REPORT OF FINDINGS FOR THE SUSTAINABLE ENERGY SYSTEMS FOR WASTEWATER TREATMENT PLANTS

Report One

Prepared for:
Energy Trust of Oregon

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February 24, 2012

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MEMO

Date: April 20, 2012
To: Board of Directors
From: Philipp Degens, Evaluation Manager
Kim Crossman , Sr. Industrial Sector Manager
Subject: Staff Response to the Sustainable Energy Systems for Wastewater Treatment Plants Report

The Sustainable Energy Systems for Wastewater Treatment Plants (SES) initiative, run by the Oregon Association of Clean Water Agencies (ACWA), is a wonderful example of strategic energy management services provided by an organization other than Energy Trust. Energy Trust sees the promotion of such services by an industry trade organization as a positive step towards fostering broader adoption of SEM practices.

Partnering with ACWA allowed Energy Trust to engage with participating plants and help foster efficiency and renewable energy projects. ACWA is offering these services again in 2012 and is utilizing the same contractor that Energy Trust engaged for the Industrial Energy Improvement (IEI) pilot. As before, Energy Trust anticipates working with this next set of participants to develop efficiency and renewable energy projects.

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Introduction

Energy Trust of Oregon (Energy Trust) engaged Navigant Consulting to conduct an evaluation of the Sustainable Energy Systems for Oregon Wastewater Treatment Plans (SES). The SES was a series of workshops conducted to provide training and robust tools to Oregon wastewater utilities. The goal of the SES is for Oregon wastewater utilities to become energy independent through application of energy efficiency and renewable energy technologies, while achieving excellent environmental and water quality standards.

The Oregon Association of Clean Water Agencies (ACWA) organized and implemented the SES in collaboration with its partners, Energy Trust, Environmental Protection Agency (EPA) – Region 10 Sustainable Water Infrastructure Strategy, EPA – Office of Water, Bonneville Power Administration, Zero Waste Alliance and EPA Region 10 PEER Center, and Oregon Department of Environmental Quality (DEQ).

Seven workshops were held over a 12 month period, from April of 2010 to May of 2011. Participating utilities were required to contribute to the funding of the project on a sliding scale basis, based on the size of their wastewater treatment plant. Each community was asked to sign a letter of agreement that outlined their interest in the project at the plant and public works director level.

Participant requirements included spending seven full days (plus travel) to attend each of the workshops plus conducting work assignments between each workshop session. At the conclusion of the workshop series, participants were to complete and submit a final, written report.

The workshop participants included thirteen wastewater utilities plus the Oregon DEQ. Twelve of the participants, including the DEQ, submitted final written reports. Navigant Consulting reviewed each final report then contacted the participants to request a telephone interview. Interviews were able to be conducted with ten of the fourteen participants. Interviews were conducted between July of 2011 and January of 2012.

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Participant Interview Findings

Navigant interviewed ten participants who took part in the SES training: nine were from participating wastewater treatment facilities, and one represented the Oregon DEQ. This section summarizes the findings from the participant interviews for each of the key research areas. Key conclusions and recommendations from Navigant Consulting are in the next section, "Conclusions and Recommendations".

Motivation to Participate

Participants initially heard about the SES training from a couple of sources, with the vast majority of participants hearing about the program through their membership with ACWA. Five of the participants were contacted by ACWA's Executive Director, Janet Gillespie, and one participant had read about the program in the ACWA update newsletter. One participant said that he heard about the program while working on an EPA project.

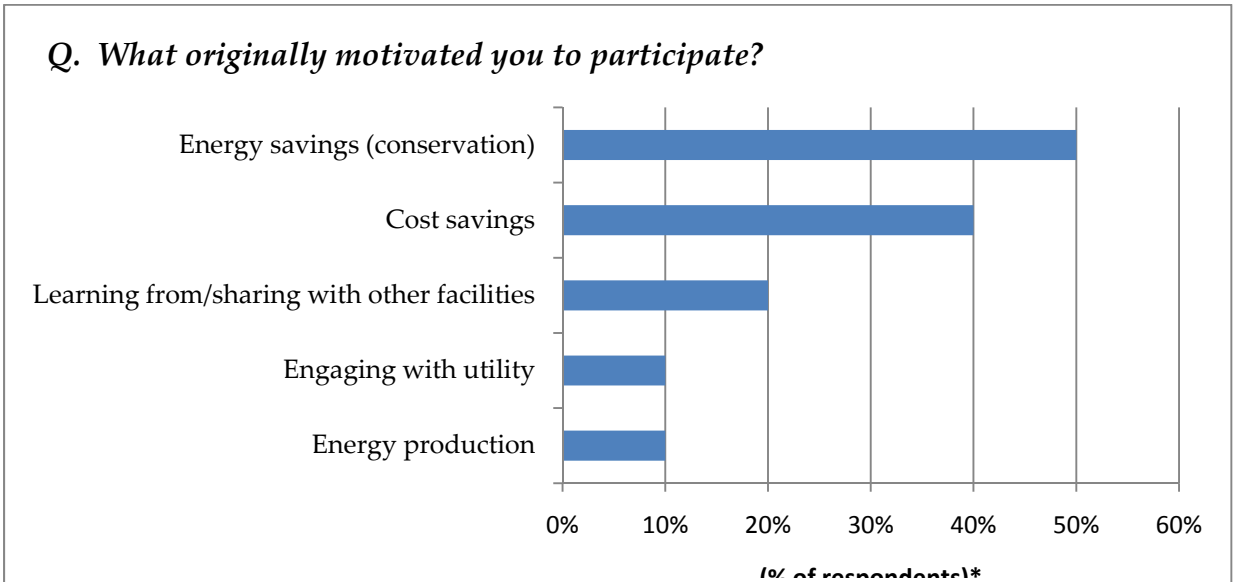
Navigant asked participants what originally motivated them to participate in the SES training. Figure 1 shows a summary of their responses. Some participants provided multiple responses; therefore, the total percent in Figure 1 is greater than 100. Half of the participants indicated that energy savings originally motivated them to participate in the program. They cited "conservation," "getting more sustainable," and "being energy conscious" as key motivators for their facilities' participation. Nearly half of the participants also mentioned cost savings as a key motivator. One of the participants put the high costs of energy in the wastewater management industry into perspective, saying:

> *"We are always interested in ways we can save money. If you look at budgets: it's wages, chemicals, then energy. You can't do anything with wages and chemicals, but you can with energy."*

Two participants were motivated by the educational value of the program; one participant said they were eager to learn, while another participant was eager to share some of the energy efficiency work that his facility had already done. Only one participant, from a larger facility, identified energy production as a motivation to

participate, and another participant said he was interested to engage with his utility on energy efficiency projects.

Figure 1: Key Motivators for Participation



Source: 2011 Navigant SES Participant Interviews (n=10)

**Some participants provided multiple responses; therefore, total percent may be greater than 100.*

Goals and Benefits of Participation

Participants reported a variety of goals and benefits that they hoped to achieve as part of the SES program. Two participants said that they were hoping to see how they compared to other facilities. One of the participants commented that he was eager to find out what other facilities are doing in terms of energy conservation and production. Other participants were hoping to gain a more concrete way of monitoring and conserving energy at their facility, including:

- setting up an energy management plan, or improving an existing one;
- developing a baseline for energy use; and
- improving an existing energy monitoring system, so that staff could see what they are spending every day to operate.

Seven of the ten participants reported that they had already achieved some of the goals that they set for the purpose of the program. Table 1 shows a summary of the goals and targets set by some of the interviewed program participants, in addition to the reported status of their goals after program participation. One participant noted that his facility was able to fully implement its energy monitoring system by the end of the program, which was the facility's biggest goal. Another participant said that he had achieved his original goals and more, commenting that the program had "inspired a lot of creative ideas." Two participants reported achieving numeric goals of 10% energy savings and 1MW reduction, respectively. Finally, one participant was very confident that changes made during the program would provide financial returns for the city.

Participants were asked if they received any unexpected benefits from participating in the SES program. One participant said that, before the program, he did not realize that his industry had access to some of the same utility incentives as the general public. He was happy to report that since then, his facility had completed a $60,000 lighting upgrade project; of which, $20,000 would be provided by the utility, and the project would save $4,000 in energy costs per year. Other unexpected benefits reported from participants included:

- learning different ways to treat wastewater and save energy;
- understanding energy asset systems and how to think from a system-wide perspective;
- gaining insights and ideas from the facility tours;
- networking with others in the industry and hearing about their successes and challenges; and
- becoming acquainted with energy monitoring and assessment tools.

Table 1: Summary of Goals and Targets Set by SES Program Participants

Part.	Goals	Targets	Goal Reporting
1	• Increase EE and engage staff on awareness • Conduct audit and develop baseline • Implement power monitoring and incorporate into SCADA system • Design and install turbo blowers	• Complete goals by 2011/2012	• Completed energy audit and power monitoring installation on SCADA • Weekly staff meetings with energy awareness as a standing topic • Proceeding with efficient blower replacement
2	• Increase renewable energy used on site • Design and construct : o digester mixing improvements and plant blower improvements, 2010/2011 o FOG receiving facility, 2010/2011 o additional 400 kW cogeneration system, 2015/2016	• 100% energy independent by 2015/2016 • 10% energy reduction by 2012/2013 compared to 2009 baseline, or 12 month running average consumption of 450,000 kWh/month or less	• Two new turbo blowers and vertical motion mixers constructed in 2011 • Phase I of FOG receiving facilities (increase biogas production) to be designed in 2010/2011, constructed in 2011/2012 • Looking into outfall paddle wheels for micro-hydro
3	• Establish an accurate energy baseline • Maximize available incentives • Promote program awareness throughout the city • Integrate EE into daily procedures	• Achieve 10% energy savings across core areas within five years	• Accurate baseline energy usage recorded for major facility processes by onsite data logging • Nearly $100k in utility incentives received or pending; $70k in government grants received for aeration equipment upgrade • Energy savings of 10.5% achieved

Part.	Goals	Targets	Goal Reporting

4	• Design and install:
	  o turbo blowers for aeration system
	  o current transformers on all influent and effluent pumps
	• Look for energy savings at UV system by optimization
	• Complete blower shutdown project with ETO's 90/90 program
		• Increase energy efficiency at plant by 5% within the next two years using 2010 baseline	• Current transformers installed on pumps and integrated into SCADA system
			• Blower evaluation completed and budget established for 2011/2012
			• Currently conducting blower shut down project in 90/90 program

5	• Continue improvement of cogeneration plant • Continue evaluation of FOG for energy source	• N/A	• RAS pumping and lighting upgrade installed • TF pump replacement budgeted for • Cogeneration upgrade out to bid
6	• Develop baseline energy use by June 2010 • Conduct energy audit and identify projects for implementation • Implement high efficiency turbo blowers and lighting improvements	• Reduce 5% of energy used per gallon of water treated by 2012 • Utilize 10% of total power from a renewable resource by 2015	• Anticipated that 119,355 kWh or $5,370 of energy saved by participating in program • Turbo blowers installed; lighting VFD, and controls projects identified • Completed scoping energy audit and baseline energy use identification
7	• Reduce overall energy use by participating in the ETO's Track and Tune program	• Reduce overall energy use by 6.5% over the next year	• TBD (participant confident that goal will be met)

Part.	Goals	Targets	Goal Reporting
8	• Continually monitor electrical energy consumption using MT&R modeling data • Develop and utilize energy management plans, practices, and policies that support energy efficiency • Install high efficiency turbo blowers • Implement various O&M improvements for improved efficiency gains	• Initial goal: reduce plant's energy consumption 10% by July 2011, and 20% by 2016. • Final goal: reduce electrical consumption by 1MW over 2011 compared to an approved MT&R baseline	• Documented savings well over goal of 1 MW • installed high efficiency turbo blowers as well as VFDs, piston pumps, mixers, and lighting upgrades

Activities Undertaken by Participants

O&M and Capital Projects

Participants reported undertaking a host of operations and maintenance (O&M) and capital projects as a result of the SES program. Reported O&M projects focused on optimization of plant equipment and operating settings, including:

- resetting of thermostats;
- ultraviolet (UV) set-point changes and optimization;
- variable frequency drive (VFD) optimization;
- MP blower turndown and shut-off cycle implementation; and
- air pressure sequencing reduction.

One participant realized that his facility had a boiler running on natural gas and should have been running off of heat from a cogen unit. This change caused the boiler's gas usage to drop from $12,000 per month to $9 per month.

Participants reported both energy efficiency and energy production capital projects, including:

- cogen unit upgrades and replacements;
- construction of a fat, oils and grease receiving station;
- a blower project for dissolved oxygen;
- VFD installation on recycle water;
- piston pump and mixer replacements; and
- interior and exterior lighting upgrades.

Some participants also indicated that they had projects in the planning phase. One participant said that his facility currently has a cogeneration upgrade out to bid. He said that, if left to run, their current unit would violate air regulations and, consequently, must be turned off for eight weeks out of the year; however, the new cogeneration unit could be operated year round. He added that his facility is also trying to get funding for a micro-hydro project. A second participant said that his facility has a long term plan for heat recovery from a sludge incinerator, but the project

is probably ten years out. Finally, a third participant said that his facility plans on implementing a supervisory control and data acquisition (SCADA) system in the near future.

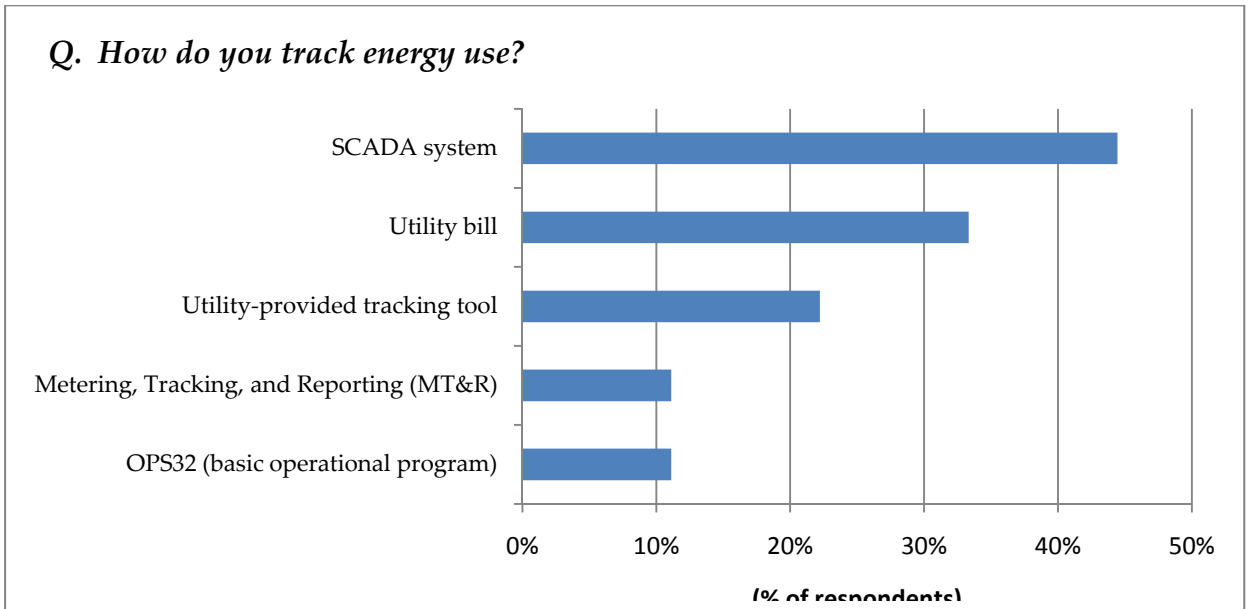
Half of the participants said that they have worked with Energy Trust in the past, and three participants said that they have communicated with their Energy Trust Project Development Coordinator (PDC). One participant said that he is already working with his PDC and has been approved for an incentive for a fat-oil-grease (FOG) project. He added that his facility is also in the feasibility stages for cogen and is in talks with the Energy Trust for that project. Another participant reported working with his PDC on the 90/90 program.

Improvements to Energy Management Practices

The SES program motivated nearly all participants to implement a method of tracking energy or to improve an existing method. Only one participant indicated tracking energy use "long before the SES." Another participant said that his facility tracked energy use before participating in the SES, but "not to the level they are now." Participants reported a variety of methods they use to track energy at their facilities. A summary of their responses is shown in Figure 2.

The most common response among participants was tracking energy with a SCADA system. One participant commented that his facility tracks power daily with their SCADA system and they review it in staff meetings. Half of the participants reported tracking energy use through their utility bill or a utility-provided tracking tool, such as E-Manager. The remaining participants reported tracking energy use with spreadsheets, other operational programs, or metering, tracking and reporting (MT&R) methods.

Figure 2: Reported Methods of Tracking Energy Use



Source: 2011 Navigant SES Participant Interviews (n=9)

**Some participants provided multiple responses; therefore, total percent may be greater than 100.*

Participants were asked if their facilities had formed energy teams, either prior to the SES or during/since the training. Eight of the ten participants interviewed responded that they had some type of energy team; of these, five said that they had formed their energy teams either during or since the training. One participant said that his facility's energy team was "loosely" organized. Another participant commented that his crew is so small that effectively the "whole staff is the energy team."

Participants were also asked if they had an energy management plan or policy in place at their facility. Six participants reported having some type of plan or policy. Of these participants, two admitted that their plans were "not formal." One participant responded that his facility had a loosely-based plan before the SES, but that the program helped them solidify their plan and "put it in writing." Another participant said that his facility had assembled an energy management plan thanks to the SES training and also a parallel program with the utility. Two participants said that their facilities did not have their own energy policies but that they followed city-wide energy and sustainability practices.

Five of the six participants with energy policies indicated that their policy included some type of numeric goal, including:

- 10 percent energy savings within five years;
- 100 percent energy independent within five years;
- 6.5 percent O&M savings (or about 320,000 kilowatt hours) over the course of a calendar year;
- Reduce 5 percent of energy used per gallon of water treated by 2012; and
- 1 megawatt reduction over one year.

Of these six participants, two said that they had already met their goals (10 percent energy savings and 1 megawatt reduction, above). One participant was confident that his facility would meet their O&M savings goal (6.5 percent), especially since they were also participating in the ETO's Track and Tune program. Another participant said that his facility continually lowers its energy usage goal:

> *"We keep making our goals harder to meet. The point of goals is to make them reasonable but that you don't always meet them."*

One participant, whose facility's energy management plan did not include numeric targets, said that his facility did not feel comfortable setting "hard and fast" numeric goals since they are at the beginning of a five-year construction project.

Continuing SES Practices into the Future

Nearly all participants reported changing some aspect of their energy management since participating in the program. Several participants reported that energy efficiency is more now commonly discussed at their facilities, including:

- regularly communicating benefits of efficiency to staff;
- sending energy reports to upper management; and
- having energy efficiency integrated into weekly and quarterly staff meetings.

Over half of the participants said that they are monitoring and tracking energy use in a more structured way since the training. One participant reported that he is regularly entering energy bills into a database, generating graphs, and seeing trends in energy use. Another participant reported that he now reviews energy use on a monthly basis.

Two participants indicated that they either have made operations changes since the training or are more aware of their operations.

One participant said that their plant's staff was unaware of demand charges before the training, so they now pay closer attention to the timing of turning on equipment. In addition, they added that the training has inspired them to perform a scoping audit of the plant and to meter more of the plant's equipment.

About three quarters of the participants indicated that they have a process in place which will allow them to continue implementing the SES in the future. Two participants said that they have built SES items into their energy team or regular facility meetings. Other participants said that they now engage with their utilities before replacing equipment, to see if incentives are available. One participant said that his facility now has a system of getting employee suggestions for energy efficiency improvements.

Participant Challenges

Challenges were met and overcome by the facilities that participated in the SES. The most common challenges reported by participants included internal program management issues and capital budget constraints.

About a third of the participants indicated that they encountered challenges associated with managing and administering the various SES projects. Such challenges included:

- getting the right forms, such as rebate applications, done and getting approvals;
- having to hire an outside engineer to conduct engineering analysis and determine if projects were feasible;
- finding someone to take charge of the energy program and ensure that it maintained its momentum; and
- the administrative burden of planning and carrying out a systematic program.

One participant said that he had experience setting up similarly structured programs, such as ISO 14,000. He said that he really sees the value in setting up such programs and enjoys doing it, but added that implementing these programs can be a challenge:

> *"It's tough for people to grasp how important it is. It's one thing to brainstorm technical solutions, but another to set up a program."*

One participant said that getting buy-in from some staff was a significant challenge, noting that some employees "don't care about saving energy." Most other participants, however, reported having no issues getting internal staff on board.

A few participants said that they faced challenges or constraints associated with budgeting for capital projects. Two participants from smaller facilities indicated that much of the workshop's energy production content did not apply to them, because they would never have the capital to undertake such projects. Another participant noted the budgetary challenges of efficiency projects, and suggested providing incentives based on payback and not energy savings:

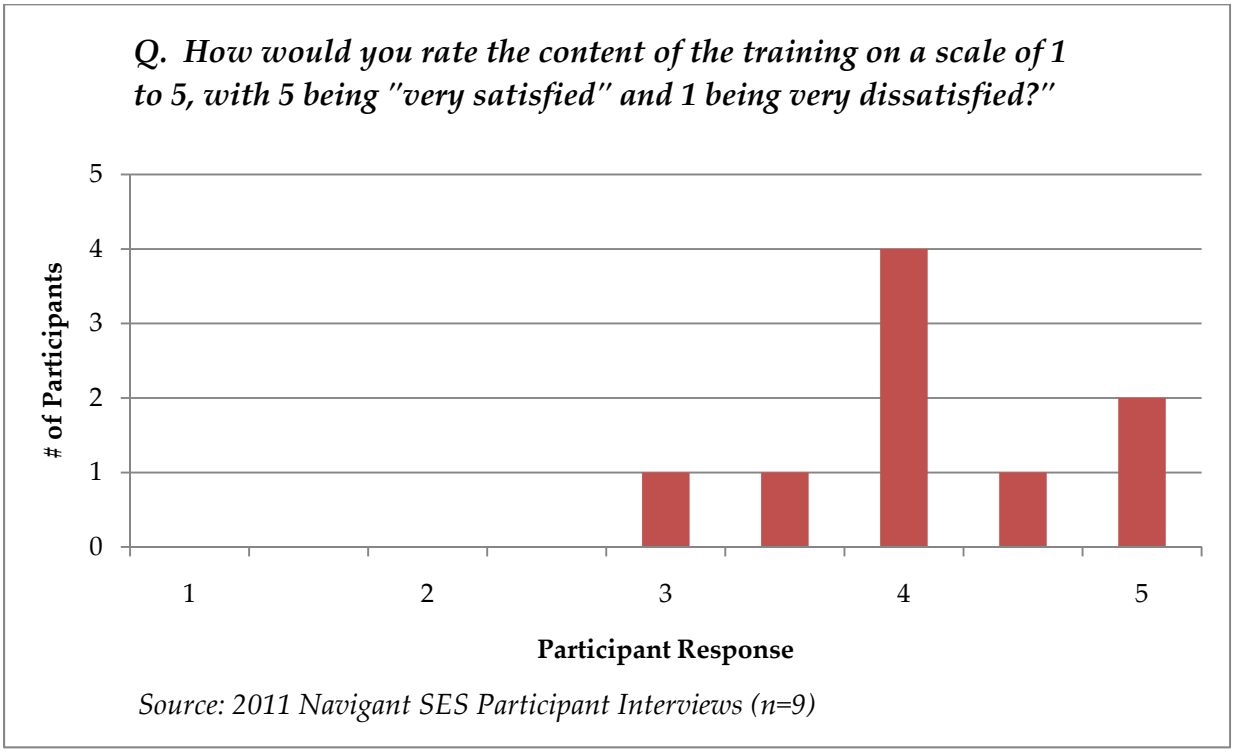
> *"Probably the biggest challenge is capital budget. It's a lot of work doing the math and doing the right thing with people's money… I would like to see incentives that bring payback down rather than base it on kWh. If something has a 10 year payback, Energy Trust would help bring the payback down to a certain level."*

Program Satisfaction

Training Content

Participants were asked to rate the content of the SES training on a scale of one to five, with five being "very satisfied," and one being "very dissatisfied." Figure 3 shows a summary of their responses. Participant responses ranged from three to five, with the majority of responses being between four and five.

Figure 3: Participant Satisfaction with Training Content

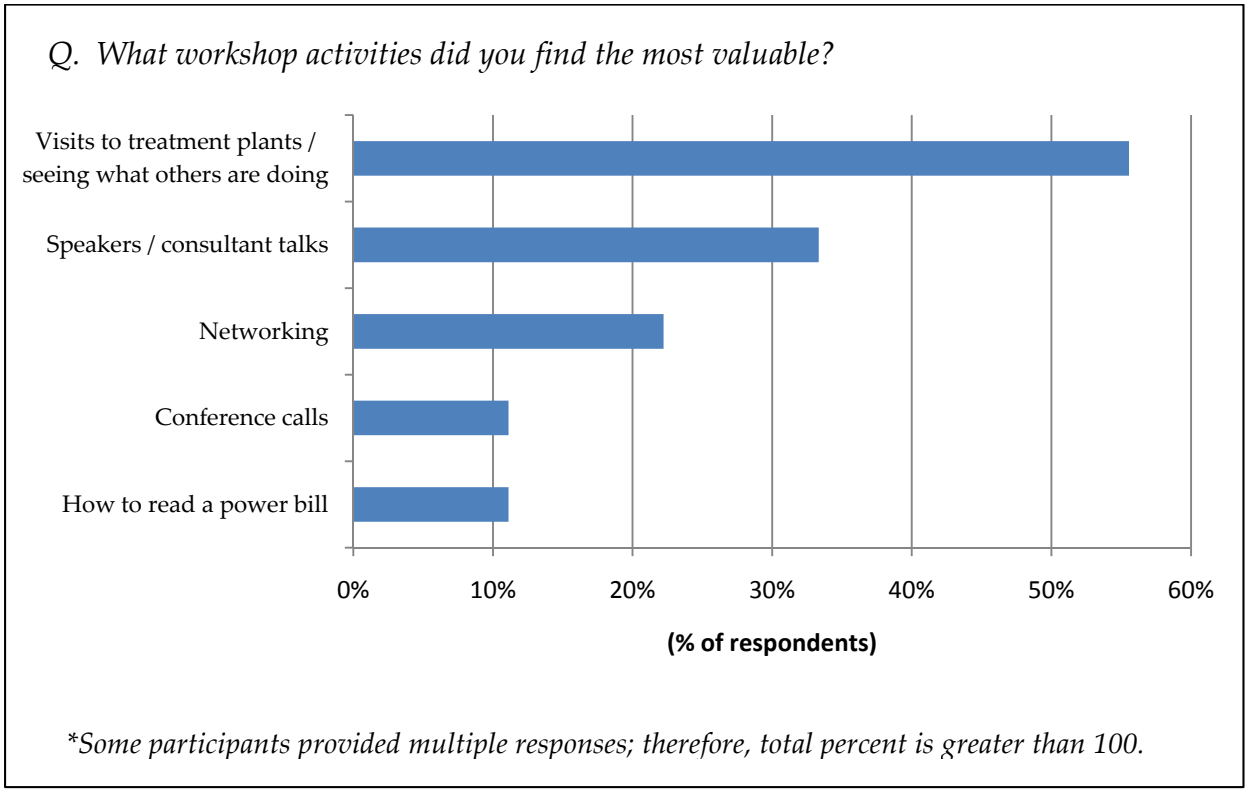


Source: 2011 Navigant SES Participant Interviews (n=9)

During the interviews, participants indicated which aspects of the training that they found the most valuable. Figure 4 illustrates a summary of their responses. Some participants provided multiple responses; therefore, the total percent is greater than 100. The most common response from participants was the value of visiting other treatment plants and seeing what other facilities were doing. This includes, as one participant noted, the facility's presentations to one another which "stimulated conversations and thoughts" from the participants. The value of seeing other facilities' successes, failures, and strategies was a common theme throughout the interviews.

On the topic of facility successes and failures, the participant from the DEQ provided an interesting insight. They said they now understand that some plants are afraid to undertake energy efficiency, because they fear that it will make them non-compliant. Although not mentioned by the participants who managed plants, facility tours and talks with plant operators can demonstrate that others have implemented energy efficiency measures without compromising their compliance.

Figure 4: Most Valuable Workshop Activities According to Participants



Over half of the respondents identified the water treatment plant visits as one of the most valuable components of the SES. Participants commented that the visits were "an important component" of the training, "time well spent," and an "opportunity for networking and talking through processes." Only one participant responded that the visits were not worth the effort. He said that he has been in the water treatment industry for a long time, so he has seen many plants over the years; however, he noted that someone with less experience would probably benefit more from the tours. Another participant said that they liked the facility tours, but noted that the long distance travel was difficult.

Navigant asked participants which facility tours they valued the most. Table 2 shows a summary of participants' responses, including specific highlights of each tour. Facilities were highlighted for various reasons including interesting energy production

systems, innovative operations or tracking systems, effective energy policy and management, and engaging staff.

Table 2: Facility Tour Highlights

Facility	What Participants Liked
Portland	Energy production (cogen); their energy policy and how they manage energy
Eugene	How they operated – "pretty innovative"
Gresham	Renewable energy (solar array)
Vancouver	"Cool, high tech;" staff seemed very engaged
Bend	Their SCADA system
Medford	Energy production (cogen)
RUSA	Their natural treatment system; "fascinating" facility
Roseberg	Innovative tertiary treatment system

Another common response from participants was the high value of the speakers and the consultants who spoke on various energy topics. Participants highlighted the following sessions as some of the most memorable talks:

- instruments to measure power use;
- measuring and tracking energy use;
- how to read a power bill; and
- alternative power

About one quarter of participants indicated that networking was the most valuable aspect of the experience. This was another common theme in the interviews that was clearly valuable to a significant number of program participants. About three-quarters of participants said that the telephone conferences held between workshops were effective; however, one participant said he thought the individual calls were more valuable, and another participant thought that the calls were unnecessary.

Navigant asked participants what parts of the training content they found the least valuable. There were few common responses among respondents. One participant did not find some of the homework assignments valuable, but did not say which ones specifically. He also felt that too much time was spent reviewing completed

assignments within each session. Two participants thought that some of the breakout sessions were too technical in nature. One participant did not have a technical background; and, the other participant had a technical background but said that he is "more interested in the big picture." Another participant commented that he did not like the EPA manual for planning process. He said that his facility has its own format for setting up an energy plan and indicated that there are other similar resources which are "not as cumbersome." Finally, one participant thought the session on how to communicate with management was the least valuable, commenting that the information was good, but could have been condensed.

The vast majority of participants indicated that the workshops had a good balance between talks by technical experts and group work, although one participant thought some of the group work was unnecessary. All participants said that the SES training materials were clear and useful. Two participants were very complimentary of the quality of the materials:

> *"They were very well done."*
>
> *"Yes, clear and useful. It was comprehensive and solid. We got a lot out of it."*

A few participants offered suggestions for the SES training materials. One said that the materials could probably focus more on energy conservation than energy production, as he felt that many utilities are not in a position financially to consider production. Another participant added that he would liked to have seen more energy efficient plant treatment processes, such as how to dewater sludge efficiently. A third participant said it would be nice to have a set of plan, do, check, act forms that they could use throughout the training process, or as he said "a more definitive set of management plan forms."

One participant commented that some of the reporting templates were changed after the training began, which caused some confusion. They also added that the flash drive and binders that were handed out could probably be consolidated onto a website.

Two participants said that it would be nice to continue the networking and support after the SES training. One participant commented that he had a great deal of support during the training, but felt overwhelmed after. He thought it would be useful to have follow-up meetings every six months for a year or year and a half after the training.

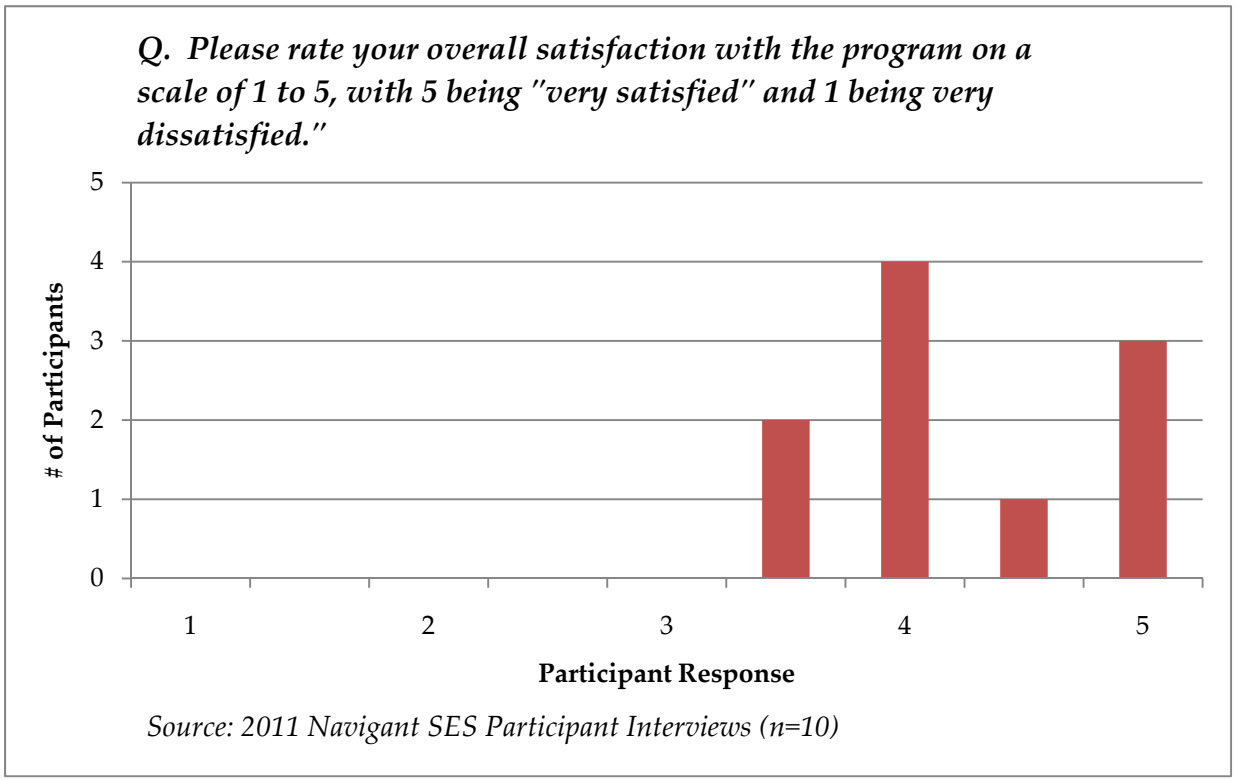
Another participant thought that a portal could be created online where SES training participants could continue to share ideas:

> *"Have a website where all could go and communicate about what they are doing, what works and what doesn't work. Continue the networking. That would be valuable."*

Overall Program Satisfaction

Overall, program participants expressed a very high level of satisfaction with the SES program. Figure 5 shows participants' responses to the question "Please rate your overall satisfaction with the program on a scale of one to five, with five being very satisfied, and one being very dissatisfied." All participants interviewed gave the program a score between 3.5 and five. One participant responded "four to five," which is represented as a 4.5 in the figure below.

Figure 5: Overall Participant Satisfaction with Program



Source: 2011 Navigant SES Participant Interviews (n=10)

An evaluation handed out at the final SES training workshop provided similar satisfaction findings to those gathered in the interviews. Of the eleven evaluations returned, 80 percent (8) ranked the workshop as "excellent" and 20 percent (2) as "good." No one marked the workshop as "average" or "needing improvement." In terms of the program content, three of the eleven responding participants would have liked more time spent on energy efficiency, and four would have liked more time and effort spent on renewables. Over half of the participants (6) wanted more time and effort spent on sustainability.

Participants were asked, overall, what were the most positive aspects of participating in the SES program. Figure 6 shows a summary of the common participant responses. Some participants provided multiple responses; therefore, the total percent in Figure 6 is greater than 100. Three quarters of the participants said that they enjoyed the networking aspect of the training. Participants enjoyed "getting to know other facility people" and "getting a broad cross section of people from the region in a room." Several participants commented that the facility tours, particularly ones with overnight stays, provided a great opportunity to network.

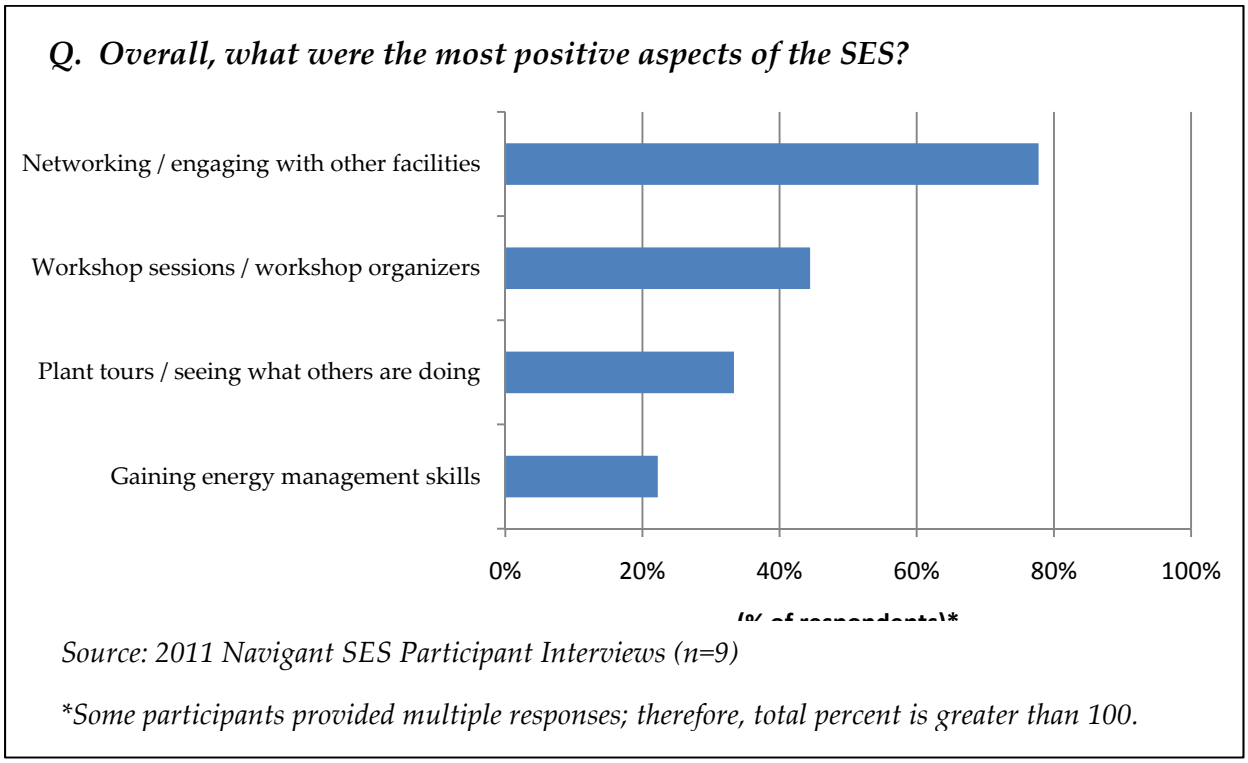
Five of the participants highlighted the quality of the workshop sessions and the exceptional leadership of the ACWA's Executive Director. Participants were complimentary throughout the interviews, commenting on how well meetings were organized and how they created a great environment for learning:

> *"Janet was very organized and her team was great."*
>
> *"Most positive aspects were Janet and her command of facilitating this kind of workshop. She keeps things on task and she's interesting to listen to."*
>
> *"Janet is really good at getting people around a table on a subject and keeping them on track… I have never seen anyone run a meeting like that. After a break, people sat down and got back to business."*

Other positive aspects of the SES reported by participants included the facility tours, the presentations by consultants, and gaining energy management skills. Three participants identified the plant tours as some of the most positive aspects of the training. Participants liked seeing what other facilities were doing for efficiency and

seeing how other plants operate. Other participants liked how the program provided them with energy management skills they could bring back to their plant.

Figure 6: Most Positive Aspects Overall of the SES



Source: 2011 Navigant SES Participant Interviews (n=9)

**Some participants provided multiple responses; therefore, total percent is greater than 100.*

When asked about any overall negative aspects of the program, most of the participants had nothing to say. Two participants responded the time commitment of the program, and two participants said traveling to the different locations. Another participant thought that the plan, do, check, act was too long of a process.

One participant suggested that the portfolio manager aspect of the training be explained in further detail. They said that the first time they used the tool, they received a score of 35, but was unsure if this was good or bad. This prompted them not to use the tool a second time. They suggested it would be useful to have a baseline set of metrics ahead of time to establish a concrete goal. They also said it would be nice to summarize the results of all of the participants so they could understand how they compared to one another.

Modifications to Program Structure

Navigant asked participants, hypothetically, if they would still find the SES training valuable if it were changed in the following manner: shorter in duration (three to four months), have more focus on energy efficiency, and not require travel across the state (keeping program within a geographic area). The majority of participants agreed that, overall, this would be as valuable. One participant commented that changing the program in this way would make it easier to gain approval from management to participate, and could also allow smaller communities to attend. Another participant suggested focusing on efficiency for the main training, but having a separate renewable training for those who are interested. A third participant thought that a hybrid approach could be valuable, in which regional meetings are held every few months and a larger statewide meeting is held every six months.

Three participants cautioned that a more regional training could hurt what they see as some of the program's major strengths, namely the facility tours and the networking. One of these participants commented that the larger geographic area provides a greater diversity of facilities, and thus a richer experience:

> *"If you could get the same diversity from a smaller geographic area, then fine. But I liked the diversity. I think it may hurt the social and networking aspect – not having travel and overnight trips. These brought people closer."*

Another participant added that it may be difficult to find enough participants in one region, and added that video conferencing could be a solution to bringing distant plants together.

> *"It would be hard to get enough participants in a region. Central Oregon probably only has four wastewater plants, and they already know what everybody else is doing. It would be nice to accommodate video conferencing for those that can't be present."*

Advice for Future Participants

Participants were asked what advice, if any, would they provide to other wastewater organizations beginning the SES process. Three participants suggested that facilities have a good understanding of their energy use coming into the program, whether that means doing their own tracking and trending or having an energy audit done at their facility:

> *"Engage with your utility provider and get going on doing an energy audit at your facility. All utilities should have this done before they have their first meeting. That should be a prerequisite."*
>
> *"Make sure you understand the energy you are using. Make sure you are tracking, trending, and understanding your current usage."*
>
> *"Get an energy audit done by utility in advance. Make sure you do data logging upfront to hit the ground running."*

Another participant, from a smaller facility, cautioned facilities not to underestimate the time commitment required for participation:

> *"Make sure they have the time to see it through to the end."*

Finally, one participant encourages facilities not to underestimate the advantages of creating a structured and formalized energy plan:

> *"Really follow the plan, do, check, act process. Really get a structure going within your organization. That facilitates doing the other technical opportunities."*

Conclusions and Recommendations

Conclusions

Participants are mainly motivated to undertake the SES training by the potential for energy and cost savings. Other key motivating factors include learning about energy efficiency and production, and seeing what other facilities are doing for energy management.

Participants reported undertaking a vast array of O&M and capital projects as a result of the SES program. Capital projects included both energy efficiency and energy production, although production projects were reported mainly by larger facilities.

Nearly all participants interviewed said that they had some type of energy team in place since taking part in the SES, and over half of all participants reported having an energy plan or policy in place.

Participants indentified the facility tours, consultant talks, and networking as some of the most valuable aspects of the training. The organization and leadership of ACWA's Executive Director and team were highly valued by all participants.

The most common challenge reported by participants was issues related to managing and administering the various SES projects, such as completing proper forms, hiring outside help to determine project feasibility, and planning a systematic program. Travel to facility sites was also a common challenge reported by participants because of the time involved.

Participants are confident in their ability to continue implementing the SES in the future. Some participants have built principles learned from the SES into their energy teams or regular facility meetings to ensure future compliance.

The majority of participants indicated that the workshops had a good balance between talks by technical experts and group work. All participants said that the SES training materials were clear and useful, but a few offered suggestions for improvement.

Participants said that the time spent on the SES was reasonable; however, nearly all agreed that a shorter duration would be better.

Most participants said that a more regional SES would be fine, as long as the networking aspects of the training and diversity of facility tours were not lost. In

addition, most said that a greater focus on energy efficiency rather than energy production would be more beneficial.

The SES was considered a success by all participants and has made them more likely to undertake initiatives with Energy Trust in the future.

Recommendations

Energy Trust should continue to sponsor the SES training implemented by ACWA. The SES should remain largely in its current form but Energy Trust should consider making the following changes:

- To increase facility participation, consider making the program shorter in duration (three to four months), having more focus on energy efficiency, and reducing the amount of travel required, as the vast majority of participants interviewed were in favor of this approach.
- Begin to tailor the content to apply to technologies used at smaller plants. The first cohort included most of the larger facilities and subsequent sessions will need to recruit smaller, regional plants.
- Leverage participants enthusiasm and their plans to continue their activities by:
    - Asking past participants to speak at current trainings; and
    - Hosting annual follow up meetings to discuss progress with initiatives.
- Continue the networking aspects of the training as these are highly valued by participants. If overnight stays are eliminated from the training, consider offering other networking opportunities for participants.
- Have participants begin metering and recording energy consumption prior to the start of the program to establish a baseline. Make this a clear expectation in program recruitment materials;
- Consider other ways to structure the training in addition to recommendation one, including:
    - having a main training session track which focuses on efficiency and an additional renewable training session for those who are interested. The renewable track could be offered every other year instead of annually.

  - focusing the renewable training sessions on modest projects that smaller facilities could realistically undertake, such as photovoltaic arrays or methane capture for running boilers.
  - keeping the majority of training sessions regional to increase participation, but offering statewide sessions once every six months to a year to broaden the diversity of facility tours and networking experiences.
  - allowing participants to join some sessions remotely via web conference, if appropriate.
- Program recruitment materials discussions should convey that participation is a significant commitment in time and resources, both to travel to and attend the workshops and to complete the assignments outside of the workshops.
- Consider facilitating ongoing support after the SES training, such as follow up events or an online communication group.