OREGON ASSOCIATION OF PROFESSIONAL ENERGY MANAGERS

P.O.Box 6764, Portland OR 97228-6764 www.oregonapem.org

SPRING NEWSLETTER WWW.OREGONAPEM.ORG 1ST QUARTER 2011

SPRING FORUM: ENERGY EFFICIENCY IN DATA CENTERS

We are excited to announce our Spring Forum on Energy Efficiency in Data Centers, to be held March 18th in Salem. Whether you work on existing data centers or new data centers this forum has something for you, including a tour of the State Data Center in Salem where you can actually walk in a "hot aisle" and a "cold aisle" firsthand to see what they are all about, and you will see how well their outside air economizers have been keeping this data center cool.

Jon Haas, Director in Intel's Eco-Technologies Program Office, will teach you about data center metrics and best practices in data centers, including the latest ASHRAE recommendations for temperature requirements inside data centers.

John Pappas of Mazzetti Nash Lipsey Burch will provide you with the information you need to identify energy-saving opportunities in existing data centers, whether you are in a 40,000 square feet data center or a 200 square feet data center that is inside an office building. John will present detailed information on airflow dynamics inside data centers and explain how to increase the effectiveness of the airflow so that the total airflow can be reduced, resulting in fan savings – and eliminating the knee-jerk reaction to adding another CRAC (computer room air conditioner) unit to "solve" an over-heating issue.

EasyStreet® Online Solutions, Oregon's largest independent provider of corporate IT serves to the Northwest, will explain the IEC (indirect evaporative cooling) systems they installed in their new Beaverton data center, along with energy efficient ultrasonic humidification and the use of chimney stacks to remove the heat from their servers, and the retrofits they implemented at another data center for energy savings.

Brandon Adams of McKinstry will provide details on a new data center opened in the Pacific Northwest that amazingly has NO MECHANCIAL COOLING! Many thought that this was an impossible task but this data center is now online and operational, and you will find out how they were able to accomplish this extraordinary feat.

A representative from the Energy Trust of Oregon will be on-hand to provide you with information on incentives that are currently available specifically for data centers.

In addition to all this the forum is being held at a net-zero energy building – the Pringle Creek Community Center, where you can tour the building to see their energy efficient ground source heat pump, CO2 controls, natural ventilation, and their live energy-dashboard that shows exactly how much energy their PV solar system is producing throughout the day.

There will be ample time to ask your data center questions of the experts, and network with peers and leaders in the energy efficiency industry. Go to our website www.oregonapem.org to register for the event, get driving directions, and see the day's schedule. It promises to be an informative and exciting event, and we look forward to seeing you there.

THIS NEWSLETTER INCLUDES

PRESIDENT'S CORNER

Top o' the New Year!! By the time you are reading this all the shiny will probably be worn off; but it's still a new year with new opportunities for energy savings and for clean energy. Did you catch President Obama's State of the Union Address?

"So tonight, I challenge you to join me in setting a new goal: by 2035, 80% of America's electricity will come from clean energy sources. Some folks want wind and solar. Others want nuclear, clean coal, and natural gas…. And to help pay for it, I'm asking Congress to eliminate the billions in taxpayer dollars we currently give to oil companies."

Got to love it- picking a fight with the 500 pound gorilla, the oil companies, to fund renewable energy research and development. I'm rootin' for the underdog. With all the sharp students being turned out by the energy programs at our colleges in Oregon, you've got to hope he wins this one and brings some of the renewable energy research and jobs here to Oregon. About that "clean coal," I don't know what FactCheck.org would have to say about it; but to me that's an oxymoron. Even if fuel prices go high enough that it is economically feasible to fund liquifaction, gasification, sequestration and carbon capture, or to create other clean combustion processes for coal on an industrial scale; in my book there's nothing clean about that dust, slurry ponds, black lung and blowing the tops off of mountains.

Oregon APEM is planning a big year. We have our new officers in place. I was re-elected as President, with Elin Shepard as Vice President, SaraHope Smith was re-elected as Treasurer, and Colleen Collins as Secretary. As always we are striving to deliver useful, relevant information to our members through our Forums. We are kicking off the year covering Energy Savings Opportunities in Data Centers at the Spring Forum in Salem. The Summer Forum will take a hard look at what it takes to make energy savings stick. Fall Forum will cover boilers and heating plants and Winter will cover strategies and tools to deliver energy savings. We'd love to hear from the membership with energy management success stories and case studies to publish in the Newsletter. Send them to our Newsletter Lead, Matt Daly at mdaly.energy@gmail.com. Look forward to seeing all of you at the Forums this year. And don't forget that here at Oregon APEM we are doing our part to put the double E (Energy Efficiency) back into GREEN.

Don Holland
President, Oregon APEM

Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did do.

So throw off the bowlines. Sail away from the safe harbor. Catch the trade winds in your sails.

Explore. Dream. Discover.

Mark Twain

NEW BOARD MEMBERS

With the close of 2010 Oregon APEM comes a changing of the guard. We say good-bye to several board members while welcoming in a couple new. Board members that will not be returning in 2011 include Brandon Adams, Christie Sphoon, Jessica Rose and Kellee Jackson, each of whom dedicated many hours of hard work to the organization and held a range of positions within the board. Most recently Brandon Adams had served as Treasure for the board. Christie Sphoon was the Newsletter Committee Lead. Jessica Rose was the Lead for several forums. Kellee Jackson had served as the President of the board. We greatly appreciate these members and their efforts to provide quality experiences for all Oregon APEM members.

Returning board members for 2011 include Don Holland, President, Elin Shepard, Vice President, SaraHope Smith, Treasurer, Colleen Collins, Secretary, and Mike Bailey, David Christie, Dave Cone, Matt Daly, Rich Davis, Mitch Dec, Rick Durst and Jeff Hamman. Joining us are Lauren Donley and Will Miller. Lauren Donley is a second year student in the Energy Management Program at Lane Community College. Will Miller has been directly involved in the energy efficiency industry for over 30 years and currently is acting as a technical advisor to the Existing Buildings Program, Energy Trust of Oregon. We look forward to working together to bring our members high quality forums and networking experiences throughout the coming year.

WINTER FORUM RECAP

On Friday, December 10th 2010, we held our winter forum, the "The Energy Manager's Crystal Ball," at McMenamin's Edgefield. Our Winter Forum brought together two timely and interesting speakers, recognized the efforts of the 2010 Energy Manager of the Year Award Winners, and presented our members with a timely update of the ETO New Building Efficiency Program.

Charlie Grist, Northwest Power & Conservation Council, explains $1 billion in utility energy savings

To kick off the morning Charlie Grist spoke about the energy savings achieved by Northwest Utilities through energy conservation programs. From 2005 – 2009 utilities have spent about $1 billion on conservation programs, and realized about 900 MW of savings. Conservation is a much cheaper way for electric utilities to meet their increasing electric demands than increased generation, and is the focus of many utilities in the coming years. Charlie highlighted this in his presentation, contrasting the average cost for a utility to purchase electricity on the open market since 2005 at $30 to $60 per MWH with the average cost for a utility to "purchase" electricity through conservation has ranged from about $10-$15 over this same time period. The cost for a new large-scale wind farm is about $100 per MWH, which is also about the same cost for a new nuclear utility plant. Clearly conservation remains the most cost effective way for utility companies to satisfy future demands for electricity.

Following Charlie Grist was Nick Leritz of Ecos. He presented information about the new (still under development) ISO50001 Energy Management System Standard. This is an ISO (International Organization for Standardization) protocol being developed by representatives of 50 countries that is designed to provide organizations with a methodology to improve their organizations' energy efficiency. It involves establishing an energy baseline, identifying energy reduction opportunities, developing a strategy to reduce energy, implementing the strategy, and evaluating the progress. It is aimed at industries, commercial enterprises, and the federal sector. ISO50001 is expected to be finalized and released in July 2011.

Elin Shepard of PECI (Portland Energy Conservation, Inc.) followed Nick Leritz. She provided an update of the revised ETO (Energy Trust of Oregon) New Building Efficiency Program. Some of the changes to the program this year include: Introducing a $2,500 incentive for owners to hold an Energy Charrette during the schematic design stage, increasing the incentive levels for new buildings energy saving projects, providing even higher incentive levels for projects that exceed 15% overall savings, eliminating many standard track incentives (such as high efficiency lighting and HVAC, VSDs, DCV, etc.) and developing standard spreadsheets that will determine the incentive for these "straightforward" measures that used to be in the standard track path. A small commercial pilot project is underway that utilizes the Core Performance Guide (Oregon Addition).

Oregon APEM President Don Holland with Energy Manager of the Year awardees Catherine Diviney and Nancy Bond, Portland Public Schools

As is tradition the Energy Manager of the Year Award was presented during the winter forum. The award for 2010 was given to the team at Portland Public Schools consisting of Catherine Diviney and Nancy Bond. Catherine is the Energy Specialist and Nancy is the Resource Conservation Specialist for the district. This District is the largest school district in the state with about 100 buildings averaging 65 years old. Being a large public entity entails much bureaucracy and fiefdoms that can often pose impediments to energy conservation efforts. Nevertheless Nancy and Catherine have successfully implemented behavioral conservation efforts, energy efficiency projects, and renewable energy generation projects. Specific projects include installing Solar PV on roofs of nine schools, installing high efficiency T8 fluorescent lights in all of their gymnasiums, roof insulation projects, boiler upgrades, and entering into a performance contracting agreement to generate energy savings.

In addition to our wonderful speakers members enjoyed several networking breaks during which they had time to meet other members and ask additional questions of our speakers. To see more photos and to see PDF versions of the presentations please visit our website at http://www.oregonapem.org/Forums.aspx.

HAVE CARE WHEN USING THE EUI

By Mike Bailey, Ecos Consulting, edited by the Newsletter Team

Often when a site or facility uses multiple forms of energy such as electricity and natural gas or another form of fossil fuel – as most do – these consumption numbers are converted to Btus – British thermal units – to allow the development of a total building energy value. This is often then divided by the size of the building in square feet to generate a number called the Energy Utilization Index – Btu / SF/ Yr – often referred to as "EUI". While the equation of 1 kW = 3415.179 Btu / hour allows this conversion to happen – just because we "can" does not mean we "should"!

Here are my basic reasons why I don't like this approach:

1. While the equation allows both fuels and electricity to be "converted" to Btu and then combined, fundamentally we are mixing apples and oranges: fuels and electricity are very different forms of energy. While electricity can be converted to heat (Btu) directly through resistance heating, most electricity is used for non-heat purposes such as lights, motors, computers, et cetera, where heat as Btu is a waste byproduct; fuels, on the other hand, are ONLY used for heat.
2. Fuels are usually a more cost effective way to deliver heating (Btus). Fuels are more heat energy "dense" – more Btu per dollar. So a site using gas for HVAC heating, water heating, and some cooking could have almost equal annual costs for gas and electricity, but the combined Btu graph wouldn't show which portion to the total Btu consumption would be for gas (approximately 70%+ in this scenario) or for the electricity-using systems. With such a combined EUI, the costs and potential opportunities for savings for each type of load are invisible.
3. Some sites may use electric heating for HVAC or water heating, while others may have gas or even fuel oil. Such a site's Btu mix would look very different. Fuel burned to produce heat is typically 60-90% efficient (since some heat is lost in exhaust) while electric heating is very equipment efficient (95-98%). But electric heating is much more expensive (on a Btu per dollar basis) and has a larger carbon foot-print (since electric generation only converts 30-50% of the original fuel energy to electricity). The result is that sites with more electric equipment will be below average (that is, "efficient") on a Btu / sq-ft basis but above average on a cost / sq-ft or carbon impact basis. So while "on paper" kBtu / yr / sq-ft or Energy Utilization Index (EUI) can be used to compare sites with different equipment, it easily provides misleading information that is not helpful in actually reducing either energy costs or consumption.
4. Btus are not understood by business management or finance organizations. A cost index, dollars per square foot, can be directly compared to other known costs of the business such as labor, deprecation, rent, custodial, and so on, and even productivity; but the Btu is a strange energy unit which avoids definition or meaning in a business context. This is one more barrier to clear communication between facility staff and engineers on one side, with the management and finance teams that approve and fund projects on the other. It's hard to reach a consensus when you're not speaking the same language.

These are the main reasons I don't like using Btus. Personally, I have also found that this issue is a rough gauge of an organization's energy management "sophistication": If the organization uses a combined Btu index it shows it is in the beginning stages of understanding how energy is being used and how to manage it. If it doesn't combine the Btus, it shows a higher level of maturity and understanding of these issues. For experienced energy managers, the Btu-based EUI is still a very useful tool – but we need to do a much better job of communicating the limitations and hidden assumptions, and speaking in the language of the management teams.

OP/ED ON BTU

By David Christie, McMinnville Water & Light, other board members, and the Newsletter team

The suggestion that the Btu-based EUI was not the best choice of energy management tools – regardless of the validity of the reasons – caused quite a stir amongst the Oregon APEM board members. Several members gave comments, led by David Christie of McMinnville Water & Light; the comments have been edited into a single document.

Btus have been used to establish whole-building EUIs for 35 years and more. Granted, the combined EUI will never tell us everything we need to know about a building's energy use, but it is a useful tool for many reasons. And as you say, the sophisticated Energy Manager will not combine the Btus of the different energy sources separate, and will further use the Btu-based EUI to present a wealth of knowledge. Here are some reasons the Btu-based EUI remains the tool of choice for Energy Management – especially when compared to the dollar-based cost index.

1. The cost based metric, while of course useful when talking to financial managers, is easily distorted. Utility charges are volatile and may have nothing to do with energy management. Utility rates change from year to year, cost adjustments are common, utility rates in different service areas vary, sometimes quite widely, and weather changes can have a noticeable impact on the utility bill. Cost indexing would not easily account for any of this, and indeed the unsophisticated management team might mistake these anomalies as signs of efficient or inefficient facilities.

   Btus, on the other hand, are constant. Although the cost of a kWh delivered by an investor-owned utility is quite different from one delivered by a public utility district, the 3415.179 Btus are identical regardless of year, service area, utility's cost; and adjustments for weather, for example using Btu per square foot per degree day, are easily done.

2. The EUI allows for easy comparisons. A facility's actual use can be made against an established target or baseline. Comparisons of succeeding or multiple years can be made to show changes in performance or the effect of energy efficiency improvements; and this comparison is valid despite utility rate changes and can be adjusted for weather. Comparisons of facilities of similar types, even those of different sizes or in different service areas, can be made easily and accurately.

3. The utility meter records the energy used by a facility, and this is how energy charges are determined, whether it is in kW, kWh, therms or gallons. The Btu-based EUI uses this data, and as described above, uses it as a constant regardless of utility rates, service areas, etc. A useful cost index can be extrapolated out of this, to good effect for the financial team, but the sophisticated Energy Manager would need to take pains to make clear that, for example, a multi-year comparison of sites across the state is "a cost index in today's dollars using averaged utility rates and adjusted for weather changes" and quickly breaks down.

4. I agree that fuels have more "energy intensive" – and some fuels are a better choice for different processes for a variety of reasons – but this is not always the same as more Btus per dollar. If your point of view is based on Portland area energy charges and comparing PGE rates to NW Natural, the use of fossil fuels for heating may be less expensive. But for heating a building served by your typical public utility district, this is not the case, as such rates are perhaps half of PGE's.

As you say, electricity is used for purposes besides resistance heat. This other use, of course, includes heat pumps, which are used not so much to create heat but to move it from one location to another, and are two, three or even four times more efficient at delivering heat to a building than the resistance heater. This means one kWh of electricity delivers, not 3415.179 Btu, but anywhere from 6830.358 to 13660.716 Btu. Even at investor-owned utility rates, a heat pump's Btu/$ compares very well to fossil fuels. A facility with heat pumps may well have a lower cost index than one with modern gas heat.

To summarize, we are in agreement that a combined EUI has limited use, although it can be used to easily make quick comparisons between facilities, years, et cetera – and more accurately than a cost index, and can be used as an effective starting point in cost discussions. The sophisticated Energy Manager can use the split EUI – with Btus from electric and fossil fuel energy sources separate – to much greater effect, and as a better illustration to the finance team. Neither the EUI nor the cost index will clearly and accurately present everything the Energy Manager or finance team needs to know about a facility's energy consumption and its opportunities for savings, but each is useful in its own way.

Editor's note: For a slightly different perspective, check out the EPA's Energy Star for buildings web site. The discussion and the link to the technical manual, "Energy Star Performance Ratings: Methodology for Incorporating Source Energy Use," can be found at http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_benchmark_comm_bldgs. It should be noted that this some of us in the Pacific Northwest feel some dissatisfaction with this methodology, since about 40% of the electricity we use comes from hydroelectric sources, while the EPA uses the average of all electric generation across the nation.

POWER UTILIZATION EFFECTIVENESS IN DATA CENTERS

If you have or work with data centers you probably have heard the acronym “PUE” used to refer to a data center’s energy efficiency. But do you know how PUE is calculated? How it should be used? Or how it is often miss-used? Did you know that the new Energy Star rating system for data centers is largely based on their PUE? Did you know that if you implement a virtualization project, without improving your HVAC system performance that your total electricity use will go DOWN (good), but your PUE will go up (bad) and your Energy Star score will drop (bad)?

PUE is a ratio that was developed years ago by The Green Grid, a nonprofit IT industry organization that focused on improving the energy efficiency of IT equipment. “PUE” is the acronym for Power Usage Effectiveness. It is the ratio of total facility electricity used by a data center, divided by the electricity used just by the IT equipment. See Figure 1. A related term is “DCE” or “DCiE” which is short for Data Center Efficiency. DCE is the reciprocal of PUE expressed as a percent. DCE was developed by the US Department of Energy, but has fallen out of use as most of the industry as adopted PUE.

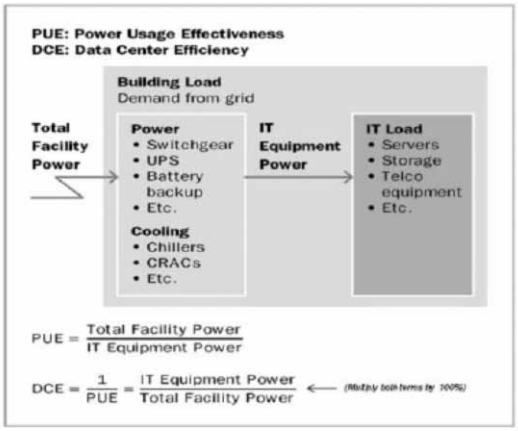

Figure 1: PUE and DCE defined - Source: The Green Grid

The average data center has a PUE of 1.8-2.2 - with lower being better. This corresponds to an average range of 45%-55% for DCE - with higher being better. As shown in the figure, neither number evaluates the “productivity” or “output” of a data center. Instead the numbers are the ratio of an input: electricity. This is because each data center is very different with different purposes. Some are used for mostly data storage, others are for hosting internet sites, and still others are for processing. So neither PUE nor DCE measure data center total productivity or efficiency.

What PUE does do, is provide an indication of how much energy is used by the data centers support infrastructure of power distribution, battery back-up power, and HVAC systems. None of these systems do any direct work or production for a data center - but they are necessary for the data center to operate. Excessive energy use by support systems is wasteful. The goal is to minimize energy use by the support systems relative to the power used directly by the IT equipment. This is the primary objective of PUE and DCE.

Unfortunately, PUE can be over-used or miss-used, and in some cases can produce misleading results. This is because PUE cannot evaluate how efficiently IT power is being used to achieve the intended results of the data center (production). It is possible that a data center with a higher (worse) PUE can have lower total electricity use AND higher processing or storage capacity (output).

An example of this issue is when IT load is reduced because of implementing virtualization or refresh (replace old with new equipment). This would reduce the energy used by the IT equipment and the total energy use and cost of the facility. However, if no changes are made to the facility power and HVAC system, the PUE will get worse - because with a smaller IT load, the share of total power used by the facility systems INCREASES.

For this reason PUE and DCE should be used with caution. PUE was not intended to be used to compare different data centers. It was intended to help data center owners and operators realize how much energy was used by their facility systems. But they need to be careful not to let PUE numbers prevent the implementation of financially attractive projects such as virtualization and faster equipment refresh.

TRAINING OPPORTUNITIES

On-Line Lighting seminars from the Northwest Trade Ally Network. Go to http://www.northwest-lighting.org/default.aspx

T8 Lighting Project - Time-limited Marketing Tools
Date: March 10, 2011
12:00 - 1:00 pm
Presenter: Sarah Gabel, Energy Efficiency Program Marketing Consultant

Lighting Retro-fit By Design: Beyond One-for-One Replacements
Date: April 14, 2011
12:00 - 1:00 pm
Presenter: Doug Oppedal, LC Northwest Trade Ally Lighting Specialist

Increasing Savings and Customer Value through Controls
Date: April 28, 2011
12:00 – 1:00 pm
Presenter: Doug Oppedal, LC Northwest Trade Ally Lighting Specialist

PGE, with co-sponsors Energy Trust of Oregon, the Northwest Energy Efficiency Alliance and Better Bricks, continues its free energy efficiency class series. RSVP as soon as possible; contact PGE at 503-464-8020, or email PGE.Seminars@pgn.com.

Fundamentals of Efficient Lighting & Controls
Date: March 15, Tigard

Improve EE in Your Building — HVAC, Building Tune-Up & Commissioning
Date: March 16, Salem

See our web site at http://www.OregonAPEM.org/links.aspx for links to Better Bricks, NEEA, PGE and other organizations for additional training opportunities.

ENERGY MANAGER QUESTIONS: ULTRA LOW SULFUR DIESEL

Traditionally fuel oil is converted to British thermal units at a conversion of 140,000 Btu/gal. With the move away from sulfur in diesel and fuel oils (From 5000 ppm to 500 ppm to the current Ultra Low Sulfur limit of 15 ppm), do we know if this affects the Btu conversion rate we should be using while protecting our environment?

The first tests of ULS Diesel fuel did show a lower Btu content than expected. However, all more recent tests indicate that the Btu content is pretty much the same, with an average of 138,370 Btu/gallon. The American Transportation Research Institute conducted a study in 2007 that indicated that there might actually be a slight energy increase in ULSD. It is natural that the actual heating value of diesel and heating oils vary as much as 4%. Until we hear otherwise, the accepted value for all #2 heating oils is approximately 140,000 Btu/gal.

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Mission Statement: To advance the understanding and practice of sound energy and resource management principles, and to provide a network among business, government, and utilities for information, education, and leadership.