Energy Efficiency in Water and Wastewater Facilities

Webcast Transcript

October 30, 2013

Contents

Webcast Agenda and Meeting Logistics

Slide 1 and 2: Introduction Slides

Operator: Ladies and gentlemen, thank you for standing by. At this time, I would like to welcome everyone to the EPA Energy Efficiency in Water and Waste Water Facilities Webcast. All lines have been placed on mute to prevent any background noise. If you should need assistance during the call, please press star then zero and then the operator will come back online to assist you. Thank you.

Ms. Emma Zinsmeister, you may begin your conference.

Emma Zinsmeister: All right. Thank you. And thank you to everyone on the line for joining us today. My name is Emma Zinsmeister and I am with the U.S. EPA's State and Local Climate Energy program and our webcast today is going to be covering energy efficiency in water and wastewater facilities. Before we get started, some logistics on how to participate in today's call. Audio is only available by telephone at the number listed on the screen here. So you need to dial and participate and as the operator mentioned, all the lines are currently on mute. So, that will minimize the background noise.

Slide 3: How to Participate Today

Emma Zinsmeister: However, you do have the opportunity to ask questions throughout the webcast and we certainly encourage you to do so. You can do this through to the GoToMeeting control panel. You can operate this panel by clicking on the arrow in the orange box, just slide the panel open and close and you'll see a section for questions where you can type in your questions and hit submit. We are going to be collecting those throughout all the presentations. And at the conclusion of the presentation, we'll do a facilitated Q&A session with all of the speakers. Any questions that we don't have time to get to today, we'll respond to in writing and we will post those answers on our website with the other files from today's webcast.

Between all of the presentations, we'll be asking poll questions to learn a little bit more about who we have on the line participating, what your experience is, what the challenges you faced are, and when those questions are being asked, they'll pop up immediately on your screen automatically and you'll be able to click your response and share your answer there. If you experience any technical difficulties at all during the webcast, Wendy Jaglom from ICF International is on the line to provide support and you can reach her by e-mailing her at wendy.jaglom@icfi.com.

Slide 4: Webcast Agenda

Emma Zinsmeister: So today's webcast, we have a full agenda and I will kick things off with just a little bit more background information about our program here at EPA and some of the resources we have to offer and then we'll jump right in to the specific topic and Jim Horne from EPA's Office of Wastewater Management will start by providing a background on energy

management planning for water and waste water facilities. And then we have a couple of really fantastic case studies to share with you. We're going to start off by looking at works that's been done in Massachusetts.

Michael DiBara from the Massachusetts Department of Environmental Protection will talk about a program the state has been running to do a pilot project effort with facilities on energy efficiency and renewable energy. And then Richard Weare from the Greater Lawrence Sanitary District will talk specifically about what they've implemented at their facility and the great results that they've seen.

Our second case study, we'll hear from Bob Freeman and Brendan Held in EPA's Region 4 in the Southeast about the Tennessee Water and Wastewater Energy efficiency and partnership and we'll hear about some great fantastic, really impressive energy savings that their facilities in that area have been able to achieve with low to no cost efficiency measures.

And as I mentioned, at the end, we'll do Q&A and once the webcast concludes, you'll have the unique opportunity to provide direct feedback to EPA on what you thought of this webcast as well as what other things could EPA do to assist you with your energy efficiency efforts.

So I really encourage you to fill out that feedback form at the end. And then in about a week or so, after the webcast, all of the audio files and recordings and any unanswered questions will be posted to our website and you can get that information at the web link listed at the bottom of the slide.

Slides 5 and 6: U.S. EPA's State and Local Climate and Energy Program

Emma Zinsmeister: This is background information on our State and local Climate Energy Program. Our main objective is to help state and local governments reduce their greenhouse gas emission. And so we do this by providing opportunities like trainings through today's webcast, other communications tool, quantification tools, best practices, case studies, and then all of that information is available online and you can look at the slide later on to get to more information and see what's available.

Slide 7: EPA Guide for Local Governments on Reducing Greenhouse Gas Emissions Through Energy Efficiency in Water Facilities

Emma Zinsmeister: Specifically, I wanted to talk a little bit about a new resource we recently released on the topic of energy efficiency in water and wastewater facilities which is part of our local government climate and energy strategy series which is highlighted on this slide.

We reused documents specifically on this topic which has been widely downloaded so far and I highly encourage you to get your copy today if you haven't already taken a look at it. This document is designed to provide a comprehensive resource for local governments that provides folks who might be staffing energy environment departments, water departments, or policy makers on the benefits and opportunities to pursue energy efficiency and key strategies, tips and

tricks for success and a step by step approach to really get an energy management plan in place and to get that operationalize.

Slide 8: Energy Intensity of Each Stage in the Water Use Cycle, with Key Opportunities for Energy Efficiency, Renewable Energy, and Water Efficiency

Slide 9: Steps for Designing, Implementing, and Sustaining Energy Efficiency Improvements in Water and Wastewater Facilities

Emma Zinsmeister: And you'll hear a little bit more about some of the things featured in this guide throughout the presentations today. Just as a sneak peak, you can see here and the guide goes over, how energy is used in drinking water and wastewater treatment processes. The starting areas, of course, or where the most of the energy is used provide examples of opportunities to reduce your energy usage and then the guide goes through EPA's Plan-Do-Check-Act process for actually getting this energy savings implemented, sustained, and evaluated and you'll hear a lot more from Jim about this Plan-Do-Check-Act process and see it in operations through the case studies that we're featuring today.

Slide 10: Contact Information

Emma Zinsmeister: So if you have any questions at all after today's webcast about our resources or our program, please feel free to contact me directly. I'm also always happy to hear from folks about how they found our resources to be helpful or anything else that they have suggestions for our program.

Poll Question #1

Emma Zinsmeister: So with that, we're going to jump into our first poll question to learn a little bit from you about your experience. So I am going to turn it over to Wendy to pull up our first poll question.

Wendy Jaglom: So, you should see the poll question on your screen now. And that question is, what is your main objective in improving energy efficiency at your water or wastewater facility? Is it to reduce air pollution and GHG emission, to reduce energy cost, to demonstrate leadership, to improve energy and water security, or to assimilate those infrastructure and equipment? And so, just enter your answers and we'll give just a minute for everybody to respond.

OK. And so, I'm going to go ahead and close the poll and show the results. And it looks like the large majority, 71 percent are looking to reduce energy cost and 16 percent to reduce air pollution and GHG emission and then 45 percent for the other options.

Emma Zinsmeister: Great. Thank you Wendy and thanks to everyone for providing that information. I think at some line was what we were expecting to see from people but we're also glad to hear that some people are primarily interested in the air quality and greenhouse gas emission as well.

Energy Efficiency for Water Utilities

Slide 1: Title Slide

Emma Zinsmeister: So with that, we're going to move into our first presentation from Jim Horne. Jim Horne is with the Office of Water at EPA since 1988. During that time, he has concentrated on educating and assisting public entities including water and wastewater utilities on the value of this in various approaches and tools to sustainably manage their operation. And some of the major efforts he has worked on includes an agreement between EPA and National Water Resource Association to promote effective utility management, working with EPA regions and others to help water and wastewater utilities use the management system approach to improve the energy efficiency which is the kind of resource that he's going to be highlighting in his presentation. He's also helped to develop the planning for sustainability handbooks which is really key for utilities to thinking about their infrastructure planning processes and the roadmap or protective processes for water and wastewater utilities.

He has degrees from the University of Texas and Washington in Public Administration, and with that, I'm going to turn it over to Jim to start his presentation.

Jim Horne: OK. Thank you very much Emma and thanks to everybody for joining us today. I'm really pleased to be part of the webinar and pleased to be here with a number of my colleagues both from the state and my friends from Region 4.

So my first slide clearly is it kind of gets at the heart of the way we see energy efficiency in the Office of Water and I think across EPA as well. And that is really the key to sustainability. And when I say sustainability, I mean sustainable operations of water and wastewater utilities in this particular case.

Next slide.

Slide 2: Significance

Jim Horne: So the next slide is just some basic facts and figures. So the number of you may have seen in the past about the overall significance of energy usage across the water sector if you will. And I've highlighted a couple of points here. 25 to 30 percent in many cases of total plant O&M cost for treating water and wastewater, but more importantly, I really like to look at that third bullet which says, this is usually, and I say usually, almost always the biggest consumers of energy in communities for water and wastewater utility.

So from a community perspective, that's your biggest opportunity. A current use of energy for wastewater treatment can also result in significant greenhouse gas emissions and that's clearly an important driver for the office of water why we're sort of interested in this whole topic as well. And what we found and I think will be confirmed by some of the other speakers today is that

some very basic improvements in energy efficiency can show pretty significant results, equipment change of lighting, pumps, even basic operational changes.

So, you know, it's out there. It's a low hanging fruit in many cases that utilities of many different sizes could take advantage of. In this last bullet, just points out that a number of plants were also moving toward what energy self-efficiency or what some people call zero net energy. Although I think in many cases, a lot of smaller plants may not be able to get to that point and that's not really absolutely necessary in all cases. It's really more important really to just improve and then become more efficient.

Slide 3: Elements of Energy Self-Sufficiency

Jim Horne: So, the next slide really talks about what I like to call the elements of energy self-efficiency. And as you can see, we've got bullets here highlighted both in red and blue. The red bullets are what I think are really essential to sort of begin to sustainably manage energy if you will towards if – even if you're going towards just basic improvements in efficiency all the way up to energy self-efficiency or zero net energy. So let me just highlight the bullets in red and you can see the others on the slide as well.

It's really important that you have the proper management motivation to implement energy efficiency. This is something that everybody at a plant or utility has got to buy in especially management because it's a long journey, its not just a project and it's got to be looked at and bought into and really made part of their integrated into the utility's overall vision and mission. Staff has got to be empowered. A lot of this I know sounds like mom and apple pie and basic stuff but we've learned over the years, both here in the Office of Water and working with the regions and others that these elements in red are really critical.

Buy in from local officials, I can't tell you the number of times we've heard from people especially in the smaller utility saying, "You know, we've got a lot of good ideas but it's going to require some investment and it's very, very difficult in many cases to get local officials to buy in to that. So it's important that people be able to communicate the potential benefits of the types of energy efficiency that we've seen throughout the country. You know, some degree of tolerance for risk and I don't think that's a major factor necessarily but there's got to be a mindset that this is something that the organization whether it's a plant or it's utility wide. You've got to buy into and be ready to accept some degree of risk.

Audits in energy managements plans and that's really what I'm going to talk about in more detail in a few minutes. The audit is really probably the most important step in my opinion that we ever found as utilities go through this process. Another important factor obviously is to optimize your current processes and educate your operators if they're not properly educated in terms of things they need to do to help improve your overall energy efficiency. And then finally, the last bullet in red is really this notion of a measurable goal linked to your vision and plan.

And this is what I would call kind of the sustainable way to implement energy management not just looking at a particular project this month or this year but really to make it part and parcel of what the organization does for the long haul.

Slide 4: Where to Start

Jim Horne: So, where to start? Here's some, just some key things that we've learned over the years working with a number of states in our EPA regional offices. You know, things like create an energy team and assess your current energy consumption. You need to know what you're using now and where you're using it.

And there are number of tools out there both EPA tools and others that have been developed to help you to do that. This notion of creating an energy team is also very important. And the sub bullets here, you see they're just really kind of amplified this first point of where to get started. Assess your energy savings opportunities, you know, I put in caps there, do an audit. An audit is really critical. I would say get the best audit you can get and a number of audits – audit services are available from electric companies, through state energy, offices, through a number of places. Or in some cases, you may need to pay for but it's a – it's investment they will pay off. I can't emphasize the importance of the energy audit enough.

Develop and implement a plan starting with the low hanging fruit project. You know, I think you'll hear more about what I would call low hanging fruit from some of our next presenters. There are things out there. This is a very, you know, this is a controllable cost in many cases and there's – there are lots of opportunities to start with the low hanging fruit.

Doing that also, there is a psychological dimension to that because it really help show the staff that there are opportunities out there to get started the next in progress, and that really, it think, encourages people to go farther and farther. Think about contract specifications for energy efficiency equipment as you go forward and if you feel like you need to make some significant equipment purchases as part as your overall energy management plan.

And then finally measure progress, get some – success under your belt and keep moving. Again, this is – this is in – we encourage people to see this as the long haul and not just something done on a project by project basis.

Slide 5: Managing to Maximize Energy Efficiency

Jim Horne: So what I'd like to highlight here is a very important guidebook that we developed back in 2008 and I'm pleased to see it's been used by our regional offices and I think it's been used effectively in a number of states including Massachusetts. So this is what we call our Energy Management Guidebook for wastewater and water utilities. It's really designed to help utilities sort of systematically asses their current energy cost and practices to set measurable performance improvement goals and monitoring measure progress. All of the things or several of the things I've said on this last slide are really sort of part and parcel of what this guidebook is supposed to do.

And as Emma mentioned a few minutes ago, we really used and believe very strongly in this whole management systems approach to energy management based on this Plan-Do-Check-Act process which I'll describe in a minute. Listen – for those of you that are familiar with the – with

environmental management system, this is really an energy management systems approach which we are very strong proponents of. And I think it's also consistent with the direction set forward in other EPA programs like ENERGY STAR. And this is nothing new but it's a process and an approach that works.

The Plan-Do-Check-Act approach again is nothing magical. You're sort of the depiction of the four steps in this sort of continual improvement process and you can see in the middle this is all about continually improving with the focus. And a particular focus in this case on energy. So if you look at the planning phase in the red circle there, identify your energy baseline, set priorities, set improvement goals and targets. Implement in the blue section. Implement your action plan to achieve these goals.

The checking phase which is really this notion of monitoring and measuring. If something is not working or not performing some steps that you've taken where you're not getting results, find out why it is, you know, if something can be done to sort of fix the problem so you can continue to make progress. And then finally, the last stage of this, again, continual process is to evaluate, you know, three or four years from now or even if we were to say three or four years earlier, then today, probably your reviews on what you can do to improve your energy efficiency would be significantly different. So this whole acting which is really, might be called an evaluation phase is really important. You know, figure out what you did, how did it work, what are the opportunities going forward and make that part of this continual Plan-Do-Check-Act cycle.

Again, as I said, this is really sort of a very effective process that's been used quite effectively in a number industry sectors. Nothing new but something that works. The second bullet, I would like to highlight the second bullet on this slide. This process doesn't give you the answer and that's not what we're trying to do here. It's not, you know, sort of put in a bunch of information and it’s the perfect answer. This takes you through a thinking process, it helps you get to the right answer for your particular utility and allows you to continue to sort evaluate your opportunities and take the advantage of them as they come forward. So, again, I think that's a very important part of this whole process.

Slide 7: Energy Use Assessment Tool

Jim Horne: The next slide really highlights a tool that we've developed here in the Office of Water, recognizing that small and medium-sized utilities are often sort of not only resource-strapped but particularly strapped for time in terms of the types of steps that they can do, you know, sort of consistent with the process I've been describing.

So about two or three years ago, we developed what we call as an energy used assessment tool. This is basically a web-based tool again designed specifically for smaller water and wastewater utilities, free of charge, downloadable tool that could be used for the smaller systems. Basically it allows you to conduct a full analysis of the utility bills and analyze your current equipment. It drills down to the actual equipment level. It would allow you to print the summary report which will lay out your current consumption. It graphs your energy used over time and it highlights potential areas for greater efficiencies.

So again it's – there are number of tools out there that can help you assess energy use but for those of you that are in a small or medium category, I think this is really something that would be very useful, so we encourage to take a look at this. Again, it's free and it's downloadable in the link on our website that's at the bottom of the slide. But we did this specifically because we felt there was a particular need to do something that was geared to the smaller and medium-sized utilities both water and wastewater.

Slide 8: Energy Conservation Measures at Wastewater Facilities

Jim Horne: Another product or report that we put out is what we call our energy conservation measures at wastewater facilities report. Again, the main audience for this is similar to the Energy Management Guidebook I have been describing, utility managers and owners of POTWs and operators. It really lays out particular performance cost and savings and benefits information for particular types of activities whether they'd be equipment replacement or operational modifications and it's based around nine-detailed case studies from utilities all over the country. This really takes it down to the next level of detail and describes some of the actual operational or other steps that these nine utilities took to become more energy efficient.

And again, a lot of these are sort of in the medium-sized category. So this is a nice complement I would say to the Energy Management Guidebook. And again, you can all have a website link to all of these things at the end of my presentation but I encourage you to take a look at this report as well.

Slide 9: Energy Conservation Measures

Jim Horne: This slide just – I won't try to describe everything on the next slide but it talks about the category of energy conservation measures and also provides you a basic description of what it is. So you can see examples of all of these through the nine case studies that are contained on the report. So again, take a look at that, a nice complement to what I've been talking about in the beginning here.

Slide 10: Industry Leadership on Energy Efficiency

Jim Horne: It's really important clearly in the Office of Water and I think in other parts of EPA to work with other partners outside of our agency who are really exhibiting what I would call significant leadership in the Water Environment Federation that's clearly in that category.

WEF put out about a year ago what they call their energy roadmap and I've got a picture of the cover of this and I don't know how many people on the call today are familiar with this but this is a very nice document. But again – it doesn't entirely parallel our Energy Management Guidebook but it does take a utility through a series of sort of strategic and operational steps to really help them move towards full-energy self-sufficiency, and – but recognizing this as I think – as I've said earlier, just for a number of utilities, you may not be able to get to fulfill sufficiency or zero net. But what's important is for you to make significant progress. So again, this is just another example of a very nice document or tool, if you will, out there that's been put up by the Water Environment Federation. It is publicly available. You don't have to be a

member of WEF to get it, just go to their website to get a copy. But again, I'd encourage people to take a look at that as well.

Slide 11: Take Away Messages for Communities

Jim Horne: So what I'd like to do is just sort of wind up with what I like to call takeaway messages. And I say takeaway messages for communities because I think if you look at the document that the Office of Air and Radiation Emma's group has put out which I think draws very heavily from our Energy Management Guidebook and some of the work we've done with the regions and states. There are number of takeaway messages that I think are important that we like to get out there.

This is real – energy efficient utilities are really critical for a community's long-term sustainability that maybe from itself evident to a lot of people, but to a lot of other people, I don't think it's self-evident. And I think that's an important message that needs to be communicated to local officials who are often reluctant as many of you know to make really difficult decisions that have, you know, serious resource implications. But, you know, greater energy efficiency is something that pays off and really leads to long-term sustainability for the community. It's probably the biggest opportunity in the community to save energy based on what I said earlier because water and wastewater energy usage is usually such a very high percentage of a community's overall energy usage. So it's a great opportunity. It's also a great way for the community to have a major impact on greenhouse gases and climate change overall.

When we've done trainings or work with our regional offices, we often don't lead with the term climate change. We again focus on energy efficiency because I think people in any community can sort of relate to that but we all know what the residual benefits are in terms of, you know, GHG reduction and climate change. So by becoming more energy efficient, you are addressing climate change in the community. And this is a good way to do it. It has lots of other ancillary benefits. There are a lot of tools out there to help people take on this challenge not just what EPA has done. And I think we've done great work but this is not something where there is a death of information out there. There is tons of information through EPA, through WEF, through AWWA, through any number of sources. So lots of tools, lots of information to help people take on this challenge.

We like to say you should do it systematically and that's really what the whole Plan-Do-Check-Act process is about. It's the whole basis for the Energy Management Guidebook.

I'd like to say don't just jump on the next neat project. There's always going to be that after but go through the process systematically to find out what you need to do now and what you can do now; and then what you can do in the future, making a continual process and injected into your planning and the sort of your strategic thinking both in the community and at the utility.

And then finally and again, I can't say this, I can't emphasize this enough. Do an energy audit. I just can't tell the benefits and the value of getting a good quality audit done. It will open up all kinds of opportunities for you to move forward. This can really become the basis for you to really make some informed choices about what you can do now, what you might be able to do in

three to five years, what you might be able to do in longer term. But the audit is really sort of a pivot point in this entire process and as I've said lots of audit tools out there, lots of organizations that can help with the cost of an audit but no matter what get one done and then sort of go from there. So like I can't emphasize that enough.

Slide 12: Closing Slide

Jim Horne: So again, thanks very much for the opportunity for speaking today. My information is here on this last slide and all of the materials that I've been talking about are available on our website here and including a lot of other stuff that I didn't cover. So take a few minutes to take a look at the website and hopefully you'll find information there that can help you. So again, thanks so much for the opportunity. OK.

Emma Zinsmeister: Thank you, Jim. That was a great presentation that highlights a lot of the key process approach to energy efficiency and resources available that will certainly be highlighted again in the case study presentation. I just wanted to mention that I think unfortunately, some of the bottoms of the slides were a little bit cut off in the view. Folks should have received copies of the presentation via e-mail earlier today and they'll be posted on our website. So you'll be able to see the full web links that were at the bottom of the slide and also as Jim mentioned, they are available to the main site that you can see on the screen now. And I'll also say that the books – the guidebooks that we just put out, Energy Efficiency for Water and Wastewater facilities has a synopsis of all these tools and resources. So it's a great place to kind of see everything in one document. And we'll also be sending around post-webcast, a much shorter Word document with WEF's tools and resources available so that folks can kind of copy things all in one place and check out all these fantastic resources.

So, thanks again, Jim, and if anyone has questions on his presentation, please, feel free to type those in and we'll answer them at the end of the webcast.

Before we move on to our next presentation, we are going to do another poll question. So Wendy, if you could pull up the poll.

Poll Question #2

Emma Zinsmeister: So we'd like to see what is your level of experience with energy efficiency at your water or wastewater facility?

So please, select any of the things that you've been doing at your facility. I will give you a couple of minutes to provide your response.

OK, I think we can go ahead and pull up the results. All right, so it looks like about half of the folks on the line have performed an energy audit. So I'm sure Jim is glad to hear that, promoting the energy audit process. About 30 percent have formed an energy management team. About 38 – 39 percent have done audit, has worked on their audit recommendations and have worked to evaluate the results of energy efficiency improvement. And just a little bit under a third are through the planning process.

So I think it sounds like there's a pretty good even distribution of the work that's being done and hopefully the presentations the researchers were highlighting will help give you some ideas and strategies about how to expand your energy efficiency program at your facility.

Greater Lawrence Sanitary District Energy Efficiency Program

Slide 1: Title Slide

Emma Zinsmeister: So with that, we're going to move into our first case study to hear about what's been going on in Massachusetts. We'll be hearing form both Michael DiBara and Richard Weare.

Michael DiBara is the project manager at the Mass Department of Energy – of Environmental Protection. He has over 22 years experience as an environmental manager in both the public and private sectors. He's currently leading Mass DEP's energy saving efforts in drinking water and wastewater plants. He's a recipient of the Commonwealth of Massachusetts Fellowship for Excellence in Public Administration at Suffolk University. And he holds a Masters of Science in Public Administration from Suffolk University and a Bachelors of Science in Business Administration from Worcester State University.

Richard Weare has been with the Greater Lawrence Sanitary District since 2000. During this time, he has concentrated on providing project management for the design and construction of district improvement projects. And some of the major efforts that he has led include installation of Biosolids Handling facilities where all the sludge is made into Class A fertilizer which is very cool. Investigation of structural adequacy of the defective pre-tensioning wires in 72 inch prestressed concrete cylinder force main pipe which is a little bit more technical than I would be familiar with.

He's done a secondary system upgrade or service area there to replace with a fine bubble diffuser system and many other energy efficiency upgrades at the facility. He has degrees in Civil Engineering, and with that I'm going to turn it over to Michael and Richard.

Wendy Jaglom: Michael, you're still on mute.

Michael DiBara: OK. Can everyone hear me OK, Emma.

Emma Zinsmeister: Yes, I can hear you.

Michael DiBara: OK. Sorry about that technical difficulty.

Slide 2: Water/Wastewater Treatment in MA

Michael DiBara: What I want to just spend a couple of minutes talking about what we've been doing at the state level and working with our partners. Just the background purposes in the course of treating 682 billion gallons of drinking water and wastewater in Massachusetts. The facility spends about $115 million a year on their energy. So from an economic perspective and also from an environmental perspective, it relates to about a million tons of CO_2 annually just to give you a perspective.

Slide 3: A New Public/Private Partnership

Slide 4: Massachusetts' Energy Pilot

Michael DiBara**:** On – excuse me. On the larger side, we actually created an energy management pilot in 2007 where we actually brought together all of various partners from – with seven wastewater and seven drinking water facilities and also our state partner is along with other resources which included every major investor owned electric and gas utility from across the state and also a non-profit and university. So trying to pull the resources together that we can combine and leverage together. So this is a non-regulatory approach, strictly voluntary.

So what we did is we in 2007 just about the time that the Energy Guidebook was coming around and the Plan-Do-Check-Act system, we thought it would be helpful from Mass DEP to pull the various resources together. And we were – by no means an energy expert but we felt that the Mass DEP could take a very important leadership role, could bring the right parties to the table. And we were focused on advancing energy efficiency as a first step. We also wanted to bundle any on-site clean power generation opportunities.

And again, this is a learning process and we wanted to be a working model that we could replicate. And our goal is 20 percent reduction in cost and greenhouse gas emission.

Slide 5: Map

This map here just shows you the distribution of some facilities which does include the Greater Lawrence Sanitary District, and Richard Weare, you'll be hearing from him today.

And this was a different treatment facility using different treatment technologies and different size (inaudible) which we felt was important to get feedback from and figure out how we could help these facilities and what the resources that were available.

Slide 6: 14 Pilot Facilities

Michael DiBara: We were fortunate to work with our private partners, the electric and gas utility companies as Jim Horne had mentioned. And they agreed to provide free energy audits for these 14 facilities both on the efficiency site and we connected with another partner that did renewable energy assessment looking at solar wind hydro and biomass opportunities. And the results on the screen here show you what the opportunities that were identified from those assessment. It's about $3.7 million of annual savings to the facilities and you'll hear more from Richard, on some of the details.

Slide 7: ARRA – Green Infrastructure

Michael DiBara: Timing is everything in life, and thanks to the leadership by Governor Patrick's administration and EPA. The Massachusetts energy management pilot became a working model that basically led to the creation of the 20 percent green infrastructure requirement within the

ARRA funding. And what that meant specifically from us, over and above a national policy change was that we were the recipient of – and along with other states of about $58 million to basically implement all the recommendations from these pilots, the 14 facilities.

Slide 8: Pictures

Michael DiBara: This picture just shows some of the examples on the renewable side. So small facilities benefited larger facilities. There was every technology from wind, solar, hydro and combined heat and power. The wastewater treatment plant did some very important efficiency measures and also a 1.5 megawatt solar installation and they'd had anaerobic digestion which they were flaring off the biogas and they were able to connect into a combined heat and power system.

Slide 9: Results

Michael DiBara: So overall, they're saving just about $700,000 a year and reducing their energy in offering class by over 90 percent. So they were on a pathway to zero in net energy. Overall, the results of these projects have been fully completed and they're operational. And the fourteen pilot sites plus seven additional sites, the results are over $5 million a year savings.

We exceeded our goal of 20 percent by 170 percent to 34 percent in their reduction. And importantly over 10 megawatts of green power were actually implemented at these facilities. So we show that this can be very beneficial and it did create a pathway to facilities to show that facilities through energy efficiency and on-site power generation can be zero in net energy or sustainable.

Slide 10: MA Energy Leaders

Michael DiBara: From the pilot, we moved on statewide. We have what's called an Energy Leaders initiative which is basically we bring together – it's not a bunch of bureaucrats talking, it's really about bringing all the different partners together, the local decision makers. We have a technical presentation. We have an energy management planning meeting which does involve the Plan-Do-Check-Act, and we have a site visit. And this is an opportunity for facilities to exchange information and resources with their colleagues.

Slide 11: Map

Michael DiBara: And to date, we have over 100 facilities. If you look at this map, statewide, that are working with us, our partners at State Department of Energy Resources, U.S. EPA New England and the utility partners. This map shows just over 100 facilities that are working with us to be energy leaders.

Slide 12: Reducing Operating Costs & Reinvesting in your Facility

Michael DiBara: From a sustainability standpoint, moving forward, we've actually looking at trying to develop a very simple cash flow approach where energy savings can actually pay for

the capital cost of improvements, leveraging all the different incentives from the various programs both on the efficiency and renewable side. So this brochure is available and it highlights a wastewater and drinking water example. But the important message here is that you can pay for wasted energy or you can reinvest in the people, equipment, and assets at your facility. And that's something that we all know that ARRA money will not come back again. That was a great opportunity. But we really need to build something sustaining that facilities can actually go ahead and implement these projects and reduce their operating cost and reinvest those savings back into the facilities.

Slide 13: Closing Slide

Michael DiBara: So I'm going to turn it over to Emma who can – I guess to Richard, I believe, and certainly welcome any questions once Richard has completed his portion.

Thank you all very much and my contact information is there, and I'd be happy to answer any questions either now or at any point. Thank you.

Emma Zinsmeister: All right, thanks. We'll get the questions together for the end after all the presentations that have been given.

Michael DiBara: OK.

Emma Zinsmeister: So with that, we'll move directly into Richard's presentation to hear specifically what was done at the Greater Lawrence Sanitary District.

Slide 14: Introductory Slide

Slide 15: GLSD WWTP System

Richard Weare: Hi, good afternoon. At Greater Lawrence Sanitary District, we've been trying to reduce energy for a number of years now. Our treatment plants service six communities in Massachusetts. We have a design capacity of 52 MGD average daily is about 130. Because Lawrence is a combined system, we receive up to 135 MGD during wet weather and we are increasing that, soon, to 167 MGD as part of a long-term control plans with CSO abatement.

We have secondary treatment capacity of 126 and we have a secondary bypass that we can treat just the stormwater. We have one major pumping station, pumps about 90 percent of all outflow, fairly large pumps, and we can see and we have a sludge drying facility that makes a class A fertilizer.

Slide 16: Photo

Richard Weare: Basically, the plan is made up on aerated grid facility, two primary tanks, aeration, fine bubble aeration, bubble building here, four secondary clarifiers and chlorination and dechlorination. Secondary bypass comes off here if you're looking at the arrow on the – on

your screen and goes down to a wet weather chlorine contact tank and then it's blended in with our outflow – flow that goes out to the Merrimack River.

We have three anaerobic digestions, four GT tanks. This is the heat-drying facility that makes the class A fertilizer administration building and processing maintenance building. And in this portion of this garage, we have three dual-fuel boilers that keep the – or actually reheat the sludge and that is primarily used – the fuel used for that is the methane gas of the digesters. We have a small industrial boiler for heating and hot water that's also used as methane gas. And the heat-drying facility is the major user of any of the methane gas to heat the sludge.

Slide 17: GLSD Energy Efficiency Study Plans

Richard Weare: We started in 1995 with the no action energy audit prior to my time. In 1998, the district embarked on the Biosolids improvement project. We used to ship off all of our sludge and – so with that project finished in 2002 year end making our own class A fertilizer. We did a lighting system evaluation in 2001. We did a secondary treatment system evaluation in 2004. And then as Michael was talking about, we were a part of the pilot program in 2008 in an energy evaluation assessment.

The assessments that were done by – through the EPA were basically a basic type of energy audit. You know, it kind of brought – brushed over the benefit of doing this and the fact that our energy bill for electricity alone was approaching $4 million a year. And our Board of – basically, doubled the budget for ourselves so that we could do a comprehensive energy evaluation which was very in depth.

We then did a lighting system evaluation -- another one in 2009. And then we did a primary and secondary evaluation in 2012.

Slide 18: Scope of 2009 Energy Audit

Richard Weare: The energy audit in 2009 as I've said was a comprehensive energy study that came up with five operational measures, basically, items that didn't require much money but were changes in the operations of the treatment plan. It came up with 18 energy supply measures that required capital to implement. And then, there was two supply energy measures such as participating and starting our generator up in high-flow times. We used the EPA Plan-Do-Check-Act approach and continue to do that because you never stop looking at energy use.

Slide 19: Electric Energy Use

Richard Weare: Part of our comprehensive study actually showed the – how our energy is – where it's used and our pumping station treatment plant and the sludge drying. And this was after the – this energy audit was done after the heat-drying facility was put in.

Slide 20: GLSD WWTF Electric Energy Breakdown

Richard Weare: I further broke it down into the biological system being the largest user of energy, not surprising.

Slide 21: 2007 GLSD Natural Gas Use

Richard Weare: And then our natural gas was basically we use a little bit in the dryer building and in periods when the digesters may not – may be at the lowest capacity of holding methane in its tanks.

Slide 22: 2007 Digester Gas Use

Richard Weare: And then we also looked at how we use digestive gas and as you can see, digestive heating was a large component. The dryer RTO is the heat-drying facility and then we found we're actually – had to flare off, a fairly large percentage of that. So one of our energy measures was actually to capture some of that gas flare instead of flaring it off.

Slide 23: 2009 Energy Audit Study Estimated Savings

Richard Weare: Our energy audit showed some substantial savings and you can see it here in kilowatt hour savings as well as electric savings and a pretty good reduction in greenhouse gases.

Slide 24: 2010 Construction Project Scope

Richard Weare: The results of our energy audit came in and ARRA funds were available. So we do some scrambling to be shovel-ready so we could take advantage of this money. We ended up hiring three engineering firms. They developed four construction contracts. We installed VFDs to replace a lot of Eddy Current Clutches. We replaced 19 Premium Efficiency Motors, all larger than 25 horsepower. We did an Energy Management System a part of our HVAC improvements in the wastewater treatment plant. We did some HVAC improvements on major pumping station and some VFD and Premium Efficiency Motors on the HVAC system.

We installed KW meters on all the systems we did so that we could track what our – improvements we are in, you know, also benefits us to see if something is not operating correctly and to tell how much power you're using.

So we do track KW and actually the data is fed in to our system where we can trend it. We've done two fine bubble aeration system upgrades and we have motorized the air valves there to optimize and reduce the amount of excess air going into the tanks. And we upgraded some hot condensate pumps. We have a lot of condensate pumps that are taking hot water of the RTOs in the heat-drying facility and it shifts it back to the digestive building where we use that incoming sludge, and then the dual-fuel burners I had mentioned is recirculation of the sludge to heat back.

And then we are also replaced our plant water pumps. Very large pumps, they are 125 horsepower using a different control scheme. We were going to able to reduce some down to 100 horsepower and put VFDs on that and we were able to actually reduce the pressure around the plant which allowed us to go down 25 horsepower in those plant water pumps.

Slide 25: 2010 Construction Project Scope (Continued):

Richard Weare: We also installed a new energy steam boilers I mentioned. It's a dual-fuel burner that provides heat to the buildings as well as hot water. We did some lighting system improvements and we installed the 441kw photovoltaic array system.

Slide 26: 2010 Construction Project Funding

Richard Weare: We received $4.9 million in construction funds via ARRA, which those of you that worked with the DEP ARRA funds know that it covers most of – what would cover similar things to the loan program which is Construction Cost and engineering during construction but doesn't pay for design fees.

We received almost $700,000 in utility incentives which allowed us to pay a design with a net cost to the district of $0.

Without the payback – or without the funds from ARRA and the utility incentives, the paybacks would have been 2.9 years on the project that we did.

Slide 27: Construction Project Funding 2000-2013

Richard Weare: But this is kind of a synopsis of where we have been since 2000. We've done a number of these projects. In blue is the – ones that were done by ARRA funds. And we also did a major project just recently of a 72 Force Main Replacement. So – in the last 13 years, we've spent almost $67 million and we got incentives from the electric and gas utilities – little more than $2 million. The DEP – the ones in red over here is what we basically got as a grant, and the remainder was the 2 percent DEP loan under the loaning program.

Slide 28: Construction Project Savings

Richard Weare: We realized pretty good savings, you can see kilowatt hour savings on these projects is about 7.7 million, about $2 million in annual cost savings. One of my little pet projects was the replacement of an existing PPC Force Main which had structural problems with the reinforcing. And we replaced that with a centrifugally-cast fiberglass reinforced polymer mortar pipe manufactured by HOBAS.

Basically, the Hazen-William roughness coefficient was – where the (PCC) pipe was about 100 and about 150 was the HOBAS pipe. And just that project alone – and you can see – had some pretty good electric savings would – in fact, and we got 800 horsepower and 1250 horsepower pumps pumping it up to the treatment plants.

Slide 29: D/B Photovolatic System

Richard Weare: We also did a photovoltaic system. We have two different arrays that were done in 2010 as the design build. Got 2100 modules. The design build cost was about 1.9 million and

then cost per watt was – to us was $4.47 which is pretty good. I was looking in the engineering news this summer and they're saying that systems larger than 100kw average about $4.6 per watt. So, we did pretty well on ours. And even the utility scale PV projects ranged between $2.3 and $6.8 per watt. So I felt pretty good about that.

Slide 30: Photovoltaic Solar System

Richard Weare: Solar system saves us about $59,000 per year in electric cost based on 10.6 cents per kilowatt which we are paying a little less than that now. This past year, we are able to sell our renewable energy credits, an additional 32,000 and some dollars, and our solar system will generate – the equivalent of electricity there for approximately 80 Massachusetts homes. And this is about two solar arrays, a large one here and a small one out back.

We never finish here. We still have a couple of projects left on our energy audit, but we're also got other projects because of our long-term control plans at CSO. One of the larger projects we haven't implemented yet, we still got some more studies to do to determine what size pumps we need to get up to 165 MGD. But with the energy audit showing the 800 horsepower and 1250 horsepower, if we put VFDs on – save about $1.7 million in kilowatt hour savings with about $240,000 with the electric cost savings. And as I've said, we got future projects as well as – for our CSO long-term control plan, and as it says in the Plan-Do-Check-Act, it's kind of a – as the old folks would say with the old computers, it's a do-loop so you never really finish.

Slide 31: Clean Energy for our Kids Future

Richard Weare: So we're pretty proud of our solar system and the reductions in our greenhouse gas output and it works well. And I think that it's good for our future generations.

With that, appreciate your listening in on this.

Emma Zinsmeister: All right, thank you, Richard and Michael for your presentations. I really appreciate you sharing the experience in Massachusetts and at your facility.

If anyone has any questions on the work that's been done in Massachusetts, please, type in your questions for Michael and Richard and we'll get to them at the end of the webcast.

Poll Question #3

Emma Zinsmeister: Before we transition to the Tennessee case studies, we're going to another poll question. So Wendy, if you could pull that up for us.

We're interested in hearing about which of the following policies or programs or activities has been the biggest influence on energy efficiency planning at your facility. In the Massachusetts example, we heard about a state-wide pilot program that was fortunate to have an infusion of public funds through the stimulus and we're interested in knowing what kinds of programs or policies, or, just – individual initiatives at your facility or a particular strong advocacy in your community that truly led to the work that you're giving. So I'll give folks just a couple of minutes to put in their answers.

All right, let's go ahead and pull up the results. So it looks like about 41 percent are pursuing energy efficiency as a result of individual initiatives at their facilities, followed by 36 percent as a result to state policies or programs, 19 percent, local government policies or programs, and only 4 percent as a result of advocacy by community groups or residents.

So that's – it's really encouraging to hear that individual facilities, regardless of the policy environment are taking the initiative and it looks these are showing some leadership as well. So thank you for your responses to that poll.

Tennessee Water and Wastewater Energy Efficiency Partnership

Slide 1: Title Slide

Emma Zinsmeister: So we'll be moving on now to our final case study from Tennessee. We're going to be hearing from both Bob Freeman and Brendan Held who are both with the U.S. EPA Region 4.

Bob Freeman is a registered professional engineer and wastewater treatment operator in the State of Georgia. He's been with EPA since 1970, and he's focused on water and wastewater systems specifically energy management including energy harvesting from waste streams with water or land treatment and reuse wastewater nutrient removal technologies and decentralized wastewater treatment. He's presented several papers at the Water Environment Federation Annual Conference on the WEFTEC and he's been published in the Water Energy Federation Journal and other publications. He has degrees in Chemical Engineering, Civil Engineering, and an MBA.

And then we'll also be hearing from Brendan Held who's been with EPA for three years, specializing in water and wastewater infrastructure. He has an Environmental Engineering degree from Michigan, Technological University and a bachelors in Material Science from the University of Michigan. He has also served in the Peace Corps in Madagascar and Mali where he did his masters research on the energy-water nexus within the context of rural communities in West Africa.

So with that, I think Bob is going to kick off some presentation. So we'll turn it over to you. Thanks.

Bob Freeman: Thanks, Emma. I'm looking to see my presentation right now.

Emma Zinsmeister: Yes, there should be box popping up on your screen where you can click to take over the control. I know – Wendy, have you been able to get that?

Wendy Jaglom: Yes. Bob it looks like you are sharing the screen, but we're just looking at your internet browser.

Bob Freeman: Yes.

Wendy Jaglom: If you could minimize that and open your presentation maybe.

Bob Freeman: All right, I'll do that.

Wendy Jaglom: Here we go, and make it fullscreen.

Bob Freeman: I will do that.

Wendy Jaglom: There we go.

Bob Freeman: Thanks. Well, I appreciate the opportunity to be a part of this webcast. I'm Bob Freeman, and we're going to be talking about our efforts with the Tennessee Department of Environment and Conservation, in our energy management initiative.

Slide 2: Overview

Bob Freeman: The things that basically we're going to cover are going to be the background, how we got to this whole effort, what did it look like, how did we work together and work with utility, what the results were of that overall effort, and then Brendan is going to take over that point and talk about some of the specific utilities we worked with, Fayetteville, Columbia and Franklin, Tennessee. And what some of the results we we're able to achieve – help them achieve there, and some of the lessons we learned doing this process and where do we plan to go from here.

Slide 3: The TWWEEP Program

Slide 4: The Team

Bob Freeman: The Tennessee water and waste water energy efficiency partnership, where do we come up with that? Well, it goes back to October 2008 when Jennifer Dodd was TDEC, Tennessee Department of Environment and Conservation, and I were working to Jim Horne now at headquarters to put on the workshop to introduce folks to the new, at that time, the new EPA energy management guide book. It had just come out in January of 2008. And in on October 2008, we had a one day workshop in Nashville that Jim coordinated a for us through his contractors, to put on this workshop of how utilities could approach energy management in the state of Tennessee.

And we had a pretty good turnout at that one day workshop, and had hoped to be able to follow up with some more activities. But, unfortunately, that didn't work quite as well as we hoped, the follow-up part. And then in March of 2009, I was involved in some infrastructure meetings that the different regions and EPA were having. And Jim Horne had arranged – Jim's name comes up a lot and he's really been the spearhead of a lot of his efforts. He arranged a meeting in Kansas City, our Region VII, where a presentation – where several presentations were given about an energy management initiative they had conducted. So then at February of 2011, I finally got back to Jennifer Dodd at Tennessee Department of Environment and Conservation and asked her if TDEC would be interested and try to really engage with EPA Region IV and put together an energy management initiative. They were very interested.

And so the first step we then took was to try to form a team to really conduct this thing and just – one more idea of background, the reason we decided to go with a team approach is because most of the past efforts there that we've seen in energy efficiency for water and waste water utilities, had produced very minimal results. A number of them in our area, some different state had energy audits done, but by and large, it became a resource that sat on the shelf. What we saw

was – what we didn't see, I guess, is really, a better way to put it, we didn't see engagement by the utilities and sales with the whole context of saving energy.

So, we decided to go with a little more intensive effort with the utilities to see if we could enhance that engagement. So we put together this team, TDEC, us in Region IV, TVA the big power provider throughout state of Tennessee, the University of Tennessee, University of Memphis, University of North Carolina Environmental Finance Center and we brought in an energy efficiency expert from Schneider Electric, you know, to give us some real world costs.

Slide 5: TN Utility Partners

The first thing we did – the first thing our team did, we met in Nashville, was trying to identify the utility we wanted to work with and we would then try to participate. We ended up inviting 10 different utilities to participate and ended up with these seven utilities were the ones that I'm showing on this state map are the ones that ended up being part of our partnership. We wanted utilities scattered around the state, we wanted from small to large. And you'll see the smallest one here with 700,000 gallons a day actual flow. The largest was one of Nashville's plants which was 17 million gallons a day. And then several sprayed in between those sizes because we wanted to be able to demonstrate energy management at our wastewater facility isn't size-dependent.

Slide 6: Photos

Bob Freeman: These are just some photos of – that illustrate some of the plants that we work with, Columbia on the upper left. They have a nitrification tower. First utility district of Knox County, this is their drinking water plant. We actually looked at their drinking water plants as well. We do look at a two or three drinking water plants in addition to the waste water plant.

Lower left corner, Nashville dry creek waste water treatment plant, that's the one that actual flows around 15 million to 17 million gallons a day. Bottom right corner, Lenoir City utility district wastewater treatment plant. That's a considerably smaller plant, just to remember, Lenoir City is only seeing one and half million gallons a day.

Slide 7: Photos

Bob Freeman: What we did during this effort, we went to each treatment plant, made a sight assessment to assess opportunities, our team did, made a size assessment to assess opportunities to save energy. We wrote up our report and we gave back to each utility with another trip back to them to explain the report that identified and discuss some of those opportunities. And then we invited them to participate in a series of four different workshops that at our operator training center in Murfreesboro, Tennessee. These are shops for all of the utility centers that we see people, in some sense, gather to participate in four-day long workshop over a six-month period in Murfreesboro where we went over all the types of the different approaches, the whole idea of energy as a part of your normal management of that utility was stressed over and over again.

Slide 8: The Approach

Bob Freeman: The basis of that approach was this whole Plan-Do-Check-Act approach that was one of the important elements in that regional energy management guide book. The beginning planning, the implementation, finding out how well that implementation work, revising the strategy and then acting on that.

Slide 9: Results To-Date

Bob Freeman: The results – and the result of working with those utilities from about March of – or April of 2011 until October of 2012 measured actual energy savings is over 5 million kilowatt hours a year over $400,000 a year cost savings and over 4,800 tons of CO2 emission reduction. That's already accomplished based on about a year's worth of operational data. We've continued to work with those utilities, collect our electric data, plot it out, and we continue to share it with them. We expect to see at least 1.5 or 2 million more kilowatt hours a year, as some projects that involved a longer implementation time are implemented.

There will even additional savings and some of the projects that require little more long-term planning are implemented. And we're continuing to work with those seven utilities.

At this point, I want to pass the ball to Brendan and let him get into some of the specifics of what we were able to do with specific utilities.

Slide 10: Individual Examples

Brendan Held: Thank you Bob. Let me just get my screen sharing in with you guys, and I think – are we good? Does that look good?

Wendy Jaglom: We can see it now.

Brendan Held: OK, great. And, yes, just before I move on, I want to highlight how important that process was to the success of the program. As Jim said, you know, those workshops – I figure that Jim said that those were workshops present an opportunity for the participants to network with one – each other and share ideas. It also builds a lot of trust between EPA and the participants as well as the other partners which was critical to the whole effort.

Slide 11: Fayetteville – WWTP

Brendan Held: So, moving on, I guess the first example is Fayetteville, Tennessee. It's a 1.2 million gallon plant which is considerably smaller than one of the profiled earlier. I think that was about 100 times the size, but smaller doesn't necessarily mean small. 1.2 million gallons is actually about a little bit more than the volume of the Washington Monument.

So, the plant has two orbal oxidation ditches which wastewater goes from the outer ring into the inner ring into that central circular clarifier. And then the sludge is put into these digesters/holding tanks.

Each of the ditches has 150 horsepower variation between them. It's a – I guess they've had disk aerators and then also there is supplemental air being blown into the inner of the aerobic holding tanks. Just for those who might not have an idea of how big horsepowers are and what they translate to into terms of kilowatt hours, 100 horsepower is about 75 kilowatts which costs $6 to run for an hour. That's pretty small compared to a lot of industrial processes, but if it's running 24/7, the cost can certainly head up.

Let's see here. The plant has a fairly low organic loading compared to its designed organic load, and they could probably get by with using one tank but they use two to deal with hydraulic surges. Doing this causes a long solids retention time which is about 50 days for the plant. And what that means is some of the digestion actually occurs within the ditches. And so these digesters are really being just used more as holding tanks than digesters, and that plays into some of the savings that we're able to achieve here.

Slide 12: Fayetteville – Orbal Oxidation Ditch

Brendan Held: That's a close up of the disk aerators that sort of helps push the wastewater around the track and add oxygen into the mix. And some plants have the ability to control the speed of these aerators based on the DO of what's in the tank at that moment. That was not the case in this plant. It had to do it manually and it was on-off operation. It didn't have variable speed on it.

Slide 13: Fayetteville – Aerobic Digesters

Brendan Held: And again, here's another view of some digesters. They had supplemental air, like I said, you can see the course bubble aerations going up and down in the middle there. What we were able to recommend was that they turn down that course bubble aeration which is being fed by, I believe, 225 horsepower blowers that were pretty old and rather inefficient. So, when I did that, we were able to see no impact to the treatment but very significant impact to their budget and their energy use.

Slide 14: Fayetteville – Measured Energy Savings

Brendan Held: You can see there that there – we did a benchmark of their energy use for the past – the previous two years prior to the implementation. But it was about 30 percent savings and 820,000 kilowatt hours per year savings which is pretty big for a plant that size. So we were pretty pleased with those results.

Slide 15: Columbia WWTP

Brendan Held: Next up is Columbia. Well, it's a bigger plant, 5 million gallon per day which is enough to cover a football field, the end zone to end zone, sideline to sideline, 11.5 feet deep. It had 14 million gallon per day design load which means it's loaded about 35 percent of its design capacity. This is not common, but it's not rare either, and it makes it difficult to operate the plant efficiently if there's not – if it's not operating in its design load. It also produces 4,900 pounds of dry sludge to landfill everyday, quite a bit. And it's a conventional system with just aeration

basin and clarifiers and it got had a polishing trickling filter here that does a little bit of denitrification for them – I'm sorry – nitrification for them. And chlorine contact down here.

Slide 16: Columbia – WWTP

Brendan Held: There's the nitrification tower and a close-up of the aeration tanks there. Again, the – the SCADA system and the operation, the monitoring of the dissolved oxygen and the mixed liquor was out of date and rather dysfunctional and the staff had to basically operate based on smell and color of those aeration tanks. And as a result, we found that they were supplying about six times oxygen that was needed for treatment. And as engineers, we recognize that safety factor is a probably a good thing to have, but that seemed a little excessive. And based on that finding, we were able to recommend shutting off one of their 450 horsepower blowers.

And again, there was no impact to the level of treatment that they were achieving. And that led to 20 percent savings which was 1.9 million kilowatt hours per year. So, again, not the cost that – not a change that cost them a lot of money. They also made some improvements to their U.V. disinfection system. It was a simple change, we're not clear on the exact details or the cost, but it was a cost, yes.

Slide 17: Columbia – Measured Energy Savings

Wendy Jaglom: If you just choose the first – don't close it, just choose the first one.

Brendan Held: OK.

Brendan Held: OK. Yes, all right. Here we go, OK. Yes, so they made some minor changes to their U.V. disinfection system which basically improved the control of it so they were able to pace with the turbidity of their effluent. And that was able to allow them to turn off their lamps as the turbidity improved and that also contributed to those savings. We don't have exact numbers as far as how much of that 1.9 million kilowatt hours is due to aeration system and the UV system individually, but at the total, those savings have been measured and verified.

The interesting thing in this case was we showed this bar chart to the plant Superintendent and, you know, we were expecting him to be pretty pleased with the results. and he was pretty hesitant to publicize this especially to his board and the governance because he was afraid that once they found out that, you know, he would be spending a lot less money on electricity that that money would come out of his budget. And that was one of those sort of "aha" moments where we realized that, you know, communication is a big thing here especially between the operation staff and city governance and getting them to an agreement where it is a good thing for them to go looking for efficiencies so it doesn't hurt them later when they might need that money later either for upgrades or, you know, if they had to turn that blower back on when those loads go back up.

Slide 18: Franklin – WWTP

Brendan Held: And Franklin was, again, bigger still. This was a 10 MGD plant with a design flow of 12 MGD. It had these three oxidation ditches, two of them were in service. These two down here were older and this one was newer, and this is – the one active older ditch had supplemental air as well vertical aerators that we saw from Fayetteville. They also operate with anoxic zones bringing the dissolved oxygen to a low level allowing for denitrification and some oxygen harvesting.

So they're already doing a lot of things to improve their treatment and also reduce their oxygen demand, but the set points that they're operating at were in a 2 to 2.5 range milligrams per liter developed oxygen. And we recommended lowering that to 1.0 because that would provide sufficient oxygen for treatment but not anything in excess. And they were able to slowly and gradually implement these changes, so they didn't worry about shocking the system or violating the permit. And they were able to see significant savings.

Slide 19: Franklin – WWTP

Brendan Held: I skipped over that other slide because there's – they had a good number of other projects including a solar array, some of the ones you saw in Massachusetts. This was purchased with a public private partnership where the private entity was audible for the subsidies that the public entity was not. So they paid for the solar panels and they took a larger portion of the generation credits from the utility for the first 10 years. And then that ratio will flip so that Franklin public utilities will get a larger portion for the next 10 years. And then, some time after that, they'll get all of the savings from the electricity generated. And that saves them 168,000 kilowatt hours for the first year that they implemented it.

They've also looked a lighting refit which was eligible for an automatic rebate from TBA, the power producer, and joined a demand management program. Among other things, they keep telling us how enthusiastic of their staff is going after more and more savings. They're really enjoying themselves.

Slide 20: Franklin – Measured Energy Savings

Slide 21: Lessons Learned

Brendan Held: I just got the chime, so I'm going to skip ahead to the lessons learned. I hope that our presentation kind of highlighted that any size plants can find savings. It's not just the big boys that has lot of VFDs and large pumps. It's pretty much anybody all the way down to less than one MGD. Minimal investment can produce big results. Most is not all of these implemented projects really came at no cost to the utilities themselves. That won't necessarily be the case for everyone because that cost was born by folks such as Bob and myself and the professors and everyone volunteering their time. But, the savings are generally there and it just takes a little bit of upfront expense to find them. That's the important of doing the audit. It looks like most of you have already done.

The savings beget more savings. Fayetteville is using some of their savings to pay for dissolved oxygen probes to improve their monitoring system and their control system for their

blowers. And that's something I like to see because it shows that it's not just a one-time band aid, it's something that is really integrated in that continuous improvement system that we've got. The team approach works best. That's sort of that point we're talking about with Columbia where they didn't want to share their success with their governance because they're afraid it would put them later down the road.

Slide 22: Next Steps

Brendan Held: Next steps, Bob and I are continuing to be very active supporting activity in our region. For example, Tennessee is set to implement a second round with another eight to 10 utilities in the next year. Alabama are in the planning stages for a similar program and were – starting to work with United South and Eastern Tribes, which is a large consortium that goes from Texas to Maine, and we're helping them develop their capacity so that they can support their member utilities. And towards the Georgia Environmental Financing Authority is very eager to spend money on construction projects that are related to energy efficiency through the SRF program.

Slide 23: Next Steps

Brendan Held: So, if there's not something going on your area, what can you do? Starting small, doing an audit that Jim was telling you about, that huge – that energy assessment tool is a very good tool just to get started and start seeing where your improvements might be. I think I mentioned that power companies might be able to support doing an assessment so that you don't have to go out of pocket for the audit. There's a guide book again that have been mentioned before, and, like I just said, SRF financing might be able to pay for the audits. And you can always just call us, our emails will be on the last slide.

Slide 24: Energy Management Training

Brendan Held: Also, just a quick little plug, we've got a two-day energy management training course that will focus on optimizing operations, getting into more details. It would be taught by Dr. Larry Moore who was a member of the Tennessee effort and was key to identifying a lot of these operational improvements. So I really encourage anybody who's interested to tune in. We'll have that available through Adobe Connect, similar to this, so you can attend online. Or if you're in the area and really interested, give us a shout and you can attend in person. It'll be January 7th and 9th, 2014 here in our office.

With that, I just want to thank everybody who stuck around and still listening. And I'll turn it back to over to Emma.

Slide 25: Contact Information

Emma Zinsmeister: All right. Thanks Brendan and Bob for your presentations. I just want to reiterate how impressive it is that with the utilities of the sites that you're mentioning, achieving savings at 20 to 30 percent in just a couple of years with mostly no cost changes is really, really quite impressive. And so, I really encourage folks to go back to the presentations after the call

and look more in detail in some of the resources and examples because there's just a lot information on tools and resources.

So, before we …

(Inaudible).

Emma Zinsmeister: Yes? Does somebody have a question? I thought I heard someone. Anyhow, so if anyone has any questions for Bob and Brendan, please go ahead and type them in to GoToMeeting. We'll have a few minutes and just a moment to do Q&A. We will address any questions. We don't have time to get to in writing.

Poll Question #3

Emma Zinsmeister: And very quickly, we're going to throw up our last poll question just to get a little bit of sense of the roles that folks are playing in their utilities. And, of course, people are often or more than one hat in their job. So, if any of these that, you know, sort of multiple apply to you, please go ahead and select as many as appropriate, and I'll give you just a minute to enter in your response.

All right, we should go ahead and pull up the results there to keep things moving. And so it looks like a lot of folks are consultants and engineers or fall into the other category, others about 16 percent plant managers, 4 and 5 percent were with the city government or utility management respectively. So, that's interesting for us to know and we appreciate your feedback. We're going to take just a few questions now because we are getting very close to the end of our call time for today.

Question and Answers

Emma Zinsmeister: So, I'm going to turn it over to Wendy to ask the questions that we have received. And just a couple of reminders quickly because I know folks are probably going to start dropping off. I see on the slide here, you can go ahead and click on the download. That's a link to the energy efficiency and water and wastewater facilities guide that I mentioned earlier to create resource. It compiles just about every resource you've heard talked about today, so it's a good starting point. And then, also, when you do close out, please provide us feedback on the webcast and your resource needs because we do directly use that information in our program planning.

So, thanks everyone for participating, and, Wendy, if you want to go ahead and maybe we'll do about one question per presentation. I think that's what we have time for.

Wendy Jaglom: Sure. Thanks, Emma. So, the first question is for Jim Horne. Do you have recommendations on who should be on the energy team?

Jim Horne: That's a very good question. I think it depends to a certain degree on the size of the utility. But, to the extent possible, you should have people with very strong operations experience. Also, if you have people with a financial background they should be considered as well.

The other point that I would make is that in many communities, the person that actually sees and pays the energy bill for the utility is not at the utility. They may be the town clerk or somebody like that. So, especially when you get into a position of analyzing what your current energy usage and costs are, if those people are available and they perform that kind of function, I strongly advise that you put them on your team as well.

Wendy Jaglom: Great. Thanks, Jim. The next question is for Mike and (Richard). How were you able to justify solar and wind?

Michael DiBara: Or in our case, we had an ARRA grant that paid through 100 percent of it. So, the good news for us was that as soon as we turned the switch on, we're cost-effective.

Wendy Jaglom: OK, great. Thanks. And then for Bob and Brendan, Brendan, the scenario you described where there were concerns about energy saving leading to budget cuts. What was the communication strategy used to prevent that facility from losing the money saved?

Brendan Held: That's a good question. We actually – we offered to step in and speak with the governance, but the utility much would rather handle them themselves. So they – it was sort of – Bob, how do you characterize it?

Bob Freeman: It was a tough situation because there were – there had been some bad history between the public works manager and the city council who blamed the public works manager for some of the rate increases that had to be implemented some years before.

So, that kind of the history that was going on there and I think once – not to say that was a solution to the problem, but the public works manager retired shortly after our effort which allowed the plant superintendent to kind of start with their city governance with a clean slate. And they presented to them the sense that if they could continue to use that savings to find more savings, then it would put off potentially or reduce the size of any future rate increases to the extent that they're actually harvesting money that had been previously going to the power company. Well, I think that was a fairly persuasive argument since that was – the rate increase was one of the causes of problems between them in the first place.

Wendy Jaglom: Great. So, thank you. And maybe we'll do one more for Mike and Richard?

Emma Zinsmeister: Go ahead.

Wendy Jaglom: OK. So, lots of great improvements but the 30-year payback doesn't seem particularly attractive. What amounts of your capital investments were necessary regardless, or rather, what was the marginal capital increase when you're first doing energy efficiency? Would that improve your simply payback?

Emma Zinsmeister: You might be muted.

Michael DiBara: On the efficiency side, just to give you an idea, the majority of efficiency requirements or opportunities on those 14 facilities averaged a 4-year payback on the efficiency side. So when you bundle the efficiency with the other clean energy projects, in total it was – as you were aware, 11 years – when we take all the projects together. So, there is an advantage with bundling the efficiency, the high return measures, with renewables. But bear in mind, taking advantage of all the different incentives that are available, where that's through the private programs or the public programs and making these projects cash flow positive rather than simple payback is a pretty convincing case to look at. So, in general, those are some numbers from the pilot.

Emma Zinsmeister: Great. Thank you everyone for your responses to those questions. We did get several more so we will be – for writing written response to those so everyone can get their questions answered.

Thank you everyone who stuck with us a few minutes after our time. I know – I can see we have quite of people still on the line, so we appreciate that. And we appreciate all the feedback that you've provided through the polls and please do fill out the optional feedback questions at the end when you close out. We'll be posting all of the audio files and the presentations along with some other resources to our website after and you'll get e-mails post webcast with that information.

So, thank you again for everyone for participating. Thanks to all our speakers. We really appreciate your time and expertise. And, hopefully, folks might be able to join us for our next webcast. Thank you. With that, we'll close out.

Operator: Thank you. This now concludes the conference call for today. We thank you for you participation, you may now disconnect.

END