TITLE:	**Overview of the 50% AEDG-SMO**
CUSTOMER:	**United States Department of Energy**
CONFIRMATION NUMBER:	**30472061**
HOST:	**United States Department of Energy**
DATE:	**September 15, 2011**
TIME/TIME ZONE:	**9:00 am Pacific Time**

Rosemarie Bartlett: Welcome, ladies and gentlemen. I'm Rosemarie Bartlett with the Pacific Northwest National Laboratory. I'd like to welcome you to today's webcast, Overview of the 50% Advanced Energy Design Guide for Small to Medium Office Buildings, brought to you by the U.S. Department of Energy's Building Technologies program. At this time, all participants are in a listen-only mode.

Before we begin the webcast, we'll conduct a polling session. We have one polling question for you before we begin. To answer the question, you'll need to press the numbers on your touchtone phone. Please wait for the entire question to be read before responding. There will be a brief 10 to 15-second period of silence after the question's been asked so that the results can be compiled. Please remain on the line.

The question is how many attendees are at your location viewing the webcast together? Please use the appropriate number on your phone to represent the number of viewers at your site. For example, press one for one viewer, two for two viewers, and so on. Please press nine to represent nine or more viewers. Once again, the question is how many attendees are at your location viewing the webcast together? Please use the appropriate number on your phone to represent the number of viewers at your site. Please answer now by using your touchtone phone and remain on the line during the silence while the results are compiled.

Thank you. This concludes the polling session. A couple of logistical announcements before we begin. If you'd like a handout of today's presentation, it's available at the link on the screen right now. Also, in approximately one week a video of the event will be available at that same link.

You may ask a question at any time during the webcast today by using the Q&A menu on your computer. Questions will not be answered via the computer but will be answered live by the presenters as time allows at the end of the presentation. Please do not wait until the end to ask your questions or the speakers may not be able to get to them.

Lastly, when you've typed in your question, please click "Ask". Do not click on the raised hand icon, as we can only take questions that get typed in.

I'm happy to welcome our four speakers today. Jeremy Williams is currently on fellowship with the U.S. Department of Energy's Building Technologies program. His educational background includes business, education, and construction management. He was a Senior Graduate Research Assistant at Center for Construction Project Performance Assessment and Improvement at Michigan State University with a research focus on energy co-compliance. He coordinated the Michigan Energy Code Training and Implementation program in Michigan, a joint effort between the state of Michigan and MSU.

Bing Liu is a Senior Research Engineer at Pacific Northwest National Laboratory with more than 16 years of experience in sustainable building design and analysis, energy efficiency analysis and simulation, and high performance building metering and measurement. Miss Liu leads the PNNL Commercial

Building Simulation team supporting the next generations of codes and standards, ASHRAE Standard 90.1 and 189.1. She also chaired the Project Committee to develop the first advanced Energy Design Guide targeting 50% energy savings for small to medium offices.

Dr. Merle McBride is employed by Owens Corning and works at their Center of Science and Technology. His technical focus has been on the energy performance of residential and commercial buildings, focusing on U.S. energy codes and standards. Dr. McBride has served on several ASHRAE technical committees and on all of the 30% and 50% AEDG project committees. His current committee appointments include Standards 189.1, 90.1, and Chair of 90.2.

Michael Lane joined Puget Sound Energy in May of 2011 as Senior Energy Management Engineer working in the Business Energy Management Division. Previously, he was Project Manager and lead Lighting Specialist at the Lighting Design Lab. Michael is a member of the IES and serves on the IES Outdoor Environmental Lighting and IES Energy Management Committees, the ASHRAE 90.1 Energy Committee as co-Lights Chair, and has served on six AEDG project committees. In 2004 and 2010, Michael received the IES Presidential Award.

Welcome again to all of the speakers. Jeremy Williams is going to start us off. Jeremy, take it away.

Jeremy Williams: Hello, I'd like to say welcome and thank you to all of the attendees for joining us today. My name is Jeremy Williams and I am a fellow with the Department of Energy Building Technologies program, part of the Office of Energy Efficiency and Renewable Energy. I'm going to start us off today by introducing the 50% Advanced Energy Design Guide, or AEDG series, and then the following speakers will give us some more details on the Small and Medium Office Guide.

So, this section of the presentation will include a brief introduction to the guides. We'll cover some of the questions, such as what are the Advanced Energy Design Guides, some additional background, who develops those guides, and talk a little bit about where the current 50% series of guides is headed.

So, the AEDG series, or I should say the Advanced Energy Design Guides in general set out to assist in helping you as designers, building owners, et cetera, kind of develop high performance, or green, or energy efficient buildings and provide some real recommendations by building types and geographic location. And when I say geographic location, I mean the - - by DOE climate zone. These are in line with the DOE energy savings targets, so DOE develops targets, such as the 50% savings target, and then some of the other programs within DOE, such as the Building Energy Codes program, kind of work there - - the work that we're currently doing around those targets. So, for example, in the Codes program we currently have a 50% goal to realize energy savings above and beyond baseline code. So these guides are a - - they're really a collection of experts with combined experience from various segments of the market and industry. They're in line with those DOE energy savings targets. These guides primarily apply to new commercial construction, although they apply beyond simply new commercial as well. And overall, these are for educational guidance. So in other words, they are not a code or a standard. And that has some positives and negatives, really, to that. So, they're not written in enforceable code language. However, the advantages to that is we're able to make more specific and functional recommendations through the guides where a - - such as an energy code could not do that. These can also be referenced as a compliance option in above code options, such as the LEED Building Rating System or other green building systems.

So, who makes the AEDGs? The Advanced Energy Design Guides are really a partnership of the organizations you see at the base of the slide there, and that includes ASHRAE, DOE, the American Institute of Architects, the U.S. Green Building Council, and IES. And these professional Organizations provide members to project committees, and each of those project committees are, really, set around a certain building type. So you'd get a really quality level of knowledge and specialization within a certain building type, so whereas hospitals require a different type of expertise than, perhaps, office buildings, we are able to provide general recommendations and keep everything consistent and uniform across the series of guides and the different building types but still provide the level of specialization with the certain building type needed. So, these are backed by the Department of Energy National Labs. The Labs provide a lot of the energy simulation, the technical analysis, and technical support to the guide development process, and then they go through the ASHRAE peer review and commentary process from there.

So, the Advanced Energy Design Guide series that are out there, there are two series currently out there. The 30% series was the previous series, and we are currently developing the 50% and second AEDG series.

The 30% series, so just kind of going back and recapping what happened with the 30% series, the 30% AEDGs were compared to the ASHRAE Standard 90.1

1999 Commercial Energy Standard. There were six guides produced in that 30% series, covering small office buildings, small retail, K through 12 schools, warehouses, highway lodging, and small hospitals. Each one of those is available for free download at that link you see on the slide there through the ASHRAE website, and they go - - the typical format you see with the AEDG series is by building type and then the recommendations within that guide are by building type, cover the different climate zones and get into more detail there.

Currently, we are working on the 50% AEDG series, and there will be four guides in this series. And those guides will be for small to medium office buildings, K-12 schools, medium to big box retail, and large hospitals. Now, the important thing to remember here is the 50% series is over ASHRAE Standard 90.1 2004, so it's not as simple as 30 being cranked up to 50%. They are in comparison to two different baseline codes. So, any time you're working with above target or percentage improvements, especially with buildings, it's always important to keep in mind what that baseline is.

Some background on the AEDGs. These are often described as a cookbook approach to energy efficiency. The Guides provide different design packages, strategies; these are designed to help owners, designers. But not just simply owners and designers, it's really anybody involved with high performance buildings or energy efficiency in buildings. They provide detailed guidance as well, and we've also heard of them being used to start the conversation on energy efficiency, so putting it in the middle of that project committee meeting and using it to build the conversation around from there. They also help to compare against. So if you have a project, it may be a high performance project, it may be a small remodel; it really helps to compare back to the recommendations in these AEDGs to know where your project stands as well.

These are what's called a whole building approach. They cover the envelope, fenestration, lighting, as well as day lighting, HVAC service, hot water, some of the other mechanical equipment, plug, and process loads. So, all of the recommendations in the guide are inclusive of all of these things.

Continuing with the background, we find these Guides are most commonly used by architects and engineers, but as well as owners, developers, or, as I said previously, anyone interested in energy efficiency or high performance buildings will find value in these Guides. They're primarily new commercial construction, but they can also be used for major renovations, building additions, remodels, or even system upgrades. So even if it's not a whole building, again, it helps to compare the choices being made in your project back to the recommendations in these Guides.

Behind the Guides. There is a series of 50% technical support documents, otherwise known as TSDs. These provide a lot more detail, I guess I would say, than the Guides. Whereas the Guides are created to be mostly user-friendly, some of the meat that goes into producing these Guides can be found in the technical support documents. There are a number of these for the 50% series, for - - by building type, they are small office, medium office, large office, large hospital, medium retail, grocery stores, highway lodging facilities, quick service restaurants. One of the things that the TSDs have that the AEDGs don't go into detail on are a cost effectiveness analysis and, like the AEDGs, these are also available for free download through the ASHRAE AEDG web page.

So, looking at the impact of these Guides. As of lately, there are over 329,000 copies of these in circulation. So, that's of September 2nd of this year, and it grows daily. These really promote energy efficiency outside of the - - even outside of the U.S. While they're - - as you can see in the graph there, they are predominantly used in the U.S., but they're starting to have some impact or more of a pickup in Canada, specifically India, and - - as well as other countries worldwide; Australia, Brazil, and so forth there in the chart to the right on the slide.

They are also often referenced in RFB - - or excuse me, RFP specifications; so owners that wish to ensure that these recommendations are a part of the project development process will reference these specifically in the RFP for a project.

They also are - - commonly inform the commercial code development process; so in developing ASHRAE Standard 90.1, 189.1. They also have an impact on the USGBC Rating System as well.

So, here's what's coming in the future. We're currently developing these four building types. So, small to medium office, which is available right now for free download on the AEDG ASHRAE website and the link that was included previously in the presentation. There is a K-12 Schools Guide that should be available next month some time. And then keep an eye out for the Medium to Big Box Retail Guide targeted for January of 2012 and then the Large Hospital Guide, the fourth Guide in the 50% series, is scheduled to come late spring of 2012.

So, that closes our introduction. Before I let you go, I would like to request your feedback. If you're using these Guides on a project, if you're interested in these Guides, we would really like to know how they're being used. We have a pretty good idea who is using them, and we'd like to know more about how specifically they're being used. I'd like to encourage you to email me personally if you have some feedback on the Guides, can tell me how they've helped a project, how they've gotten a project started. I would really like to know more on that issue.

I'd also like to remind you to ask questions as we go. We'll be able to address those questions a lot easier if we get those throughout the presentation and then there's a scheduled question-and-answer period towards the end of the presentation.

So with that I'd like to introduce Bing Liu. She is the Small to Medium Office Project Committee Chair from Pacific National Laboratory. So, thank you for participating in today's webinar and Bing, take it away.

Bing Liu: Thank you, Jeremy. In the next several of the sessions, myself and several of my project committee members will talking about specifically for the first AEDG Small Medium Office Building Guide targeting 50% energy reductions for office buildings.

Let me introduce my project committee. As Jeremy mentioned earlier, the form of the project committee is also representing their variety of different organizations and professional and their committees. So my project committee members are (inaudible) by a group of industry professionals. They represent the ASHRAE, IAI, USGBC, IES, and DOE. Also, a lot of them are practitioners and also designers, so they're doing their daily works, (inaudible) those, and have figured out what's the best practice to design low energy use buildings in the real world. So, they're also architects, lighting designers, day lighting designers, HVAC engineers, et cetera. So, that's - - they are the primary owner - - authors to develop this Guide.

And also, I'd like to introduce my two colleagues, Brian Thornton and Dr. Weimin Wang from PNL. They provide and brought a tremendous (inaudible) analytical skills to provide extensive analysis as the foundation we develop the recommendation criteria in this Guide.

Another person who I want to acknowledge which is not on the list of my project committee is Bill Worthen from AIA. He is on the AEDG Steering Committee representing AIA. He also hands down help our project committee by introducing the integrative (inaudible) concept and really try to close the gap between architect and the engineers in terms and promote their integrative design process. I will talk a little bit more related to their integrative design process in the following session.

The scope of the AEDG small medium office buildings. We usually try to cover the small to medium office buildings up to 100,000 square foot in gross floor areas. And we try to cover the buildings like administrative, professional, government, bank, financial service buildings, and some of even medical offices. So, that's the major building types in the category called office building. It's really also in line with the commercial building energy consumption service, so called the CBECS (inaudible) from their principle building areas definition as well. And in this buildings, we also have a lot of space types, including the open plan, private offices, conference room, meeting rooms, corridors, and other transition areas; lunch, lobbies, storage, restrooms, mechanical, utility rooms, et cetera.

However, I have to point out is the Guide doesn't cover some specialty spaces, such as data centers, which is, we believe, more typical in the large office buildings, or some people call that as IT (inaudible).

I'd like to give a really high level framework introductions of the Guide. What is in the book? The book has several major chapters. We have forward, which is really writing towards to the realtors and the investors, try to make a business case to building owners and why - - what's the motivation *[sic]*, what's the - - what's really the benefit to design low energy use buildings. And we have introduction chapter. The next chapter is the expanded guidance on integrated design. Chapter three really focus on integrated design strategies. This is really focused on the performance strategies for those of the designers who want to use their prescriptive (inaudible) recommendations as in chapter four. And we have our several whole building case studies in this chapter as well.

Chapter four is the recommendation tables by climate locations. It's - - we have general strategies by different climate zones, and we have prescriptive recommendations by specific climate location as well to cover all the component of the building design.

Chapter five is the how-to section chapter. It's (inaudible) talking about okay, for your particular climate locations, you want to have particular technologies or criteria to meet in chapter four. Now, the question is how, how to do the designs, how to operate the buildings. So, the chapter five is really give a lot of good design practices, we call how-to tips, a lot of good technical examples and covers additional bonus which is, we believe you don't need them to get to your 50% energy savings goal, but we know they are - - we call that a bonus savings and can use as kind of a trade-off as well, including top-lighting, natural ventilation, and even renewable.

As I mentioned earlier, chapter two and three is (inaudible) focused on first, introduce their integrative project (inaudible) process and multi-disciplinary recommendations and major (inaudible) from building envelope, lighting, (inaudible), HVAC system, and the series *[sic]* water heater. In the next sessions, I will have a few slides really focused on talking about the - - a new feature in this Guide is the integrative design process and strategies.

This is the case studies examples from the chapter three. We have our field buildings from - - it's really real world experience for designers, design team, who already figured out how to design and build a very low energy use building and in a cost effective way. So that's a case study provide a good examples. And also, it demonstrate a flexible (inaudible) we offer in achieving the low energy use as well. And in each of the case studies we also provide a text describing the energy features used and the technology implemented in this Guide as well.

Chapter four, again, the main body of the chapter four is recommendation tables by your climate zones. So, you can go to your counties and find your climate zone and through this graphic map then you're going to see two page of the recommendation tables for each of climate zone. For this two pages it covers the major component of the buildings, from envelope, lighting, mechanical systems, (inaudible), et cetera.

Again, chapter five is really focused on good practice. So, what I'm showing here is technology examples. Also in chapter five, we provide some cautions. The cautions is also important. When you try to implement something new, when you try to design something new, we collect a lot of lessons learned so you can avoid anything - - you know, some lessons learned we already know; you have to be very careful when you try something new.

The next few slides I will touch base a little bit about integrative design process. Before I start it, I have to emphasize again this is a guide. It's really provide a good practice and it's provide a one way, but really not only way through the prescript tables. The purpose is really educational tutorial on the elements of the integrative design for energy conservations. We also present a descriptions of required design task *[sic]* by different design (inaudible), from the concept design all the way to construction documents, (inaudible), you know, during the construction site. So, it's a different - - what you should do differently through the whole life of a building design and the construction. We cannot stress more the important of energy modeling for design of high performance building or low energy use buildings. It's - - the modeling is very powerful tool to use to link all the design team together, to think the building as a whole, and design in the whole (inaudible) the way. It's enough, you know, to do the modeling if after design already done we generally lose opportunity to optimize and the (inaudible) all the different design decisions. So, the prescript tables we provide in chapter four is just showing okay, through the design using the modeling, that's one way, at least, you know, we know to help you to significant reduce your energy use in that building. But we cannot emphasize more to encourage you to use energy modeling as a tool at early design stage to help make a key decision.

This is a bubble chart. Unlike traditional design teams, which is more really might (inaudible) from - - it's a linear relationship from building owners to (inaudible) to specialties like, you know, MEP design teams. The model disciplinary design team we have our design team lead as (inaudible) engineer, project manager, or owners represented as the center. The communication interaction is really not linear. It's really two-way communication. So, that means even at the very early design stage in order to have integrative design process, you have to be able to engage all the key players in the design team. So, from - - if you have day lighting designers, you have contractors, so mechanical, (inaudible), indirect (inaudible), you have facility peoples, make sure they are also a part of the key decision maker as well.

This is a very busy chart. One of our project committee member, Aaron McConaghy* from AREP*, and she really pushed hard on the concept of the interactions about the different component of the building as well. So, the focus of this concept is separate building load generator and building load satisfier. So, even at early design stage, there's a lot of design decisions how to interact or impacts with each other. And there's a lot of balance we have to deal with. Are you going to spend your more (inaudible) costs to have a passive architectural design, then later on you have a (inaudible) and reduce the load so you can save your mechanical system money? Or you do the other way. So, our philosophy in terms of when we developed this Guide is we trying to reduce the loads from envelope, from lighting, and from (inaudible) as much as possible before we go to select the mechanical system. And this chart is really showing the key decision making in terms of a building component of the (inaudible) of the internal loads and the relationship from the loads to mechanical systems.

This one, the slide is really showing the saving opportunities. They are different and various by climate zones. There's no surprise on this slide. It's about - - it's really (inaudible) and visualize and quantify where the saving comes from when you move from Miami, a very hot, humid climate, to Minneapolis, very cold. So, no surprise here. The good saving contributors is coming from cooling in Miami and a lot of coming from heating in the cold climate. But the saving opportunities for internal loads are quite consistent, such as the lighting and (inaudible) load, and the (inaudible).

Another slide is really showing accumulative impact of integrated design approach. I have to make a point here is we didn't design the book in this way, but this one is just educational showing (inaudible) mechanical - - (inaudible) envelope first and going all the way down to the mechanical. That's how we got into the 50% savings.

We have ground rules. One of the ground rules I have to point out is any technologies, tools, products we recommend in these books, at least there have to be two (inaudible) manufacturers can (inaudible). We really try to encourage their competitions. And when we pick any systems, we have to have our first *[sic]* costs in mind. If - - without a budget, you know the cost, we all face the limited budget on cost, how the cost affect the design and build a (inaudible) building that's really of our (inaudible) as well.

And there's some rules as well is our baseline is 90.1 2004. But on the other side, on the systems and the product, we also must be compliant with most recent (inaudible) standard as 2010 edition.

In addition to energy, we also have to make sure we design a building to meet Standard 62.1 for ventilation and the Standard - - ASHRAE Standard 55 for comfort.

As Jeremy mentioned earlier, in addition to the Guide, we also have our technical analysis. A basic approach is we take two different sides of the buildings to test all these ideas through extensive simulations. And the (inaudible) simulations we also have - - can compare as different baseline standard. So, you can see when their baselines improved itself, you know, the savings also - - the numbers change differently.

If you're interested in all this background information, all the detailed documentations of how we conduct analysis, what's the key assumptions we use in term to reach to our recommendations, and in addition on what is the cost effectiveness of this analysis, we have two technical support document, one for small office, one for medium office. I provide a link here. You can download them of your interest.

Now, I'm already have my big - - quick overview of AEDG Small Medium Office Guide. Now, I'm handing over to next speaker, Dr. Merle McBride of Owens Corning.

Dr. Merle McBride: Thank you, Bing. Good afternoon. It's my pleasure to present an overview of the envelope material in the Guide. I will be reviewing some of the envelope measures, not all of them. And as background, I want to set the stage. When we developed the 30% Guide, we were able to achieve energy efficiency by accepting the architectural design. However, when we went to the 50% Guides, we also had to change the function and form, which impacts the architectural design of the building. Finally, I'll show some new features introduced into the Guide.

Let's start with the general design strategy, which has three major principles. First is to minimize the envelope heating and cooling loads, both sensible and weigh. Second is to minimize the internal loads. And the third is to maximize the mechanical system performance. My presentation will focus on envelope strategies, while subsequent speakers will address the other two strategies.

There are three building envelope strategies. One is to upgrade the envelope thermal efficiency. Two is make fundamental changes to the building's basic structure and form, and third, incorporate new features. We will be reviewing each of these strategies in some detail.

The first one is upgrading the envelope thermal efficiency. We address all the major elements of the element, including the roofs, walls, floors, slabs, doors, vestibules. We've added infiltration and then day lighting to get to the 50% goal.

First component is insulation above deck. The graph presents the criteria for small office building compared to the 90.1 2004 standard. The vertical access is the R-value for the insulation material, and the horizontal access is the big climate zone. We also have details in the Guide that specify that there should be no thermal bridges penetrating the insulation above deck and if you have multiple layers you need to stagger the edges to avoid thermal shorts.

Continuing with mass *[sic]* walls, same format in terms of R-value and climate zones. We see that mass walls have a significant upgrade in all climate zones. Again, if there's multiple layers of insulation, we recommend that the joints be staggered to avoid thermal shorts.

Steel-framed walls, again, same format. We say significant upgrades in all climate zones, and we stagger the joints if there's multiple layers of rigid insulation, consistent with above deck and mass walls as well.

Unheated slabs. In climate zones one through three, we have no change from 90.1 Standard. There's not a big difference in the actual energy savings that can be realized. That's also predominantly the termite zone, where you have a lot of questions about the exterior insulation. The vertical access on this graph is the F-factor, and a lower value is better performance. And we see significant upgrades climate zones four through seven. Climate zone eight's about equivalent to what was in the standard for climate zones like in Alaska.

Looking at vertical fenestrations, we have multiple levels of performance. The first one we're going to look at is the U-factor. We see that we have significantly lower U-factor in most climate zones except climate zone three, where the 90.1 Standard (inaudible) had a low value. The other metric we look at is solar heat gain (inaudible). And again, the 90.1 Standard had done a very good job in controlling solar heat gain, but we did add a criteria for climate zone eight just to round out for modeling purposes have a specific value.

There's also an option in the Standard as an Appendix which provides an alternative for the opaque construction. And this lists the U-value for above grade components, the F-factor for slabs, thermal transmittance for below grade values, and if you wanted to use some other construction other than the prescriptive option, as long as you meet these performance metrics you'll be in compliance with the Guide.

All right, the second major design strategy is adjusting the building structure and form. Look at windows, exterior sun control, addition of vestibules, day light glass, building orientation, and day lighting. This building orientation is probably the biggest thing as well as building shape that impacts the architectural basic design. And we round that out with having a need for correct lighting levels.

Details around these variables begin with the windows. In terms of orientation, there's a requirement that the area for the west and the area for the east each have to be less than the area for the south. Also, the window-to-wall ratios have to be between 20 and 40%. In terms of exterior sun control, requires a projection factor of 0.5 on all the south, east, and west orientations.

Vestibules is a focus on the primary occupant entrances. We have some exclusions; emergency exits, maintenance doors, building docks, and specialty entrances. Specifically, the requirements are climate zone one through two there's no recommendation specified. In climate zone three that are - - in buildings that are larger than 10,000 square feet, there's a requirement. And in climate zone four through eight, all offices require vestibules.

In terms of the day lighting glass, the visible transmittance has to be within the range of 0.6 to 0.7. We also have a requirement that controls the minimum BT divided by SHGC; has to be equal to 1.1 in all climate zones.

Finally, in terms of the vertical fenestration, the effective aperture has to be less than or equal to 0.12 in all climate zones.

All these details are presented in three pages for each climate zone. You can (inaudible) this information so you only have to look at one place by climate zones to find all the construction details.

In terms of building orientation and day lighting, the vertical façade needs to provide day lighting oriented within 15 degrees of north or south. Again, this impacts the architectural design with this strategy.

Building shape and daylight. First we need to locate occupied spaces with a (inaudible) distance from the perimeter and the shape of the building footprint so that all occupants are within 30 feet of perimeter fenestration. The building footprint - - so, regularly occupied spaces within 15 feet of the perimeter. Finally, make sure that 75% of the occupied spaces are within 20 feet of the perimeter wall.

Accompanying that we need to have correct lighting levels. In clear sky conditions, the illuminance levels should be 25-foot candles to 250. In overcast conditions, we need to achieve a daylight factor of 2% illuminate and no more than 20%.

The third strategy is new features we've added in the 50% Guide do not exist in the 30% Guide. Three activities focusing on first, mitigation of thermal bridges, continuous air barriers, thermal mass to reduce loads. We have some examples of mitigation of thermal bridges in roofs, walls, and foundations. In terms of roofs, we have increased wall insulation is a classic example, increased roof insulation, and then we have an effective thermal bridge because those two are not continuous. So for the 50% Guide, the recommendations are that we have to have continuity of that exterior wall insulation up and over the parapet, and it connects down to the roof insulation so that there's no thermal bridge to short circuit the effectiveness of the insulation.

In terms of windows, they have to be set in the insulation plane, not in the exterior surface of the wall. Again, this is to provide continuity of the thermal integrity of the envelope.

And foundations, typically we run the insulation in the exterior wall down to the slab. You can insulate the slab on the interior side of the (inaudible) wall, and then you have a nice thermal short at the floor slab itself. For the 50% Guide, we recommend that that insulation extend continuously down the exterior surface below grade, and with that, then you need to provide the continuous insulation protection coating above grade.

In terms of continuous air barriers, they're required for the entire building envelope for all offices in all climate zones.

Finally, we get into thermal mass. To reduce thermal loads, we want to improve thermal comfort with passive solar design, and this can be applied in areas where appropriate; not in occupied spaces that would have an impact on the comfort of the occupants.

So, in conclusion then, the strategy of the envelope to minimize the heating and cooling loads is the first step in achieving 50% energy savings. The strategy is upgrade the thermal envelope efficiency, make fundamental changes to the building structure and form, and incorporate new features.

That concludes my portion of the presentation. The next speaker I'll introduce is Michael Lane.

Michael Lane: Thank you, Merle. I'm going to move on here to the next slide first. So, day lighting and electric lighting strategies for the 50% Advanced Energy Design Guide was my part. So, if we look at the climate zone recommendation tables, you can kind of really get a good idea of all the various recommendations that are part of the lighting. We talk about interior surface reflectances; very, very important to keep the reflectances high inside the building, the ceiling maybe at 80%, walls at somewhere around 70% reflectance. Partitions also, again, very, very important. The - - as the daylight and the electric light come into the space, we need to not absorb those in the partitions, let's say, above a desk height. Below desk height you can really do whatever you want.

Open office partitions parallel to the window wall - - you know, we're dealing with an office building, and one of the problems is the - - the partitions, the cubicles that - - I'm sorry, I have to evacuate the building. Rose, you're going to have to go on to the next one. Sorry. Okay.

Rosemarie Bartlett: Okay, will do. There's always something exciting that happening - - happens when we do a webcast live. So, hopefully Michael will be able to come back and pick up his piece, but for now we're going to jump to Bing Liu for HVAC.

Bing Liu: Can you hear me? Yes, okay. Let me - - the wrong slide a little bit.

Rosemarie Bartlett: I'll go down and click it for you, Bing.

Bing Liu: Okay, thank you, Rose. Well, I hope Mike come back to our webinar as soon as - - when he find a new place, evacuate himself, whatever. It's interesting.

And I will switch the gear a little bit, talking about the HVAC strategies for the 50% AEDG Guide. This is a slide is really Dan Nowe's* presentation. He had last minute project, so he cannot make it to this webinar. So there - - I hope I can give the summary as compelling speaker as he is, but I'm trying. The credit of the presentation also goes to Mick Schroder* from Train* and Erin McConaghy of AREP. Dan, Mick, and Erin are the key members - - authors develop the mechanical strategies for this book. They did a wonderful job to tackle on the mechanical portion of the Guide as well.

We have principles. When we talking about and identified HVAC systems, we usually try to focus on the mechanical systems that provide us a very high system efficiency but still within the reach of our construction cost budget. So, one of the things we're (inaudible) is we know there's some emergent technologies will give us a lot of good, you know, energy savings, but also it's not cheap, can be very expensive. So our consideration for system is really comparable to conventional systems.

Okay. Our principle number one is high equipment efficiency first, focused on both (inaudible) load and the power load part as well because we know the building operates most times at the power load, not the full load. So, we tackle both the full load and the power load in terms of the equipment efficiency.

The second principle is really our better humidity controls and older ventilation air maintenance as well. The strategy we put in together is really to trying to separate the older air treatment from the re-circulated air.

The next one is we try to reduce the air distribution losses.

One more strategy and also principle is the best BTU you use is the one you already have. What that mean is there's heat generated from building and can we (inaudible) that head to use the other part of the building. So, that's really the concept we have in terms of energy (inaudible) in all of the climate zones. We will go through all mechanics systems we recommend in this Guide in the next few slides.

The six system types we recommend in this Guide are including the constant volume air source heat pump system with static (inaudible) air system. (Inaudible) source heat pump, which is small size, (inaudible) source heat pump system (inaudible) as well. (Inaudible) coils with (inaudible), the (inaudible) heating cooling systems, and air cool (inaudible) with indirect gas fire heating or electric baseboard. That's really depend on their climate location or region preferences. And two (inaudible) systems with air-cooled chiller and (inaudible) distributions and a condensed (inaudible). We know other systems may work, but we didn't have that in our Guide or studies.

When we started working on taking on 50% energy reduction challenges, we know previously approach we made (inaudible) AEDG solutions doesn't work for our 50% savings. It's a very challenging goal to reduce design of building with such a low energy use target. So, in the past when working on the service (inaudible) AEDG series, in terms of mechanical systems we try to maintain the same conventional mechanical system types, just promote premiere equipment efficiency. It wouldn't work this way.

In the next several slides, I will give a very high level highlight of each of the systems and their energy impact.

The first one is the single packaged air source heat pump system. It's small heat pump system. You can use in the small office buildings. First, we have a premiere (inaudible) heating cooling efficiency in terms (inaudible) COP. Second, this kind of heat pump can operate at very low outer air temperature, as low as minus four Fahrenheit. And we have - - we know a (inaudible) major manufacturer can make this kind of product. The other component is we using (inaudible) older air system, so better incorporate it with energy (inaudible) and have better humidity control. And there's some other component as - - such as because this is still air distribution systems, so we have a low pressure (inaudible) design requirement. This is really a trade-off because you may have a bigger - - relatively a little bit bigger ductwork, so you have to coordinate with your architects to get a - - you know, a (inaudible) space around your ductwork as well. But the trade-off is you have reduced of the (inaudible) energy use. And we have the main control ventilations as well.

I will have you to take a quick look of the energy impact result by using this systems. This is a result is in addition to the envelope recommendations, lighting, day lighting strategies, and with this particular system types; so this is a whole building energy impact, including the (inaudible) load. You can see across the board we are able to reach the 50% reduction compared to building the same building just be able to meet 90.1 2004 requirements. So, we have two bars. The bar on the left is the building, small office building. If you build in Miami, what is the particular energy use, annual energy use in terms of KBTU per square foot per year (inaudible) 90.1 2004 requirement. And the red bar is if you use the recommendations in chapter four for Miami climate zone one, what's the energy use predictions for that particular building.

And we have end-use breakdown from interior lighting, exterior lighting, (inaudible) loads, and cooling and heating, so with hot water, et cetera.

The next one is really the water source heat pump systems (inaudible) as well. This is a small size of water heat pump in about five-pound size (inaudible). And we have our two options. You can have a single-stage and the water source heat pump, then you have to really have premiere very high ER and COP number. Or you can put a two-stage heat pump and in that way you have a better (inaudible) performance as well. But either of them - - any of the systems we recommend to use a ECM (inaudible) motors have better control at the power load and provided a (inaudible) flow as well.

And we have some loop heating and cooling recommendations, again, (inaudible) as here.

So this is a really high - - very, very highlight of the systems. In the Guide we have very detailed description of each system and good practice of particular technologies and also cautions of particular system as well. So, I really encourage you to look into the Guide if you are considering particular system in your design.

So, again, this is the energy impact if you're using the water source heat pump in your small to medium office buildings, and we have no problem to reach the 50%. Some of them is even way higher than 50% goal we have.

The next one is advanced (inaudible) systems. When we started develop this Guide, one of the comments and opinions that, you know, (inaudible) system is kind of the (inaudible) system, is not going to help us to design and reach to a low energy use of the buildings. We said okay, that may be true for traditional (inaudible) system as starting using in the 1970s and '80s, but there's a lot of things related to (inaudible) system that you can prove your design and the control algorithm and you can have a better - - much more efficient (inaudible) systems. One of the highlight is you use energy (inaudible) in your (inaudible) system, so you can recover return air (inaudible) to treat your older air. The other highlight is (inaudible) air temperature reset, and we have a different reset temperatures in - - versus humid, hot climate compared to the dry or cold climate temperatures. The reset idea is also trying to have a better balance between the compressor energy use and the increasing to use their more use of (inaudible) as well.

And in certain dry climate we also recommend indirect (inaudible) cooling as well. Again, we always have our demand control ventilations.

So, this is the energy impacts of using advanced (inaudible) systems. We have no challenge to meet the 50% goal across the different climates. Again, their subcomponent in that (inaudible) system are various among different climate, that as I mentioned earlier in some - - several of the dry climate, these systems also included the indirect (inaudible) cooling systems.

The advanced fan (inaudible) systems. This is really one part of the hydraulic system we (inaudible) give their flexible and more options to designers as well. For fan (inaudible) systems, the goal is really twofold. First, we try to reduce the pump energy use as much as possible. The second part is really try to reduce the fan (inaudible) - - increase the fan efficiency. So, the recommendation is using the ECM fan motors and the - - in terms of the chill water systems we recommend to have a 14-degree (inaudible) between the supply and the return water. And that way we can more efficient move the water among the pipes. So, there's a lot of details (inaudible) down here. And on the hot water side, we're using condensing boilers. This is the result for if we use the advanced fan (inaudible) system in - - more towards the medium size of the office buildings.

The next one is advance the rating system (inaudible). Two of our project committee members, both Dan Nowe and Erin McConaghy, they have practice - - have designed the rating systems in the office building application, so we have quite the firsthand experience from them how to - - you know, what's the best practice in terms of their application of the rating systems. So, we're able to take a lot of them from their brain and put into recommendation down here for rating systems. A big advantage of the rating system is we significantly reduce the fan energy using compared with their air distribution system. And in some cases, you can increase the comfort of your space as well. But there's a lot of design details.

Please pay attention to them. And the (inaudible) performance really well except in 5B we barely made it under 50%.

We have a lot of other information in the AEDG Guide. One particular topic we didn't cover at today's webinar is the (inaudible) load reduction. In the recommendation table, we have a section designated to (inaudible) load. As we squeeze more and more under stringency requirement of building envelope, lighting, mechanical systems, (inaudible) load actually taking more and more the share of the whole building end use consumptions, especially in office building. So, the recommendation we have in the Guide, we have both the peak (inaudible) load reduction recommendations and also of our control management as well.

As I mentioned earlier, we have a lot of how-to tapes, cautions, and we provide a lot of reference and resources at end of each of the chapter. We also including (inaudible) one session to talking about cover the quality assurance and commissioning as well.

(Inaudible) okay.

Rosemarie Bartlett: Michael has joined us again, and so we're going to go back to Michael. Luckily, he was able to rejoin us. So, Michael, we're going to have you go back to where you were before you were evacuated.

Michael Lane: Thank you very much, Rose. Yeah, good to be back. So, we were talking about some of the recommendations in the lighting tables and we were looking at this slide here. So, some of the things we really want to highlight is that reducing the lighting power density, we've reduced it down to about 0.75 watts per square foot from the - - around 1 watt per square foot that was originally in the 2004 requirements. Another additional requirement is reducing the 24-hour lighting. One of the major nighttime uses we see is lights that are left on to provide emergency egress when the building is actually unoccupied. And according to NFPA 101 and NEC, as long as the building is unoccupied you don't have to meet those requirements. And there's ways to do it so that if someone's in the space, like with an occupancy sensor, if they're actually in that building, the lights will be on in those areas. But often it's well over-lit for the emergency egress lighting. And we're not talking about the emergency exit signs; we're talking about the general lighting that allows you to walk out of the building in a nonemergency mode. Of course, in emergency mode, the lights have to be on for the required time.

The efficiencies of the lamps, we're seeing with T8 and T5 technologies with the high performance lamps, the lamps that produce around 3,100 lumens, around 92 mean lumens per watt. And, of course, in the other sources, we are not eliminating all sources but fluorescent, there's opportunities for compact fluorescents, ceramic, metal, halide, LEDs; really like to keep those incandescent out of there. So, we still are allowing efficiencies around 50 lumens per watt for other sources. The ballast, there's been some increases since the 30% Guide to the NEMA Premium type ballast. These use maybe about 3 to 5% less energy than the standard electronic ballast that we see out there. Of course, doing some daylight harvesting probably in the open office plans because those are the ones that are most effectively lit with daylight and we want to locate those as much as possible on the north and the south sides where day lighting is much easier to do. Of course, a lot of the automatic controls, and many of these, if you were reading through the 2010 90.1 Standard, you'd see a lot of these control requirements in that Standard. So, we've actually put them in here. And, of course, façade lighting, reducing it even beyond the 2010 Standard, in some cases, you know, do we really need to do the façade lighting, the decorative part of it, if we're trying to really do an energy efficient building. And then the recommendations for parking lots and other exterior applications.

So the day lighting recommendations, definitely as Merle had mentioned, use a shallow floor plate. If we can get the people, the workers near the windows, use the daylight, we can reduce or eliminate the electric lighting needs during those times. Again, as I just mentioned, the open office workstations, locate those on the north and the south sides. Use low or translucent materials for the office cubicles so that the daylight doesn't stop eight feet in as it hits the first cubicle wall. We would like it to get into the second cubicle, and if there's a third cubicle, actually get to those locations. Locate your private offices on the east and west perimeters, because we're going to use occupancy sensors in those, manual on occupancy sensors so that you have to turn the lights on. If there's daylight coming in, there's a pretty good chance that you won't turn those on as you walk into the spaces. We also already talked about light-colored matte finishes and the dimming controls that we want in those spaces.

So, here's just a table showing you the breakdown from a lighting standpoint and how we got down to the 0.75 watts per square foot. Open office reduced from 1.1 down to about 0.68. Private offices, which comprise about 29% of an average floor - - of course, no building is average and these percentage of floor areas are for an average building. We got this information from the 90.1 Standard. And so you can see the baseline standard for 2004 there in the second to the last column and the adjusted, and at the bottom we got down to 0.75 watts per square foot.

Of course, control recommendations and other lighting recommendations, we talked about the high performance lens fluorescent fixtures - - we'll see a picture of those here in a minute - - of what those really are. But it's kind of a relatively new advancement, maybe in the last three to five years these times of luminares *[sic]* have been coming out, and they're much more efficient at producing light down on the work surface and on the walls than the older style parabolic fluorescents or the basket style - - recessed basket style fixtures. Using the high efficiency fluorescent lamps and the NEMA Premium ballast, of course dimming the general lighting in the open offices. Using a dual circuit occupancy sensor in the private office or a manual on. They both save about the same. The dual circuit, what it does is as you walk into the space it actually turns on automatically 50% of the lights and you manually have to turn on the other 50%. So, that's - - and the savings are about equal of doing that type of scenario versus a manual on occupancy sensor because many times, manual on, people will automatically hit it on, a portion of them won't. Where this auto on to 50%, manual on to 100%, it will save about the same and people will just walk in and hey, there's light in the space and continue to work. And, of course, reducing that night lighting to about 10%.

This is showing you an example of two different high performance lens fluorescent fixtures. There's a number of manufacturers who make these types of light fixtures. There are probably eight or nine different ones. Of course, from IES we don't want to meet the IES recommended light levels for the space, so in the calculations we did using these types of fixtures at the 0.68 watts per square feet, we're averaging about 30-foot candles with about 50-foot candles on the work surface by locating the fixtures basically right above the workstation in the open office plans.

Of course, we can't forget about the exterior lighting. We only want to light the areas that we need to light and only can calculate for those areas. So, basically, when we get down to about 0.1-foot candles, we assume those areas aren't lighted. So, if you have a large campus you're not going to get to count walkways, pathways, but you don't plan on lighting and there's really no reason to do that. Design with the minimum to maximum illuminance ratio of 30-to1. That just kind of keeps your real bright areas not feeling super bright versus the dark areas might still be a 0.1, but it feels so dark in those areas that it actually creates a contrast problem and a safety and security problem. So you want to keep those light levels as even as possible.

Also, reduce the power after midnight or when the building is closed, or an hour, say, after, to about 6 a.m. to no more than 50% of the power. You know, 3:00 in the morning, do we need all the parking lot lights on; 3:00 in the morning, do we need all the pathway lighting on or do we need all of the façade lighting on? Let's turn those off, as we can see in the next bullet point there. Turn off the façade lighting after midnight. We don't really need that on. There's not as many people out there in those hours. And also, use the new 90.1 2010 lighting zone three or lower recommendations for your exterior lighting recommendations.

And that's the end of my presentation, Rose, so if we could skip ahead, I guess, to the questions and answers? Is that where we're at?

Rosemarie Bartlett: Yes, we'll do that. Thank you, Michael. I'm glad you were able to make it back.

Michael Lane: Thanks.

Rosemarie Bartlett: Thanks to everybody. The U.S. Department of Energy wants to thank all of you for your attendance today. I wanted to put up the contact slide so you can take a moment to make any notes on that that you would like. And please note at the bottom of the slide, again, is the link to download your free copy of the Guide.

As we continue answering some questions, I'll be putting up some of the other slides that have links, as requested by several of you. So please keep watch on the screen as the presenters are going through and answering as many of your questions as possible.

However, before we do that, we do have a few quick polling questions for you. This time, however, rather than answering using your phone, you're going to be answering using your computer. So, I've put up our first polling question, if you would please vote now as to your familiarity with the Advanced Energy Design Guide series we would appreciate it. Another few seconds here to answer. Thank you very much.

Now, we'll move on to our second polling question for you, if you'll take a moment to answer this as well, please. Again, a couple seconds. Thank you very much.

And finally, we would very much appreciate your feedback about this webinar. So, if you'll take a moment to answer that. Thank you very much.

Now, we're going to turn it over to the speakers to go through and answer as many of the questions as possible. And I think we'll begin with Jeremy, since he was our first speaker. Jeremy, do you have a couple questions to answer?

Jeremy Williams: Sure. This is Jeremy Williams from the U.S. Department of Energy. I'm going to take a quick stab at a few of the questions I saw come through here. So, there were a couple questions asking specifically how the Advanced Energy Design Guides are different from LEED. So, LEED is the U.S. Green Building Council's rating system for green or high performance buildings. And the scope of that - - the main difference between that and the AEDGs has to do with scope. And the AEDGs focus on what I'll say is energy alone. So, LEED explores things such as site conditions, the water quality, water consumption. It gets into a lot of what are labeled as green products, which are products that, for example, emit low levels of VOCs, such as in glues and paints. And LEED also covers energy in the energy and atmosphere section.

So, the AEDGs take a more detailed look at that energy portion and cover what I'll say is that energy portion alone, although there is some discussion and consideration for things such as indoor air quality, how to organize an integrative design process, et cetera. Because these things such as water and indoor air quality certainly have an effect on energy, they're not explored in details in these Advanced Energy Design Guides.

So secondly, there was a question on - - stated as "Why would the new 50% AEDGs which are still in development be based off the ASHRAE 90.1 2004 Standard when ASHRAE 90.1 2007 is the latest and also required by the LEED 2009 rating system?

So these Guides - - one of the main things these Guides do is assist in paving the way for the model energy codes. And so DOE creates the Guides in line with the Department's current energy targets. On the commercial side, this is set at a 50% savings over 90.1 2004 currently. So, ASHRAE Standard 90.1 2010 is actually the most recent version that is available to the public. So while it would be ideal for our targets as the Department of Energy to align with all the codes that are out there, the building rating systems that are out there, it's just not the reality we face. So, all of these are developed on separate code cycles, the dates don't line up, the scopes might be different. So, while the scopes of some of those things might be focused on just energy, but for a system like LEED, they would essentially have to coordinate their system with all of the latest energy, water, green product recommendations, all those rating systems that are out there, and that's just not really feasible right now. It's not feasible for us as the Department to coordinate with LEED specifically, because there are a lot of other interests and stakeholder interests and ramifications out there. And LEED is right now a voluntary system.

So, what is - - also covering what is that 50% over the baseline code mean? So, when we say 50% over, what exactly are we saying? It means that if we created two identical buildings, so let's say you have one of those buildings built to ASHRAE 90.1 2004 commercial code and one is built to the recommendations of whatever 50% AEDG you're using. That second building, the Advanced Energy Design Guide, or AEDG, building should use 50% less energy. So, when we say 50% over, we really mean that there are 50% energy savings or that it uses 50% less energy than that plain old code building. So, basically, if you're going beyond what I'll call the average, if you're going to know how far you've gotten, you've got to know where you started and what you're comparing yourself back to. So, when we say 50%, that's essentially what we mean there.

And then finally, some were asking if there's a way you can get notified when the K-12 Schools Guide, the next Advanced Energy Design Guide, comes out, scheduled some time next month. What I would suggest is getting yourself on the ASHRAE and Department of Energy Building Technology program email lists. And you can do that by just Googling the ASHRAE mailing lists or Google the DOE BTP, and you should find a link on those websites to get on those notification or email lists. A notice for that Guide and all of the Guides following, or I should say the electronic free version of each one of those Guides, will go out through those lists. We're also going to push for what's called the Department of Energy Progress Alert, which is through the Department of Energy Public Affairs Office. They'll send out a notification as well.

So, I think that covers it for my questions. I want to make sure to leave time for questions with the other speakers as well.

Rosemarie Bartlett: Okay, great. Thanks very much, Jeremy. Okay, I'm going to turn it over to Bing to answer a few questions.

Bing Liu: Thank you, Rose. I have a few questions related to - - some of them are really related to the questions regarding what is the baseline codes, as Jeremy has addressed earlier. This particular question asking is "I'm getting U.S. (inaudible) requests for proposals that are looking for 40 to 50% savings from ASHRAE 90.1 2007 baseline. Do any of these Guides meet that requirement?" Again, our own analysis of recommendation target is building in ASHRAE Standard 90.1 2004 version as the baseline. However, we did do additional analysis on to compare if we changed the different version of their baseline. So, I'm very happy and confident to say if you implement the recommendations in this Guide, you're very much in line to have 40% better designs compared to 90.1 2007, particular for the Small, Medium Office Guide, our analysis showing is national average (inaudible) by implemented recommendations you can get 40% better compared to 90.1 2004. I hope that really satisfies your question.

I have a few other questions related to mechanical systems. The question is really centralized are "What are your baseline systems when you have this six different mechanic systems as a recommendations?" I need to apologize. I think I should've covered that, you know, when I make a presentation. It's just a time crunching thing. In my slides, earlier slides - - thank you. Thank you, Rose. I see Rose pulled up the slides here. We have very detailed descriptions what are the baseline conventional systems in this PSC. But in general, you can see we have two different buildings we're using as a testing of the ideas. For small office buildings, it's about, you know, 20 square foot buildings. It's (inaudible) air warming systems with the DX cooling, and we have two baseline systems. One, we use electrical for heating; the other is using natural gas for heating. So, we have two baseline systems for smaller size of office building.

For medium size office buildings, it's about a 55 - - 50 to 55,000 square foot; it's three-story buildings. The baseline systems is (inaudible) systems with DX for cooling and the furnaces for heating. It's a kind of typical rooftop units and with variable air volume air system as distribution and have electrical system as the reheating for the (inaudible) system as well. So, that's our baseline systems.

There's another question related to the result. Rose, could you help me to advance to the slides where we have all these energy savings results? It's really towards to the end, any of them. Yeah. Okay. The question is really about (inaudible) bars. Let me emphasize again I have two set of the stacked bars in this slide for all the six types. The one on the left is (inaudible) the same building if you build to - - just to meet the 90.1 2004 Standard requirement using conventional system, what is the predict energy use. The bar on the right is by implemented the recommendation in this Guide, what is your predict energy use in terms of the EOI. So, for each of the climate locations, people - - you know, the question is in (inaudible) why I see two bars, because we're showing you what is the baseline, what is the result from this Advanced Energy Design Guide recommendation. And because the bar - - because - - we have a recommendations how to reduce your lighting significantly, so you move from baseline to the advanced cases, you can see the reduction of each of end user of the building as well such that like the first one on really - - like the lower one here is (inaudible) the reduction amount of the reductions on interior lighting. The second one is the amount of energy reductions on the exterior lighting, (inaudible), et cetera. So, I hope that's really help to clarified all this graphics.

So far, that's the questions I have. Do we want to give others - -

Rosemarie Bartlett: Okay, how about we have Merle answer some questions then for us, Merle?

Bing Liu: Sure.

Dr. Merle McBride: I'd be glad to. A couple questions that I immediately respond to, the first one is the question was "What are thermal shorts?" That was really maybe a shortage in terminology. I was referring to thermal bridges. It could also be referred to as thermal short circuits. It could also be referred to as thermal bypasses. And collectively, these are all characterizing highly conductive paths that bypass insulation. That's just different terminology we use to characterize that.

Second question, "Aren't there significant losses due to slab edge above grade?" And clearly, there are large losses, and those should be insulated. And the one sample I had on thermal bridges tried to address that. Whether it's for a foundation or a slab edge, still the same problem and you need to insulate that in climate zones four and above.

That's all I had.

Rosemarie Bartlett: Okay, great. Thanks, Merle. Michael?

Michael Lane: Yeah, a couple of questions. The first one says "Please address the application of task *[sic]* ambient lighting approaches and associated controls for additional energy reductions and also address whether LED lighting options allow further wattage reductions due to superior uniformity and directionality so that illuminance is optimized on the work plane versus throughout the office." The - - a couple things to think about and to remember here. First of all, the Guide is one way. There's going to be multiple ways that we can do the lighting system, as long as we can get down to that 0.68 watts per square foot or the 0.75 average. And if you as a designer want to do a task ambient lighting system that uses LEDs, go for it. You know, we were able to get to the energy savings targets that we needed by using a general overhead lighting system, task lighting as appropriate. As you reduce your overall watts per square foot, make your systems extremely efficient as, I think, we did in this Guide, other systems, say like a task ambient system, may provide the same energy savings, but they may actually not, depending on the technology you use. You may go from, in the case of what we're using here, say, a two-lamp fixture for the general lighting to a one-lamp fixture for the general lighting, can I take that 0.34 watts per square foot and put it into a task lighting system and actually do the same thing? With current technology, the question - - or the answer might be no. We're kind of at that point where we need a technology, a breakthrough technology like, maybe, LEDs, which are rapidly evolving. I'm not saying that they're a good or a bad thing right now; there's some good and bad out there in those. But we need something a little more efficient or effective than, let's say, moving that watts per square foot into a fluorescent system that's down low doesn't always give me what I'm looking for. So, yes and no on that.

And I quickly - - I see we're quickly running out of time, but a second question on "Must day lighting controls be automatic, or is manual okay?" No, the day lighting controls must be automatic in the open office plan area to save the energy that we need. And in those open office plans, you don't want people manually going and turning the lights up and down. You want it to happen automatically. And I'll stop there.

Rosemarie Bartlett: Great. Thank you very much, Michael. Bing, I believe, has one more question that she would like to address. Bing?

Bing Liu: Yeah. I have one more question. It's very important to address that. The question is "Is cost of construction a consideration in the development of the Guide?" I said definitely yes. Again, but on the other side, this is not a (inaudible) of

Standards, so we didn't - - and we doesn't need to follow of the rigorous, you know, cost effective analysis on minimum cost criteria as we did when we developed 90.1 - - ASHRAE 90.1 Standard. However, when we pick certain technologies and the systems, we always have a cost in mind. If you're really interested in the cost effective analysis, as I show you in the slides, and go download the technical support document, on the last chapter of that document we actually show you if you're using all this package as compared to conventional systems design, what is the simple payback for the particular different locations. So that could be a good information for you to get some idea, ballpark idea estimate in terms of the cost.

The other part I cannot emphasize more is through the integrated design process we could possibly find a way very optimize the way, you know, we switch - - within your (inaudible), you know, you (inaudible) your cost and share the cost from one discipline out to the other one. You pull it up from the cost of passive design, then you save the cost maybe on the mechanical system; so just that thought.

Rosemarie Bartlett: Great. Thank you, Bing. And thanks so much to all of our speakers. I very much appreciate your participation today. And thanks to all of you for listening to the speakers today and participating in our webinar. The U.S. Department of Energy very much appreciates it. You may all disconnect.

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Please Note: * Proper names/organizations spelling not verified.
[sic] Verbatim, might need confirmation.
- - Indicates hesitation, faltering speech, or stammering.