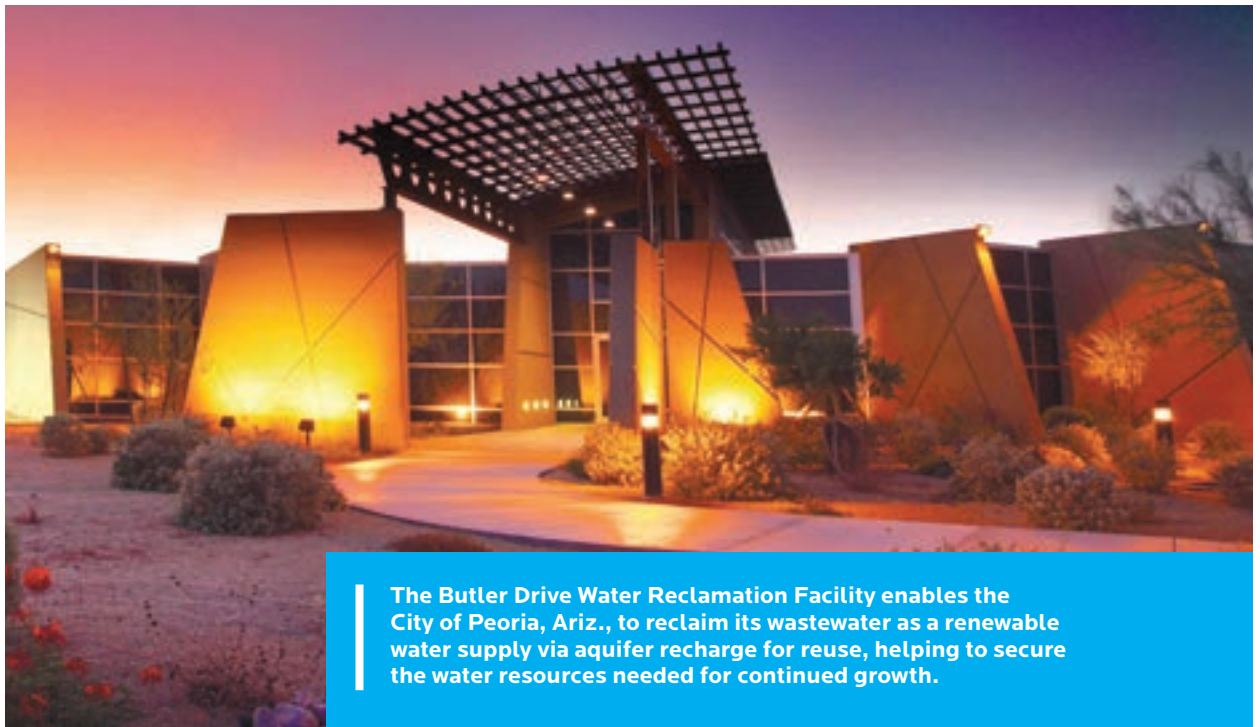
One water qualification that must be eliminated from the water industry vernacular is “wastewater.” It is time to shift our focus away from the elimination of something undesirable to the opportunity to recover valuable resources such as water, energy, nutrients and beneficial products. The planet’s 7 billion-plus inhabitants—especially those in highly developed countries like the United States—need to adopt the mindset that continuous recycling of these resources will better serve future generations than delving deeper into dwindling supplies. Where economics support the decision to generate valuable products in conjunction with the cleanup of used water, wastewater treatment plants are poised to become resource recovery centers, producing not only recycled water and energy but also phosphorus-laden fertilizer and beneficial biosolids products.

Many utilities are already recovering water. According to the survey, water utilities in the West are more concerned about water availability/scarcity and place greater importance on conservation than their peers in other U.S. regions. Certainly, utilities in the West and parts of the South are leading the way in adding water reclamation and reuse to their water resources portfolios. Only one in

four respondents told us that their customers wouldn’t be accepting of gray water for non-potable use (See Sustainability section).

THE ONGOING PRACTICE OF CLASSIFYING WATER INTO DIFFERENT CATEGORIES CREATES DIVISION ABOUT WATER VALUE AND ITS POTENTIAL USES.

Where water is scarce or of impaired quality, discussion tends to focus less on overcoming the “yuck” factor and more on providing the flexibility to match water quality to a specific use. For example, water used to flush toilets or water lawns shouldn’t require the same advanced treatment as water intended for aquifer recharge but does require third-pipe distribution and appropriate regulatory oversight.



The Butler Drive Water Reclamation Facility enables the City of Peoria, Ariz., to reclaim its wastewater as a renewable water supply via aquifer recharge for reuse, helping to secure the water resources needed for continued growth.

ASSET MANAGEMENT

One activity that would significantly help utilities more efficiently manage water resources is the collection and analysis of real-time data through smart infrastructure/ grid programs. Wireless communications offer the potential for greater efficiency as compared with system elements that operate independently. Immediate access to the right data moves decision-making closer to real-time and can greatly improve efficiency within the water industry.

Overall, integrated planning to most effectively manage all utility resources is becoming one of the most important activities for utilities moving forward. This requires a holistic evaluation of all assets and resources using life-cycle analysis to determine the economic impacts of potential energy reduction and resource recovery actions. Social and environmental objectives often must be considered along with financial factors.

Achieving this balance isn't easy. While beneficial results can be identified in isolation, the best balance

is found through big-picture evaluation. For example, in many respects it is considered a success when a water management approach, such as a conservation program, results in decreased energy consumption for water production, recovered capacity within existing infrastructure, and less wear and tear on system assets. However, equally important is the recognition that such a program may have financial impacts for utility providers that typically have significant fixed costs, including decreased revenue. In other situations, there are tradeoffs between required water quality and operating impacts.

The capital costs to add new facilities or processes can be significant; meeting regulations and replacing critical infrastructure tends to take top priority when budgets are tight. This adds to the challenge of making holistic decisions that factor in all resources – energy, water, beneficial byproducts and optimization of existing assets. The Asset Management Section of this report shows approximately two-thirds of respondents have conducted assessments and/or are implementing improvement programs. This is a critical first step in developing comprehensive solutions for reducing costs and improving services related to reliability and regulatory concerns.

CONCLUDING THOUGHTS

The three mega-issues identified within this report have been companions of water utility leaders for decades. While these issues are not new, the gap between what we have and what we need continues to grow. Closing this gap will require innovation in financing, technology application and utility operations.

Traditionally, the U.S. water industry has relied on central government sourcing for funding water and wastewater infrastructure needs. While some funding relief may be on the horizon, the current fiscal and political environment suggests it will not be sufficient, or may not occur at all. Additionally, as noted earlier, many municipalities have challenges associated with credit rating downgrades that are increasing the cost of obtaining capital through traditional municipal bonds. As a result, water industry and municipal leaders will need to explore additional options.



Public-private partnerships provide an alternative means of bridging the gap between available capital and necessary capital expenditures. The availability of nearly \$200 billion in private capital could enhance funding to accelerate infrastructure projects, yet, according to survey results, utility leaders – or perhaps their governing bodies – show little interest in pursuing private financing.

There is also much work to be done in educating consumers and government leaders on the value of water and the true costs associated with providing water and wastewater services. On a global level, industry and national leaders are recognizing the true significance of precious water resources. Secretary of State Hillary Clinton recently referred to water as “the new oil,” casting water as the next great catalyst for future diplomatic tensions and possibly even military conflict.

At the local level, water and sanitation services are viewed as basic necessities, and elected officials are hesitant to raise rates or explore private involvement. Under these constraints, most utilities are searching for innovative solutions to support infrastructure funding needs along with new technologies that optimize existing assets and offset the high costs of producing safe drinking water and returning clean water to the environment. Fortunately, these technologies exist and are well proven. And, as survey results show, utilities are moving forward with implementing these cost-cutting measures.

When considering the significant system needs and fiduciary constraints, water utility leaders are to be commended for their consistency in delivering reliable and safe water and wastewater services to their customers. However, this consistency masks the underlying problems that our water and wastewater services are, in many areas, one event away from significant disruption. Water utility leaders and the local governments they serve must move forward with infrastructure rehabilitation and replacement. Consumers must understand the value of water and the true costs associated with delivering these services, and politicians must be willing to make the hard decisions related to financing and rate adjustments.

President Franklin Roosevelt once stated, “Confidence and courage are the essentials of success in carrying out our plan.” Today’s water utility leaders know the challenges and needs. Together with local, state and national leaders, we must push forward with confidence and courage to preserve and protect precious water resources, maximize energy efficiencies and seek out new ways to fund vital capital improvements. Failure today to move forward only places greater burden on future generations.

**“CONFIDENCE AND COURAGE ARE THE ESSENTIALS
OF SUCCESS IN CARRYING OUT OUR PLAN.”**

– FRANKLIN DELANO ROOSEVELT

FINANCIAL OVERVIEW

BY **JOHN KERSTEN**

To those who work in or around the water/wastewater industry, it is “old news” that there is a pent-up demand for the renewal and replacement of aging infrastructure. In fact, the need is so large as to represent a literal crisis in many communities across the country.

With cost estimates for required system investment ranging from the hundreds of billions of dollars to a trillion dollars by 2035, industry respondents ranked aging infrastructure as the single most important water industry issue today. Regardless of an exact dollar value, the bottom line is the potential for catastrophic failures in our water/wastewater infrastructure is a ticking time bomb waiting for a place to happen.

Responding to the growing surge of renewal and replacement needs will not be a one-time challenge. Most of our nation’s utility infrastructure was built in the post-World War II era, starting with significant projects launched in the 1950s, and these aging assets are only the starting point. Once issues with 1950s assets are addressed there are projects from the 1960s and 1970s, and so on that will require extensive maintenance to comply with regulatory mandates, contain costs and improve system reliability and safety, and other key drivers of water utility investment. Simply put water utilities recognize that they will be dealing with the renewal and replacement of infrastructure for as long as people need water – forever.

The best way to confront this issue is to address the need immediately by analyzing system needs correctly, developing long-term management plans and finding funding sources thoughtfully. Perhaps most importantly, we will need to find the courage and political will to

raise rates to fund these improvements appropriately. Patchwork and marginal actions today will only lead to even larger challenges tomorrow.

**THE BOTTOM LINE IS
THE POTENTIAL FOR
CATASTROPHIC FAILURES
... IS A TICKING TIME BOMB
WAITING FOR A PLACE
TO HAPPEN.**

Complicating the options for utility executives and municipal boards is that 85.4 percent of industry respondents believe that the average man or woman on the street has little to no understanding of the gap between the cost of producing safe water and the current rates paid by consumers (Figure 9 on page 16). In most cases, the public has virtually no concept of the value of water. This lack of awareness is clearly a “call to arms” for the water industry.



Rehabilitation and replacement of aging infrastructure has a significant impact on the financial health of utilities.

FINANCIAL OVERVIEW

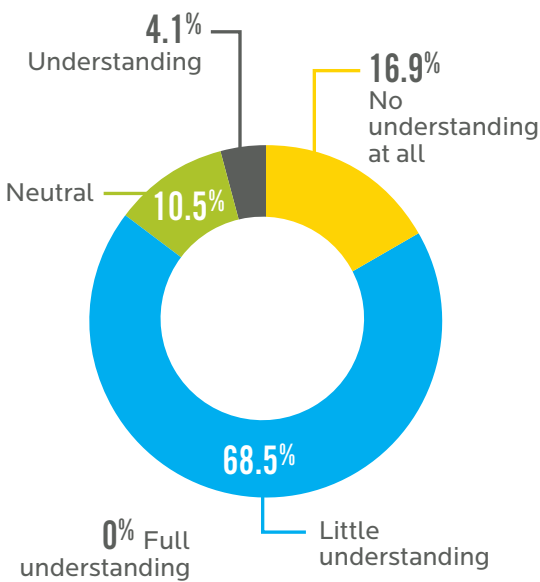
Interestingly, nearly 50 percent of these same respondents feel that customers will probably be willing to pay the higher rates needed to address pressing infrastructure needs (Figure 10). This finding suggests an inconsistency in the water industry's management of its relationships with its customers. Customers certainly won't enjoy seeing rates and charges rise, but we have no other option but to pay the full costs to provide this critical service. The near-term question is will local elected officials be willing to overcome the political pressures aligned against raising rates? The key to solving this problem is improving customers' understanding of the value of the water delivered to their homes.

The survey also gives a peek into the future of investment spending. There is no doubt that significant dollars will

be needed to fund renewal and replacement. But what technologies will be there to support the industry in the future? Nearly 60 percent of responders said technology to increase efficiency and to manage assets more effectively will be the areas given the most emphasis in the future (Figure 11).

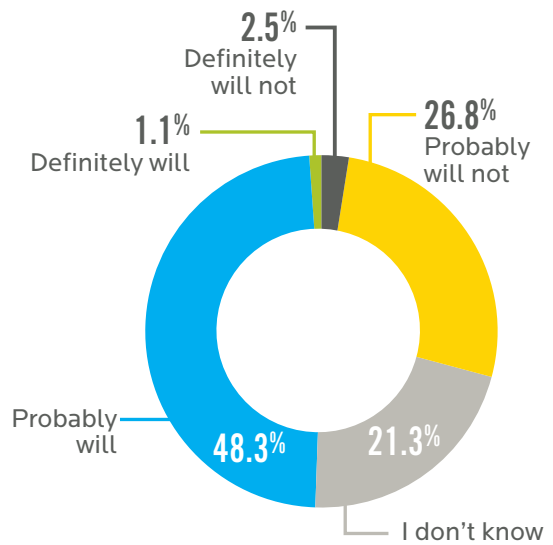
These technologies address current assets, doing more with what we have and finding ways to do it cheaper. Given this state of the industry, where will the money come from? Is it available? Can we access it? What's the catch? The catch is that it might not come from the same sources or as easily as it used to. Utilities can still access some grant monies and low interest rate government loans, but quantities are limited, so the bulk of this pent-up capital demand will have to come from somewhere else.

FIGURE 9
UNDERSTANDING THE GAP BETWEEN COSTS AND RATES



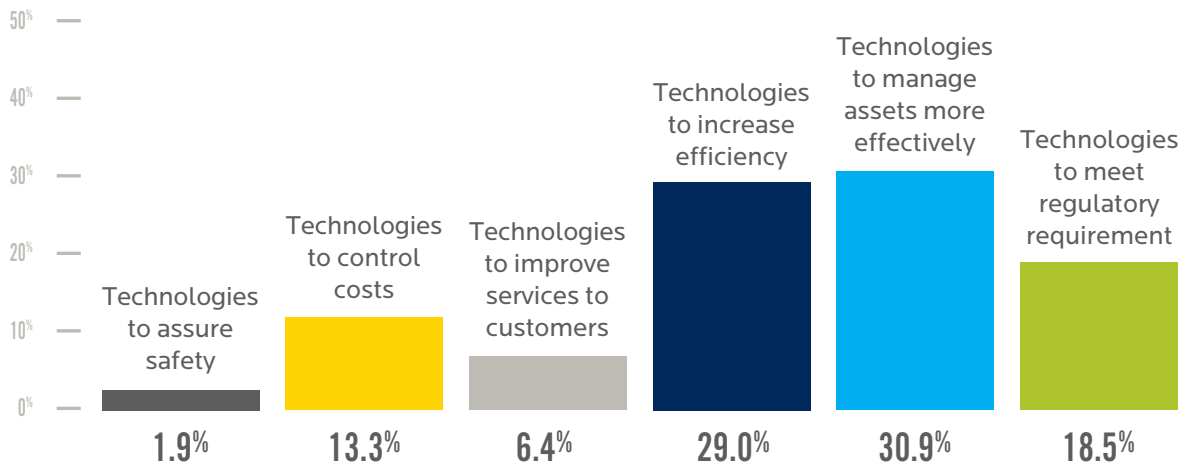
Source: Black & Veatch
Survey respondents were asked to rate how well customers understand the gap between the cost of producing and treating water and current rates. Nearly 85 percent of respondents indicated customers had little to no understanding.

FIGURE 10
WILLINGNESS TO PAY INCREASED RATES



Source: Black & Veatch
Survey respondents were asked if customers are willing to pay increased rates to support capital spending requirements.

FIGURE 11
NEW TECHNOLOGY EMPHASIS



Source: Black & Veatch

Survey participants were asked to select one of the above choices regarding technologies the industry should emphasize.

Nearly 74 percent of respondents feel that infrastructure renewal has a strong impact on the financial health of their utility. Physical assets are examined, deterioration rates are estimated, and in many cases, the operational impacts of aging infrastructure are analyzed and quantified. But finding the resources to respond to these needs continues to be difficult. According to respondents, only 27 percent believe that funding will be sufficient (Figure 12 on the next page).

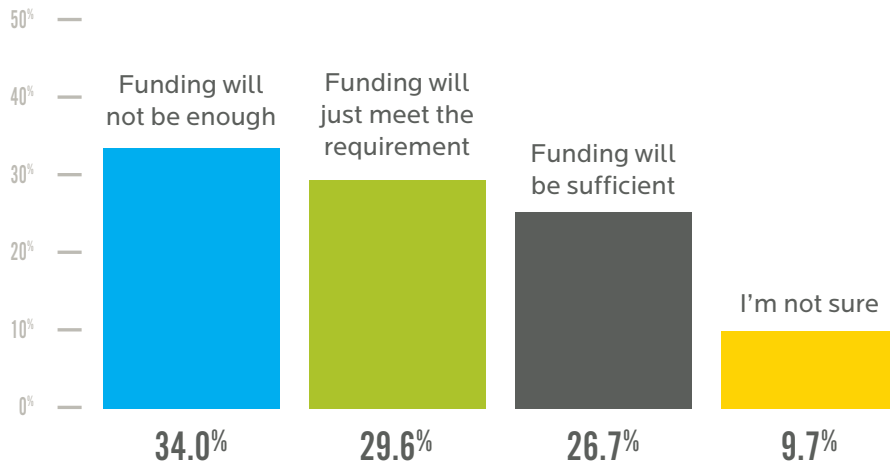
Respondents suggest that the revenue bond market will be their primary financing vehicle, but post-2008 financial due diligence standards are significantly more stringent than before, making it unlikely that the market will support the vast quantity of bonds necessary to fund needed projects. Rating agencies and institutional investors expect significantly increased disclosure of operating and financial conditions, and solid reports on non-financial, regulatory, management and local economic conditions are required for municipalities to obtain favorable ratings and interest rates. For many water utilities and municipalities, this will require the search for alternative funding streams, many of which have not yet been examined (Figure 13 on the next page).

Numerous industry forecasts, reviews, outlooks and projections indicate that the capital requirements to solve the aging infrastructure problem are so large that the public sector will have to consider other sources beyond just traditional bond financing. Yet the respondents indicate very limited interest in any form of public-private partnerships. The hurdles are likely varied in different locations, and may reflect political resistance, management resistance, or perceptions regarding legal constraints or the costs and value of potential financial arrangements.

Privately managed infrastructure funds with billions of dollars available for investment in water/wastewater infrastructure should recognize that regardless of the reason, private investment in municipal water assets is still viewed with suspicion. Proponents of public-private partnerships have significant work ahead of them if they are to become a meaningful part of the answer to the water industry's thirst for capital, but those within the industry must recognize that the old ways of doing business have circled the drain.

FINANCIAL OVERVIEW

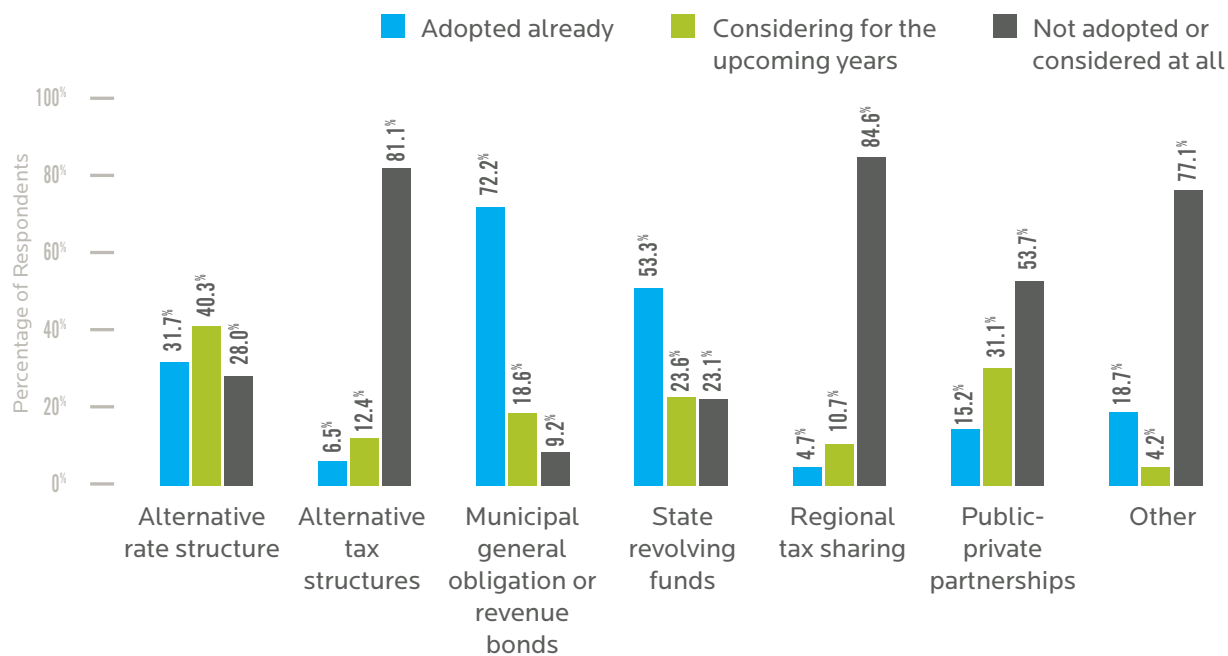
FIGURE 12
FUNDING AVAILABILITY FOR CAPITAL INFRASTRUCTURE PROJECTS



Source: Black & Veatch

Survey participants were asked, "How available is funding for capital infrastructure projects for your utility during the next five to 10 years?" Just over one-fourth stated "Funding will be sufficient."

FIGURE 13
FINANCING METHODS ADOPTED OR CONSIDERED TO SUPPORT CAPITAL NEEDS



Source: Black & Veatch



SUSTAINABILITY AND THE WATER-ENERGY NEXUS

BY **STEVE TARALLO AND BOB HULSEY**

More than five years have passed since the concept of “sustainability” entered the mainstream of the water industry. “Exactly what does sustainability mean and how does it apply to my utility?” and “Is sustainability just a passing fad?” were recurring questions when the term originally surfaced.

Today, local and national association conferences, seminars, webinars and other water industry events, typically include elements devoted to all things “sustainable.” Industry research organizations develop and support projects that investigate sustainability concepts and assessment methods and tools. In addition, a growing number of utilities are applying sustainability tools and methods to address significant operational challenges and capitalize on opportunities to advance strategic objectives.

The water industry generally now accepts that sustainability can mean different things to different utilities and that it is certainly not a passing fad. Rather, sustainability is now widely viewed as a utility management framework that can provide significant benefits. Evidence of this trend is reflected in the survey results: Nearly all of the respondents think sustainability is

important, and more than half consider it to be a strategic focus for their utilities (Figure 14).

The issues and challenges that drive water utilities to seek sustainable solutions are as diverse as the industry itself. Although it is generally accepted that using less non-renewable energy, chemicals and water is environmentally sustainable and the right thing to do, many utilities historically have assigned more weight to practical, local economic and community/social issues when making decisions. These economic and community/social considerations are region- and utility-specific and often drive utility strategic planning activities. Meeting regulatory requirements and serving the community are generally paramount. In appraising the potential to invest in largely discretionary sustainability programs and projects, the industry has embraced, and many utilities have begun to apply, the Triple Bottom Line

(balancing environment, economics and social/community considerations) framework for sustainability decision-making.

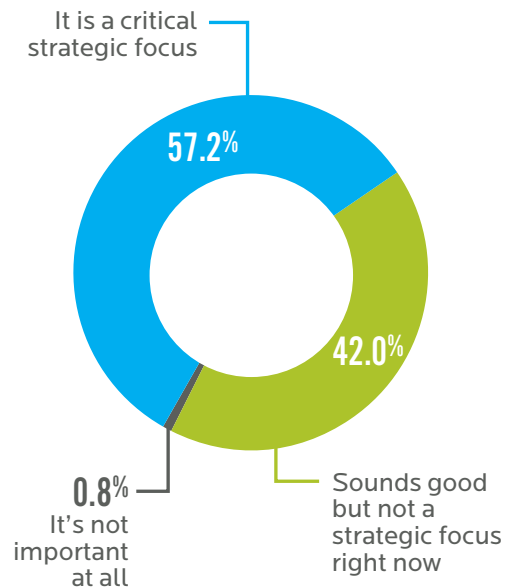
Survey participants were asked to select the most significant sustainability issue for their respective utilities. The results from this question are represented in Figures 15 (page 22) and 16 (page 23). Predictably, energy use is the overriding sustainability issue with nearly half of respondents choosing energy efficiency.

The effects of energy use and cost on the Triple Bottom Line performance of water and wastewater utilities are impossible to ignore. Energy costs are second only to labor in most utilities' operating budgets, and energy represents the largest controllable operational expenditure of most utilities. Energy costs are putting additional pressure on utilities' finances, making it more difficult to meet the substantial capital investment needs required to address aging infrastructure and more stringent regulations. Similarly, decreased capital limits utilities' ability to invest in "green" projects such as renewable energy development. The economic impact on water and wastewater utilities is particularly stressful during periods of economic pressure when budgets are squeezed by decreased revenues and funding constraints.

Water conservation and water scarcity responses, which totaled 39.1 percent, were disproportionately from the South and West regions where water scarcity has been a significant public policy concern for several years. Conserving precious water resources can reduce total energy and chemical use (when combined with management practices that capitalize on lower throughput to optimize treatment), as well as lower the amount of residuals that need to be disposed.

For areas dealing with water scarcity issues, water conservation also reduces the need to pump from far away supplies or rely on treatment of lower quality sources. Low quality water sources usually require more advanced treatment – which often requires additional energy use. With every 1,000 gallons of water produced and pumped from fresh water sources, approximately 1.5 to 2 kWh of energy is consumed. Utilities striving to maintain a

FIGURE 14
SUSTAINABILITY IN THE WATER INDUSTRY



Source: Black & Veatch
Survey participants were asked to select one item from the above choices that best represents their view on the importance of sustainability in the water industry.

THE EFFECTS OF ENERGY USE AND COST ON THE TRIPLE BOTTOM LINE PERFORMANCE OF WATER AND WASTEWATER UTILITIES ARE IMPOSSIBLE TO IGNORE.

SUSTAINABILITY

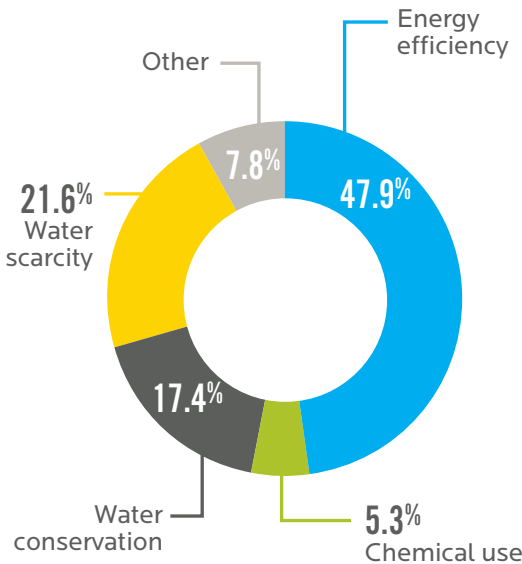
sustainable supply of potable water need to also consider the energy required to move water from its source to consumers' taps.

Where brackish water merits consideration as a primary or secondary source, energy is a major factor. An additional 1 to 4 kWh of electricity is required for every 1,000 gallons of produced potable water. Furthermore, inland systems face additional issues related to the disposal of the brine produced from desalting. Although research in this area is uncovering novel uses for the salt content of treated brine, including the production of salable fertilizer products, managing brine is still a significant challenge for utilities. Saving water means saving energy and chemicals, which in turn makes an important resource – capital – more available for other uses.

While research into more effective means of separating salt from seawater has reduced the energy needs of desalination, it is still more sustainable to treat water with lower dissolved solids – especially when, as the survey shows, an alternative source such as “gray water” reuse is an option. Reclaimed wastewater is of growing interest to utilities worldwide as a reliable, pathogen-free source for irrigation and other industrial uses. This holds true even when advanced treatment for nutrient removal is required, as using the water closest to the need, lowest in salinity and in plentiful supply can satisfy growing requirements for industrial, agricultural and other non-potable demands.

Of the nearly 8 percent of respondents who think “other” issues are most important, a large majority

FIGURE 15
MOST SIGNIFICANT SUSTAINABILITY ISSUES



Source: Black & Veatch
Survey participants were asked which of the above sustainability issues is the most significant for their water utility.

CONSERVING PRECIOUS WATER RESOURCES CAN REDUCE TOTAL ENERGY AND CHEMICAL USE, AS WELL AS LOWER THE AMOUNT OF RESIDUALS THAT NEED TO BE DISPOSED.

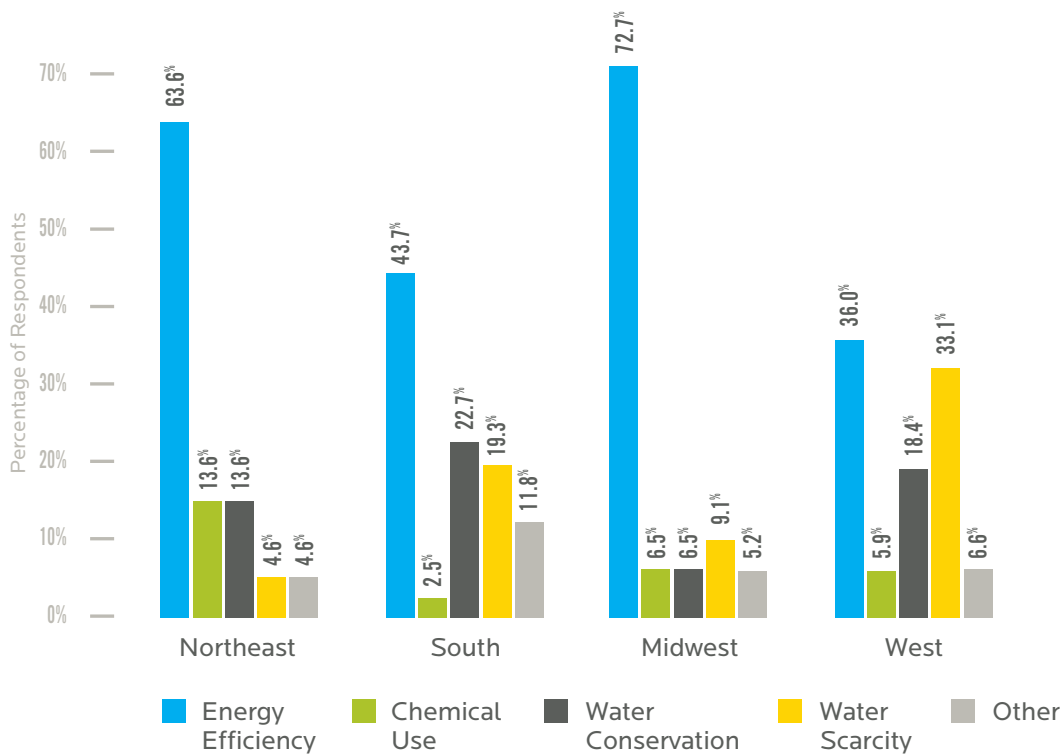
identified “aging infrastructure” and “fiscal sustainability/economics” as the most significant sustainability issues. These results reflect the generally strong connections in the minds of utility personnel among asset management, financial health and sustainability.

Sustainability is increasingly viewed within the water utility industry as a driver for investment and positive returns (a value mindset) as opposed to strictly an environmental concept. Asset management facilitates a positive feedback loop between investments in energy efficiency and aging infrastructure. A clear example of this loop is the repair/ replacement of deteriorating pipes to reduce water loss/ leakage from a water distribution system, which includes energy-intensive pumping within the cycle. Every day, approximately 7 billion gallons of precious potable water

is lost through leaking pipes and mains. This represents a tremendous amount of energy that must be used to replace water losses within the system. By minimizing leaks, asset management activities reduce energy consumption, conserve water and reduce other negative environmental impacts, while extending the life and value of the water distribution assets. Wastewater utilities can reduce energy requirements and simultaneously improve effluent quality through process control automation and replacement of aged, oversized blowers and pumps with new, high-efficiency blowers and pumping systems.

Energy costs can account for as much as 30 percent of most utilities' operating budgets and account for more than 85 percent of water utility greenhouse gas emissions. It is not surprising that the survey results indicate that

FIGURE 16
REGIONAL VIEW OF MOST SIGNIFICANT SUSTAINABILITY ISSUES



Source: Black & Veatch

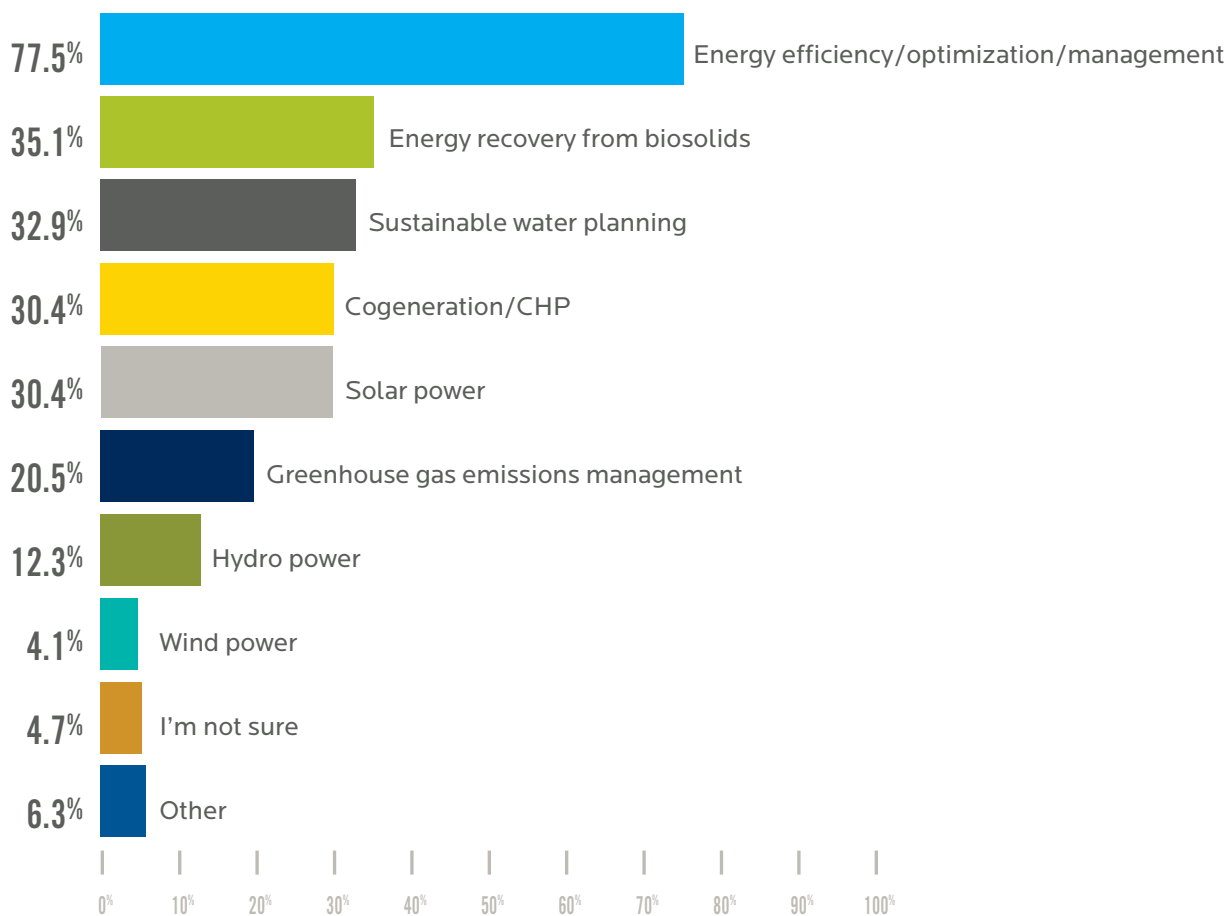
SUSTAINABILITY

the focus for sustainable energy management efforts is first on planning and “low-hanging fruit” solutions for energy efficiency/conservation, such as installing variable frequency drives and premium efficiency motors. More than 75 percent of the survey respondents said their utilities had undertaken “energy efficiency/optimization/management” for “water sustainability in relationship to energy” (Figure 17).

Energy management activities can range from reducing energy consumption through fragmentary application of energy efficiency measures, to becoming energy-neutral

(generating as much energy as consumed) or even becoming net energy producers. Increasing automation of high energy-consuming processes and systems, such as aeration at wastewater treatment plants or distribution system pumping for water utilities, and making treatment plant operations more energy efficient are good starting points. This is especially true for smaller utilities that want to reduce energy use and save money but do not have the financial or staff resources to effectively implement larger-scale programs that involve major capital expenditures and higher risk tolerance.

FIGURE 17
ACTIONS UTILITIES HAVE TAKEN FOR WATER SUSTAINABILITY IN RELATION TO ENERGY



Source: Black & Veatch

Survey respondents were asked to select from all of the above actions they have taken in regards to energy use.



Orange County Water District Principal Engineer and GWRs Program Manager Mehul Patel (right) examines reverse osmosis connections in the District's Groundwater Replenishment System (GWRs). The system provides a high-quality source of water to recharge the county's groundwater basin.

Photo Credit: Orange County Water District

Although fossil fuels remain the predominant source of energy powering the water industry, the environmental and social issues associated with fossil fuels include impacts such as job creation/economic development, effects on water quality, energy supply reliability and air emissions. Conserving energy through efficiency measures and demand-side management can save money to invest in other essential projects with favorable financial returns and benefits to the environment and community.

SURVEY RESULTS CONFIRM THAT THE BIGGEST CHALLENGES FACING UTILITIES PURSUING SUSTAINABLE WATER AND ENERGY SOLUTIONS ARE ECONOMIC.

Leading utilities are also taking additional steps towards hedging future energy price rises and maximizing environmental benefits by investing in energy recovery, cogeneration/CHP and renewable-energy projects. These projects typically require large capital investments and can have longer (greater than five to 10 years) payback

times than smaller-scale energy efficiency projects, but they often result in positive net present value as well as hundreds of thousands of dollars of recurring positive cash flow once the initial investment pays back. In most cases, capital-intensive energy recovery projects are implemented incrementally over time and in conjunction with energy efficiency improvements as part of a larger strategic energy management plan.

The survey results confirm that the biggest challenges facing utilities pursuing sustainable water and energy solutions are economic. Technologies are available and, in most cases, well-proven, so technological challenges are rarely this stumbling block. The non-economic benefits are clear and largely undisputed: What utility doesn't want clean air, clean and abundant water, and a satisfied community? Justifying financial investment in largely discretionary sustainability programs and projects to utility governing boards and political bodies while mitigating the risk of those investments, however, appears to be the largest challenge to widespread adoption of sustainable water and energy solutions for the foreseeable future. An important objective for water and wastewater utilities with a desire to advance sustainability strategic objectives will be to develop and implement new business processes, organizational change initiatives, and advanced project evaluation and risk analysis techniques geared towards honest justification and defense of sustainability program investments.

ASSET MANAGEMENT OVERVIEW

BY **WILL WILLIAMS**

Aging water and wastewater infrastructure was identified by the water utilities participating in the survey as one of the most important issues currently facing the industry, along with managing capital costs, energy costs and obtaining capital funding. The potential for system deterioration due to age is further compounded by expectations for growth (90 percent of survey participants indicated annual system growth was forecasted) that would further stress existing facilities.

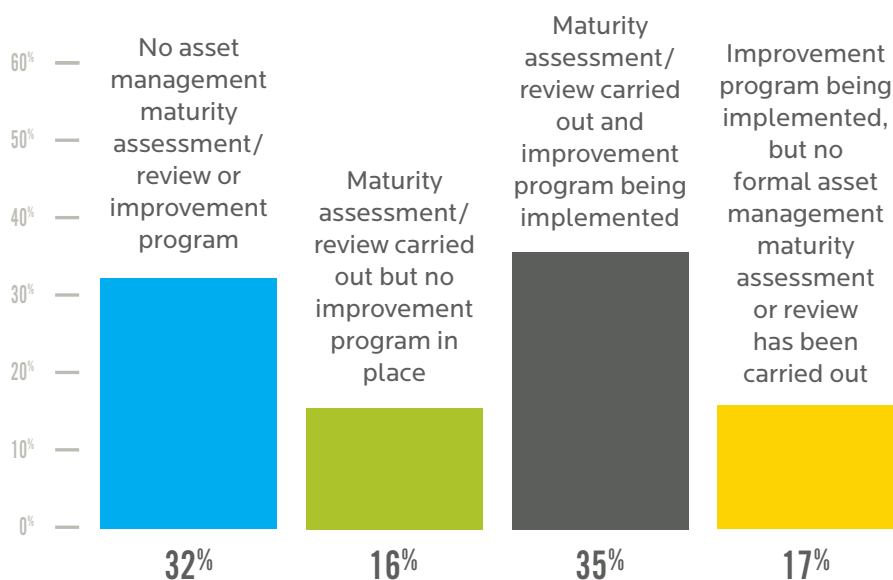
To deal with these issues, many water utilities are implementing asset management programs. However, in many respects, the United States is playing catch up to leading water utilities in the UK and Australia where asset management has been at the forefront of delivering high levels of service to customers and efficiencies within the industry for years. In those markets, regulation has been the main driver of water utility action and we note that survey respondents identified regulatory compliance as one of the main drivers for infrastructure investment here in the United States as well.

Less than 27 percent of survey participants believe that funding will be sufficient to meet future operating needs. Also noted was the need to do more with existing infrastructure. Good asset management practices

represent a proven methodology for water and wastewater utilities to maximize ratepayers' ROI, extend asset life and reduce life-cycle costs. In plain terms, an asset management framework allows an organization to determine:

- What assets it owns.
- What condition its assets are in.
- How these assets are performing.
- What service it currently delivers and what it needs to deliver in the future
- What risks there are to the services
- What assets will cost over their planned life
- When assets need to be repaired or replaced and how.
- What may need to be done differently in the future

FIGURE 18
CURRENT STATUS OF ASSET MANAGEMENT PROGRAMS



Source: Black & Veatch

Survey participants were asked to select one of the above choices that best represents the status of asset management programs at their utilities.

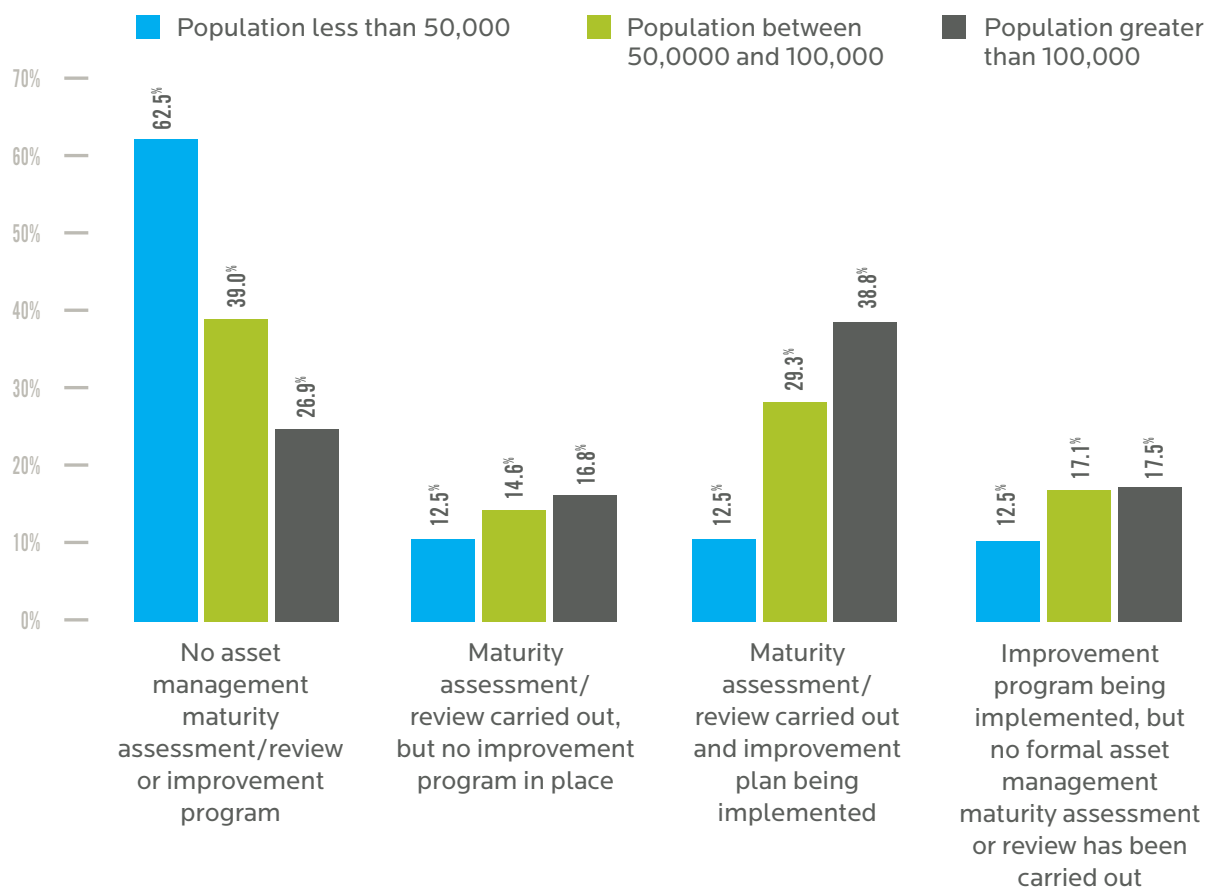
In seeking to improve asset management within an organization, it is advisable to undertake an asset management maturity assessment or gap analysis and compare results against good practice. From this assessment an asset management improvement program can be developed. Survey participants were asked if their utility had carried out a gap analysis and/or were implementing an improvement program. Overall, roughly a third (32 percent) of respondents stated no asset management assessment or improvement programs were in place or ongoing (Figure 18).

Interestingly, 17 percent of respondents were implementing an improvement program without having carried out an initial asset management assessment. It is difficult to implement an effective improvement program without first identifying what the existing gaps are and what the priorities are for improvement.

Black & Veatch always recommends undertaking some form of assessment before deploying capital. The highest proportion of utilities implementing an improvement plan without an assessment are located in the Northeast (36 percent).

There is a tremendous disparity among utilities serving smaller populations versus larger utilities when it comes to implementation of asset management programs. Nearly two-thirds (63 percent) of utilities serving populations less than 50,000 stated they had no asset management assessments or improvement program (Figure 19 on the next page). Here there is clearly room for improvement from the smaller organizations. Size is not a barrier to development of asset management programs and effective measures of service.

FIGURE 19
CURRENT STATUS OF ASSET MANAGEMENT ASSESSMENTS AND/OR IMPROVEMENT PROGRAMS BY SIZE OF POPULATION SERVED



Source: Black & Veatch

DATA QUALITY

High-quality data has the potential to transform a utility's operations through improved business processes and streamlined operations, as well as prioritize capital investments. However, success in maximizing efficiencies is directly determined by the quality of data received from the asset management systems. Survey participants were asked to rate the quality of their asset information. This information is depicted in Figure 20 on the next page and shows the percentage of respondents who chose "good" or "very good" when asked about the quality of specific asset data.

Nearly 70 percent of respondents believe their basic asset information, such as the number of assets, type, size, capacity and age, as noted in the "asset characteristic" section is largely viewed as good or very good (note: 77 percent of water-only utility participants selected good or very good). For other data, such as asset condition and performance as well as replacement costs and value, the percentage of respondents who select "good" or "very good" declines. Also noteworthy is that there is no significant difference between utilities that provide water only services, water and wastewater services, or wastewater only services, related to the quality of data in these areas, indicating this is an industry-wide challenge.

However, this still leaves nearly half of respondents who reported their data as being average, poor or very poor. This is an important area for improvement, as without good quality data, utility leaders will be hard-pressed to plan, prioritize and justify capital programs and improvements.

RISK MANAGEMENT

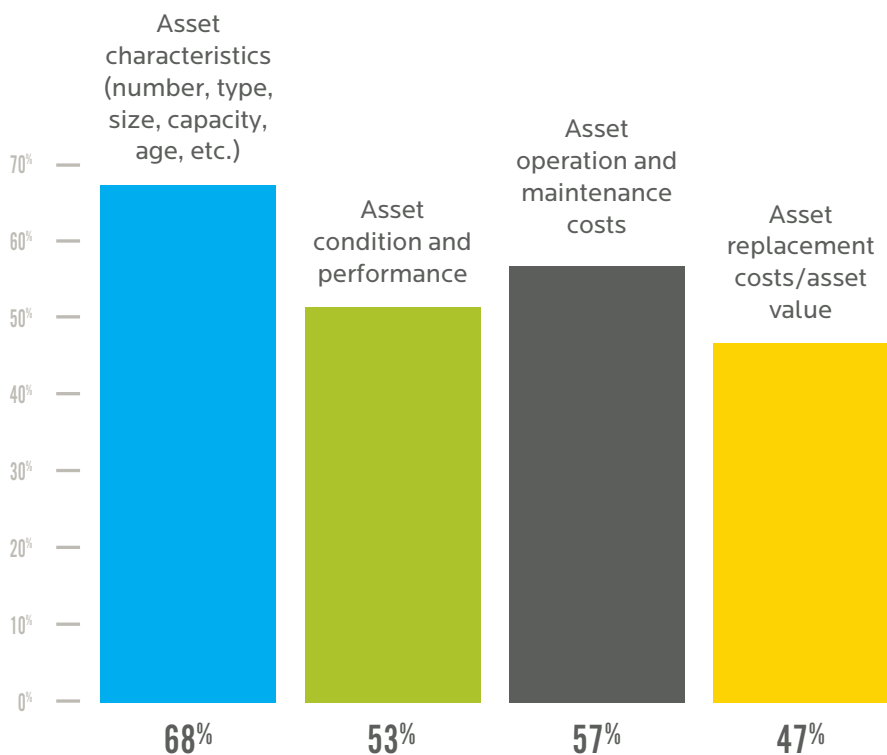
Risk management is a key component of effective asset management and can be described as achieving the optimal balance between cost, risk and performance (or levels of service). Again, data is the essential ingredient for managing and improving utility operations in this area.

Survey participants were asked how risk was managed within their utility. Responses to this question indicate the majority of respondents use risk management for some asset groups or the majority of their assets (Figure 21 on page 31). Most of the utilities that stated that risk assessment processes were in place for the majority of assets also answered "Yes - for the majority of the assets" to the other three questions on risk management.

Another valuable set of data for utilities is level of service indicators. Industry best practice calls for levels of service indicators to be based on stakeholder requirements in order to be most effective and meaningful. Examples of levels of service indicators include water quality compliance, number of main breaks per 100 miles, number of sanitary sewer overflows per 100 miles and wastewater treatment compliance. Service levels should be key drivers in asset management planning. With sufficient data and good models, impacts on levels of service can be analyzed for different investment scenarios.

THERE IS A TREMENDOUS DISPARITY AMONG UTILITIES SERVING SMALLER POPULATIONS VERSUS LARGER UTILITIES WHEN IT COMES TO IMPLEMENTATION OF ASSET MANAGEMENT PROGRAMS ... SIZE IS NOT A BARRIER TO DEVELOPMENT OF ASSET MANAGEMENT PROGRAMS AND EFFECTIVE MEASURES OF SERVICE.

FIGURE 20
QUALITY OF DATA ON UTILITY ASSETS RATED “GOOD” OR “VERY GOOD”



Source: Black & Veatch

Survey participants were asked to describe the quality of their information on the assets their utility owns and operates. The chart above provides total percentage of respondents who ranked data as “good” or “very good” for each area.

Survey participants were also asked how their organizations use levels of service indicators to measure service provided to customers and to inform their asset management planning. The results show that the majority (84 percent) of utilities monitor levels of service provided to customers. However, only 30 percent of respondents said that their levels of service indicators were influenced by stakeholder requirements (Figure 22 on page 32).

The following provides additional survey data related to level of service indicators:

- Nearly half (49 percent) of respondents are incorporating levels of service in their asset management planning.
- A higher proportion of water-only utilities (57 percent) use levels of service in planning as compared with water and wastewater (49 percent) and wastewater-only utilities (47 percent).

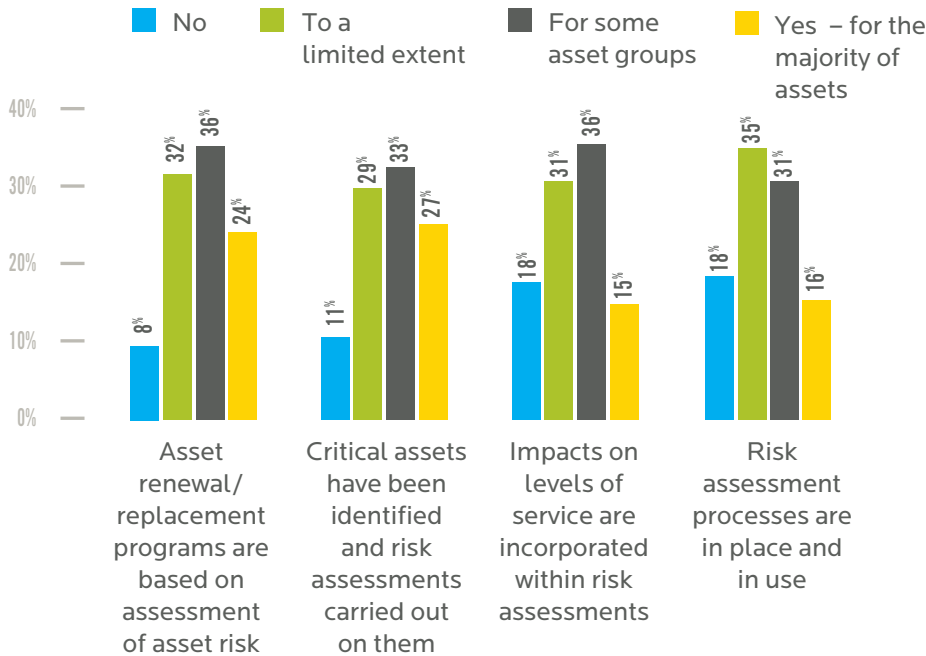
- 38 percent of utilities serving a population of less than 50,000 do not use levels of service indicators. This is a significant difference when compared with utilities serving larger populations

CHALLENGES AND CONCLUSION

With nearly half of all survey participants indicating they have no assessment or asset management programs ongoing or in place, we now look at the challenges of implementing this essential tool for utility organizations. Survey participants were asked to identify the main challenge for implementing an asset management program at their utility and results of this question are highlighted in Figure 23 on page 33.

The majority of respondents identified developing the required systems and processes needed to improve asset

FIGURE 21
STATUS OF ASSET RISK MANAGEMENT PROGRAMS



Source: Black & Veatch

Survey respondents were asked to select the appropriate response for each of the above statements related to how asset risk is managed at their utility.

management as their main challenge. This appears to be more of a challenge for medium-sized utilities (100-499 employees), where 73 percent selected this answer. By comparison, 50 percent of small utilities (less than 100 employees) and 55 percent of large utilities (more than 500 employees) selected this response. The responses to this question came from a broad range of utilities that were at various stages of their asset management programs and therefore there was no bias, either from utilities that had not yet started their program or those that were already at an advanced stage of implementation.

There was no correlation between those utilities that selected lack of asset data as their main challenge and those that reported their asset data as being poor. In fact, a number reported their data was good or very good. This leads us to conclude that utilities do not have uniform

coverage or quality of data across their complete asset stock and that data improvement is still a key challenge. In order to get the most out of their asset management programs, utilities need to be able to perform sophisticated analysis on the asset data, so its quality and quantity are important factors that require careful consideration and investment in long-term improvement plans.

Overall, the picture is one of a utility sector that is beginning to rise to the challenge of implementing asset management programs. The majority (68 percent) of respondents have started an asset management improvement program in some form. Decisions are being made based on asset data that is generally of good quality, with nearly half of utilities now basing their asset management decisions around levels of service.

ASSET MANAGEMENT OVERVIEW

Smaller utilities that serve populations less than 50,000 are lagging in this area, with nearly two-thirds having not conducted or planned an assessment or asset management program.

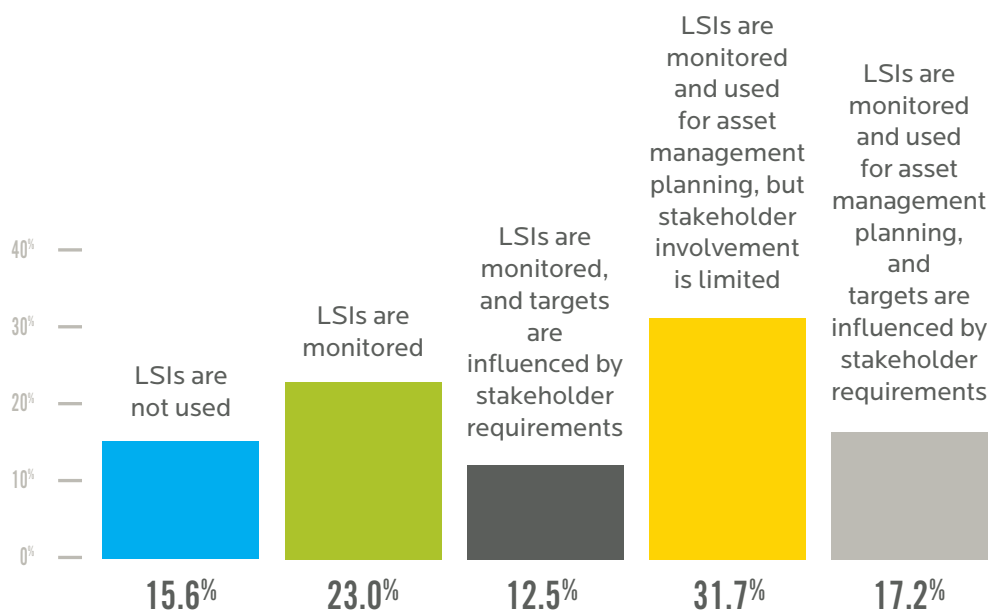
The biggest single challenge for implementing asset management programs appears to be the development and application of the necessary systems and process improvements needed to embed asset management into day-to-day business and operational tasks.

Risk-based planning approaches are starting to be applied and levels of service are starting to be used to prioritize investment, although there is still room for improvement. Just over half of survey respondents (53 percent) have no, or limited, risk assessment processes in place. As noted within the Financial section, utilities accessing capital through traditional bonds and other financing mechanisms will likely be subject to more stringent requirements related to risk management and asset management.

As the U.S. water industry works to overcome major issues associated with aging infrastructure and fiscal constraints, asset management provides a comprehensive solution for reducing costs and improving services. Proven methodologies used across the UK and Australia have already yielded tremendous results that can be replicated in U.S. utilities.

Good ideas work regardless of region or geography, and proven methodologies remove guess work and provide assurance of success. Asset management frameworks are proven to reduce capital and operational costs while improving performance. In fact, the Institute of Asset Management (IAM) has stated, “Good asset management is not about spending more—it’s about spending more wisely. Life-cycle planning and management has been shown to reduce the overall cost of asset ownership by around 30 percent, and sometimes much more.”

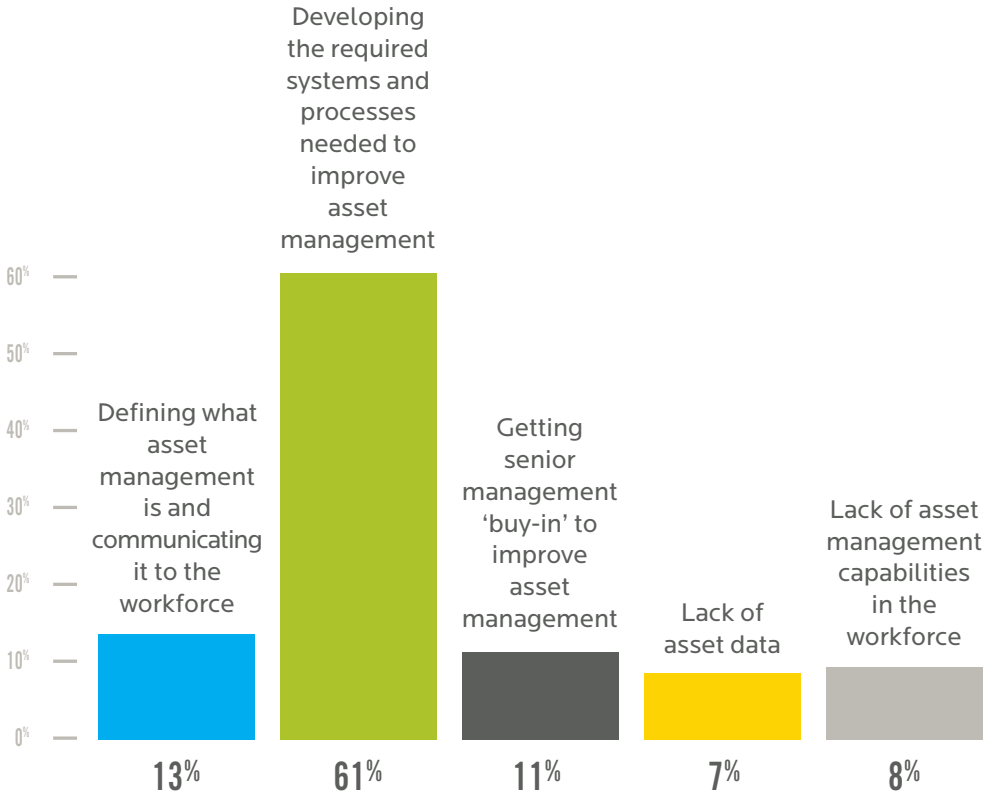
FIGURE 22
USE OF LEVELS OF SERVICE INDICATORS (LSI) TO MEASURE SERVICE



Source: Black & Veatch

Survey participants were asked how they use levels of service indicators to measure service to customers and to inform asset management planning.

FIGURE 23
CHALLENGES TO IMPLEMENTING ASSET MANAGEMENT FRAMEWORKS



Source: Black & Veatch

Survey participants were asked to choose which of the above items best represents the main challenges for improving asset management in their organization.

“GOOD ASSET MANAGEMENT IS NOT ABOUT SPENDING MORE—IT’S ABOUT SPENDING MORE WISELY. LIFE-CYCLE PLANNING AND MANAGEMENT HAS BEEN SHOWN TO REDUCE THE OVERALL COST OF ASSET OWNERSHIP BY AROUND 30 PERCENT, AND SOMETIMES MUCH MORE.”

– INSTITUTE OF ASSET MANAGEMENT

A PATH FORWARD

BY JOHN CHEVRETTE

In the wake of the Great Recession many municipalities are managing their finances in a fashion similar to U.S. households in the pre-crisis days. Rather than focusing on strategic, long-term investments, municipalities are operating essentially paycheck-to-paycheck on a year-in and year-out cash budget. In response to falling property and sales tax revenues, municipalities are putting off essential items in order to pay for past spending, and just as it impacts individuals, this behavior ultimately affects the long-term financial health and livability of a community.

Unlike consumers, however, municipalities don't have the option of simply cutting back or going to discount stores and big-box retailers to help save on essential needs. Fixed costs, such as labor, pension obligations and infrastructure maintenance are heavy burdens on municipal finances that lag the overall economic recovery. As a result, cities are forced to make hard decisions related to spending in other areas, such as fire and police department budgets, parks and other essential services that make cities safe and desirable places to live.

The result of this cycle is to kick the proverbial can of capital improvements and maintenance of critical infrastructure down the road to the next year, and the year after that, for as far as the cycle and the condition of the assets will allow. Breaking the cycle requires a significant change in how utilities develop and implement strategic and capital plans. New and innovative thinking is required when it comes to rates, funding mechanisms, and the prioritization and implementation of capital. But, one lesson should be clear in the minds of all involved in the decision making process—it costs significantly less to maintain and enhance an existing system than it does to build or replace one.

MUNICIPALITIES DON'T HAVE THE OPTION OF SIMPLY CUTTING BACK ... TO HELP SAVE ON ESSENTIAL NEEDS. FIXED COSTS, SUCH AS LABOR, PENSION OBLIGATIONS AND INFRASTRUCTURE MAINTENANCE ARE HEAVY BURDENS ON MUNICIPAL FINANCES THAT LAG THE OVERALL ECONOMIC RECOVERY.

Moving ahead, the water industry needs to look at the rate structure and adjust how rates are determined to encourage utilities to promote conservation without creating additional financial hardship for municipalities. In source-rich, capital-intensive systems, conservation efforts and consumption-based revenue can be at loggerheads as decreased consumption denies providers of much needed funds. The deployment of new smart infrastructure technologies can help increase overall system efficiency and provide the critical data streams that would allow new approaches to pricing.

Further, consumers must come to the harsh reality and understand that water is not free. Consumers rely on the critical infrastructure services provided by municipalities to obtain and dispose of this precious resource. Water is a critical element of goods and services, and the systems must be paid for in an equitable and responsible manner. While many other goods and services—perhaps a latte at the local coffee shop or the latest electronic device—have immediate “can’t live without” appeal, without water, that won’t be an issue.

In addition to the new responsibilities of water utilities and consumers, municipal government leaders, namely city councils, mayors and city managers, must understand the fiscal realities of the post-financial crisis era. City leaders must look at all avenues for funding critical infrastructure improvements, including increased involvement with the private sector through public-private partnerships. Rather than focus on the issue of “who controls what,” we must broaden the conversation to focus on the long-term benefits to the residents, ratepayers and the environment. Political will and courage must be drawn up in order to do what is right for the long term.

The good news associated with increasing rates and spending on critical water and wastewater infrastructure is the profound economic benefits this investment provides at a local, regional and national level. In 2009, the Clean Water Council published its report “Sudden Impact” that states, “Investment in water and wastewater infrastructure has immediate, substantial and far-reaching effects on the economy. At the national level, an investment of \$1 billion almost triples in size as total demand for goods and services reaches an estimated \$2.87 to \$3.46 billion.”

Investments at the local level supports construction and engineering jobs, promotes sales among local business for goods and services, and can act as a general jump start for struggling local economies. The need is there and so too are the opportunities to tap into a new water future.

ONE LESSON SHOULD BE CLEAR IN THE MINDS OF ALL INVOLVED IN THE DECISION MAKING PROCESS—IT COSTS SIGNIFICANTLY LESS TO MAINTAIN AND ENHANCE AN EXISTING SYSTEM THAN IT DOES TO BUILD OR REPLACE ONE.

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