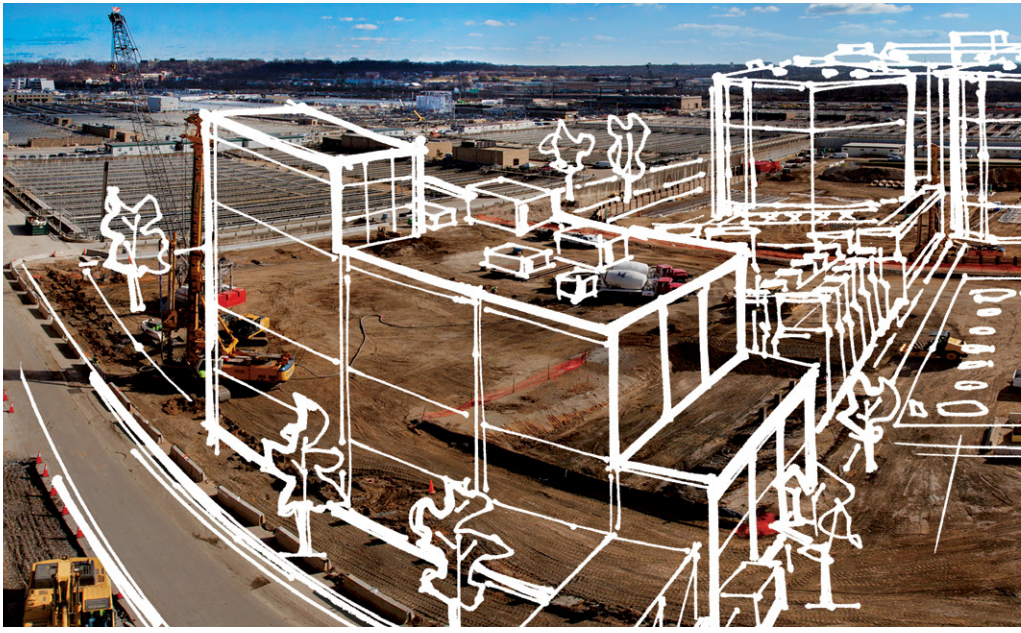
Brown AND Caldwell

BC Today

SERVICE:
Biosolids Management

Shaping the Future



The Future in the Spotlight

DC Water's ambitious and innovative Biosolids Management Program continues to garner awards as the future begins to take shape at the Blue Plains Advanced Wastewater Treatment Plant, the largest advanced treatment plant in the world.

A long-range biosolids management program implemented via alternative delivery with Brown and Caldwell as program managers, it includes one of the most extensive sludge processing systems ever developed. The system utilizes the Cambi™ thermal hydrolysis process to cut the volume of digestion tankage in half, reduce greenhouse gas emissions dramatically, produce 13 MW of electricity, and create a high-quality Class A biosolids product.

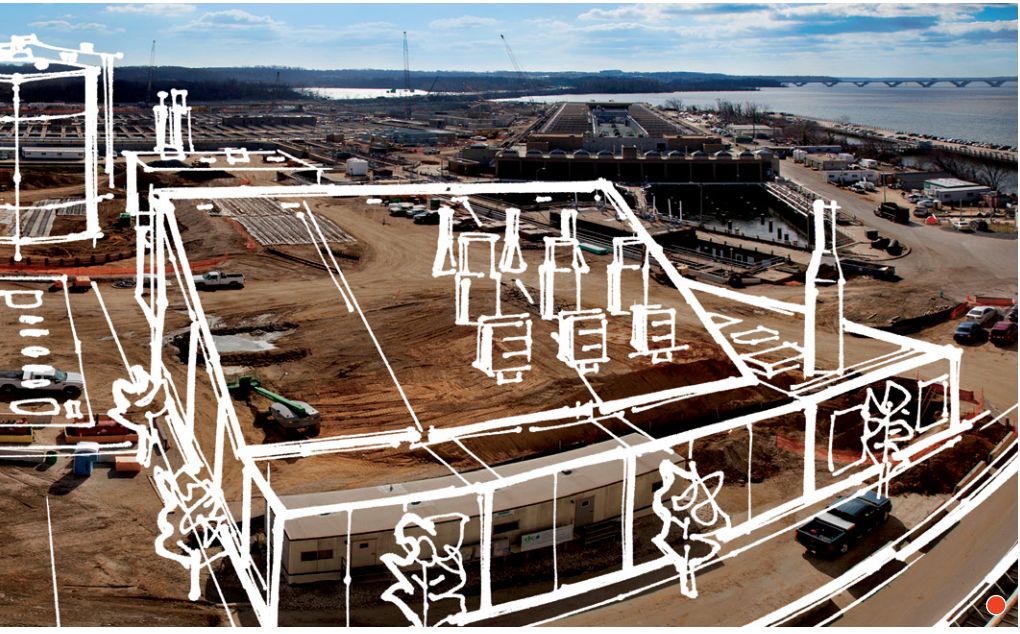
Now under construction, the project won the 2012 Grand Prize in Planning Award from the American Academy of Environmental Engineers, as well as one of two first-ever Excellence in Innovation Awards from the Water Environment Research Foundation, presented at WEFTEC 2011.

The biosolids program will reduce the utility's operational costs by $25 million per year and be "cash flow positive from day one," according DC Water General Manager George Hawkins. With the quantity of biosolids cut in half, DC Water will see a huge reduction in trucking and related expenses for handling biosolids material. The value of the renewable energy produced further benefits the bottom line. No rate increases will be required to pay for the project.

Additional savings will come from the use of alternative delivery. Three delivery methods (design-build, design-build-operate and design-bid-build) are being employed in combination to meet an aggressive schedule and to manage risk. "It's the largest plant of its kind, and we're using design-build to implement it," says BC's Larry Jaworski. "DC Water is doing all they can for the environment and for their ratepayers. And alternative delivery procurement helps them realize the benefits of this program as fast as possible."

When it goes online in 2014, the Blue Plains facility will be the largest Class A biosolids processing system in the world, producing up

Photos: Bob Rives



Construction underway along with an artist's rendering of the future biosolids management facilities at DC Water's Blue Plains Advanced Wastewater Treatment Plant. BC's Lisa Reynolds and Paul Guttridge at the Blue Plains site. And with BC's Perry Schafer and Phil Braswell reviewing plans for DC Water's biosolids management project.

to 450 dry tons per day. A facility of this scale in a limited urban site of 6 acres required "vertical" thinking and major space-saving innovations. Features like tall cylindrical concrete digesters will minimize the facility footprint and improve digester mixing.

The Biosolids Management Program represents the culmination of more than 10 years of planning and research by DC Water staff, Brown and Caldwell, university and other partners. According to BC technical director Perry Schafer, "This program has the potential to set the standard for future large-scale biosolids management operations."

The Numbers Add up for More Bio

40
PERCENT
ENERGY COST REDUCTION FOR A WWTP USING CHP

1040 MW
POTENTIAL ELECTRICITY FROM US WWTPs

1 MGD OF WASTEWA
CAN PRODUCE 26 KW OF ELECTRICITY AND 2.4

100
PERCENT
HEAT FOR DIGESTION THAT CHP SYSTEMS PRODUCE

116

170

2000
US WWTI
DIGESTIO
USING BI

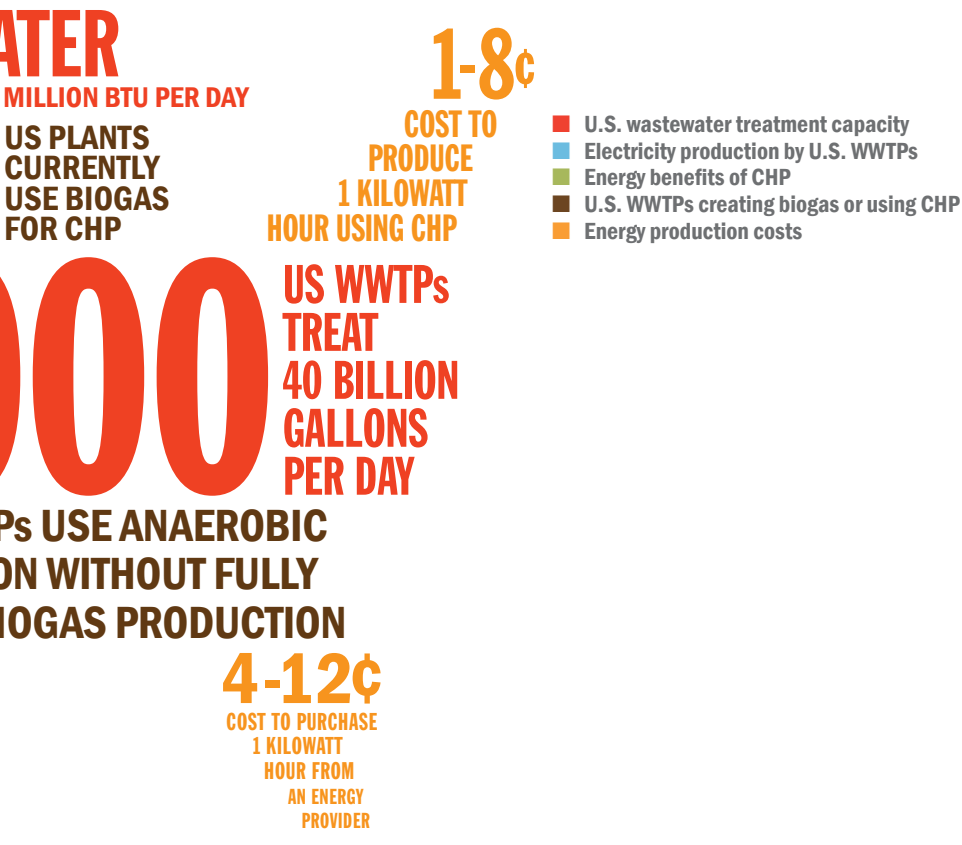
490 MW
ELECTRICITY CURRENTLY PRODUCED BY US WWTPS

Municipal wastewater treatment facilities consume about 3 percent of the nation's energy annually, costing billions in electricity. It's no wonder then that major efforts are under way to turn treatment facilities into power producers. Two recent BC-led studies show that Combined Heat and Power (CHP), in which gas produced by anaerobic digestion is used to provide the digester's heat needs and to generate electricity to help power the plant, can be economically viable even for smaller plants. And yet, the research finds that less than 1 percent of U.S. treatment plants have implemented energy recovery systems.

"Evaluation of Combined Heat and Power Technologies for Wastewater Facilities" is a comprehensive guide to the performance of CHP technologies. The report was funded by the Water Environment Research Foundation (WERF)

Sources
Barriers to Biogas (2011), Brown and Caldwell with Black & Veatch, Hemenway, Inc., and the Northeast Biosolids and Residuals from the Field, U.S. EPA/Combined Heat and Power Partnership (2011) | Evaluation of Combined Heat and Power Technologie
For more information, contact John Willis at jwillis@brwncald.com

ogas to Energy



and the U.S. EPA, and was authored by BC's Jason Wiser, John Willis and Jim Schettler.

"Barriers to Biogas Utilization for Renewable Energy" is a BC-led WERF survey of some 200 wastewater utility staff to identify obstacles to implementing biogas recovery systems. The goal of the study is "to help agencies overcome the actual and perceived barriers for biogas production."

The chief barriers to harnessing biogas reported by staff were financial—a lack of funds and a lingering perception that the money and power generated will not justify the cost of implementing CHP. That's unfortunate, according to BC's John Willis, the leader of the study. "The perception persists that the numbers don't add up," he says, "but the fact is that even small POTWs have found CHP cost-effective."

s Association | Opportunities for Combined Heat and Power at Wastewater Treatment Facilities: Market Analysis and Lessons es for Wastewater Facilities, Brown and Caldwell/U.S. EPA (2011)

Navigating the Galaxy of Options

Biosolids management isn't a new challenge, but with numerous variables at work—shifting regulations, new technologies constantly in development, and no single formula for harnessing the emerging opportunities to benefit from biosolids—wading through the choices can be daunting.

The City of St. Petersburg faced this challenge when it set out to upgrade its biosolids management program to produce a Class A product and harvest more energy, and it was anything but simple. Looking at dozens of variables involving capital costs, operational costs and revenue projections from potential resources, the number of options was dizzying. Brown and Caldwell engineers helped Director of Water Resources, George Cassady and the city identify a dramatically streamlined plan, meeting their long-term needs, saving millions of dollars and winning support from city leaders. In the interview below, George describes how they did it

Describe the scope of the project to upgrade St. Petersburg's biosolids management.

We were planning to upgrade our biosolids management at four wastewater treatment plants that use anaerobic digestion. We serve approximately 317,000 customers and treat 35 mgd average flow. All four plants are about 30 years old, and we knew that with newer technology we could better leverage our biosolids as a resource, especially in the area of energy production, and better serve the community for the long-term future.

What were the primary drivers for the project?

Our drivers were to improve the economic performance of our plants with more energy production and to move to a Class A biosolids product. We are currently producing Class B biosolids, and it is looking like that will be difficult to reuse for land application in Florida. We also have a significant yard waste collection program and we wanted to determine if we could process the yard waste in a consolidated operation.

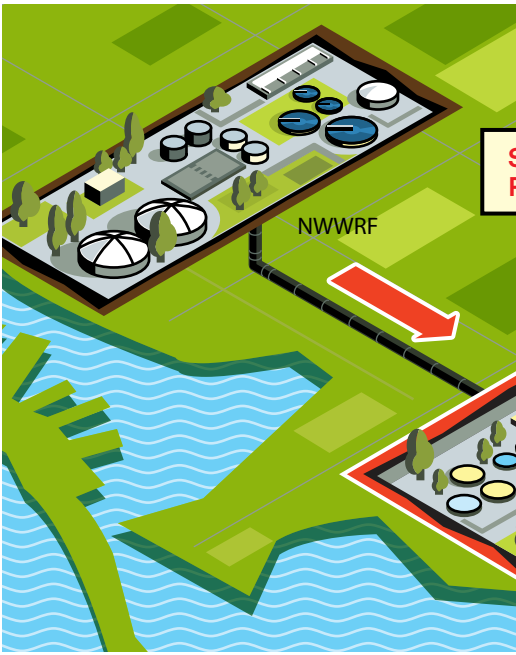
What options did you consider?
Everything. We had a very large, complex matrix of different solutions, their costs, their risks and their benefits. It became a little overwhelming. The variables, their impacts, new technologies—we finally acknowledged that we could use some help and guidance, both in terms of learning what is out there and working for other facilities, and what would work best for us.

How did you go about finding the right solution for your utility?
The folks at Brown and Caldwell led us through an analysis of about three dozen scenarios, and quantified all the factors—capital costs, operational costs, the potential savings of various energy production technologies, and the costs associated with the risks of each option. This analysis was incredibly helpful because it took us out of the realm of speculation and into the world of facts and numbers. Everything was expressed in terms of net present worth. Eventually the best choice became clear.

"It's a simple, elegant solution—the answer was under our feet but we didn't see it!"

GEORGE CASSADY

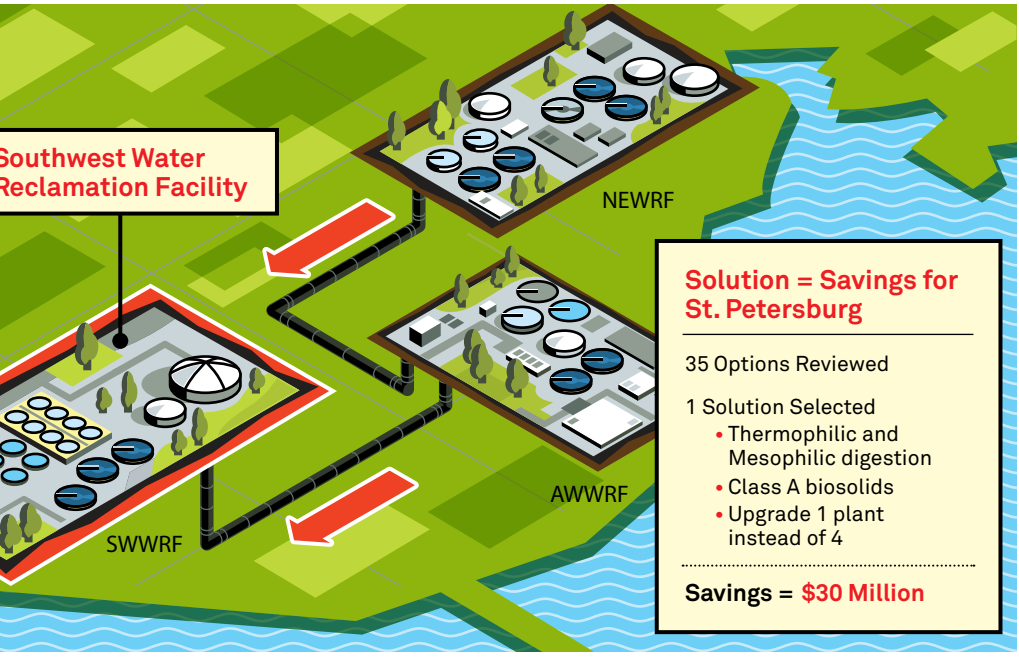
Director of Water Resources for the City of St. Petersburg, FL



The illustration above shows how biosolids will be ro Facilities) to be processed at the Southwest facility,

What solution did you select?
Our plan is to use thermophilic and mesophilic digestion in series to produce Class A biosolids and maximize gas production as well. We also found that we can pump all of our biosolids to a single plant for processing. With a relatively small investment in additional force mains, we would avoid the cost of upgrading digestion at every plant. The numbers were extremely compelling, saving something on the order of $30 million over the next 20 years.

What are the primary benefits of this solution?
There are lots of benefits. The biggest is that we feel this positions our utility to be the best stewards of public funds we can be, by taking a long view and developing a plan that should last 50 years or more.



outed from three St. Petersburg plants (Northwest, Northeast and Albert Whitted Water Reclamation , allowing the city to improve biosolids management system-wide with the upgrade of a single plant.

The financial benefits are great, but the community comes first. One big benefit was that we didn't want to have cavalcades of trucks hauling biosolids around our very dense urban environments. We avoid that with this approach.

What makes you confident that this is the best possible solution?
It's pretty black and white. There were a few other options that were close in net present worth when everything was said and done, but each one involved risks or impacts that we found unacceptable.

What did BC contribute to the selection process?
The toolkit BC brought to the table allowed us to vet about 35 approaches very quickly and thoroughly. That was invaluable. Coming up with the idea of pumping all our biosolids to a single plant was something we never considered. It's a simple, elegant solution—the answer was under our feet but we didn't see it!

How has the solution played out with your stakeholders/public opinion?
The City Council unanimously endorsed the concept.

What's next for the project?
We're currently analyzing the hydraulics of the plan to double-check that the pumping option will work. Once that is complete, we'll pull the trigger on the rest of the plan.

advancing * biosolids™