

## **RENEWABLES FOR SCHOOLS WEBINAR**

**August 25, 2010**

Coordinator: Welcome and thank you for standing by. For the duration of today's call all lines will be on listen-only. Today's conference is also being recorded. If you have any objections please disconnect at this time. And now I would like to turn the call over to your host, Western Support Contractor Mr. Guy Nelson. Sir, you may begin.

Guy Nelson: Thank you and welcome all to the Renewables for Schools Webinar. You should be seeing the first slide on the - on your screen and that's a very old picture of a much younger me getting introduced to the electric power business. And what we're going to be doing today is going rapidly through some well qualified speakers talking about their expertise in several topics including solar and wind K-12 activities, energy education post K-12, utility programs, and then we'll have a Q&A.

What you can do anytime during the presentation is click on the Q&A button that you see on top of your screen, type in your question in the Q&A box, and then click Ask and we'll start after all the speakers we'll go through as many Q&As as we can.

We'd like to acknowledge several folks and organizations that are helping make this call possible. The American Council on Renewable Energy, Interstate Renewable Energy Council, National Renewable Energy Laboratory, Salt River Project and Sacramento Municipal Utility District, and also the U.S. DOE Wind Powering America Program and Western Area Power. We really appreciate their support.

What we're going to be doing today is talking about several technologies, mainly solar and wind which will be evident - obviously evident on why they're more applicable than others. But we'll be covering geothermal, hydropower, and biomass probably in the Q&A. And what I have here is some reference information for those technologies, some sites and meetings that are going to be occurring within the next six months in those technologies.

This is not a complete list but this is the - what we consider one of the top notch lists of technologies and leadership and the - it has the annual meetings that they will be conducting and also the Websites. You can visit the Websites anytime and get a lot of information on solar, wind, geothermal, hydropower, and biomass.

Here is the agenda. We're going through the welcome and introductions right now, then we'll have Glen Kizer talk about solar energy education in K-12. Larry Flowers with - Glen is with IREC, Larry Flowers is with NREL. Larry will be talking about wind energy. Then we'll have Tom Weirich with ACORE talk about higher energy education programs.

Then we'll have three utilities talking about their activities starting with Gary Hoffmann with Western Area Power and then Suzette DelBono with SMUD and Tina Drews with SRP and they will be talking about the pains and pleasures that they go through in developing and implementing Renewables for Schools. Then we'll do the Q&A. So with that we've got - we have a pretty full agenda so Glen let me turn this over to you, Glen Kizer with IREC and sir, the floor is yours.

Glen Kizer: Thank you Guy. My name is Glen Kizer as Guy said and I'm with the Foundation for Environmental Education. We are a non-profit and we coordinate a number of solar school programs around the country primarily on

K-12 buildings. The best Website for us is the solarschools.org Website. The picture there is of a school in Sacramento, in West Sacramento, California so that's a 1KW which is one of our base schools.

For the Solar Schools Initiative through we're very flexible and I think that the reason the program is so successful around the country, not just with our organization but with the number of organizations that run solar school programs is because they can be fairly flexible.

We've got projects that we've been involved with from 1KW which is our most popular because it's the least expensive up to several megawatts. And schools can pick any size, any shape, really anything they want to do as long as the solar panels are visible, there's online data, and they use them - the solar installations as a teaching tool. So it's a fairly flexible way to be so if you're a utility or a foundation you can set up an arrangement that works for you and I think it would probably work for most of the schools as well.

This is an example of a 1KW on a pole similar to the one in California but this one happens to be at a school in Texas. And again they use the solar data, solar technology, the physics of solar in their science and their math and as long as they use it as a teaching tool we help them get these installations done at their schools.

This is again another 1KW example and this one happens to be in Ohio. The schools can, you know, go in and get teacher training and then use the education and the activities and the curriculum materials in any way they want but we make sure that the teacher training is geared to the testing requirement in their particular state and we also give them the flexibility to use it in any way they want to as long as they use it in the classroom and solar is fairly flexible and can be used for a variety of classroom subjects.

The other thing that's interesting about the solar schools program I think is that there are really two parts to a school. One is the teaching side and the student side that is the most visible but the other side is the business side where somebody has to make sure that there's diesel fuel for the buses and that the electric bills are paid and the yards are cut and everything is maintained and the floors are cleaned, all the money is collected and all the bills are paid.

And the nice thing about solar is because these - most of these solar projects are grid tied, they're actually connected indirectly or directly to the electric bill so what happens is it forces the business side of a school district to interact in many ways with the teaching side of the school district. And so we find that that's been a big advantage because it not only helps the students learn inside their classrooms but it also helps the business side learn about solar, how much space it would take up, and a variety of things.

This is again another utility project. This one is in California. This is PG&E and there are so many gardens at schools in California and it's a pretty good location because it helps connect the teaching of agricultural activities to the students, also helps them learn about energy.

PG&E has done 125 of these, they're all identical. They've trained thousands of teachers all over their service territory and most of them are the 1KW and they have experimented with different ones but for the most part once a utility picks a size it's easier for them to just keep with that size.

People always ask me why solar on schools and I think that what we like about solar on schools is that for the most part every neighborhood in the

United States has a school in it. So if you put solar on a home in a neighborhood people can maybe walk by and see it and maybe they can't.

But if you put it on the school then everyone in the neighborhood either visits the school or they drive by but if the system is installed properly and very visible and everybody in that neighborhood at least can see the solar and then they can learn more about it online. But it's a symbolic center of learning and it's an actual center of learning.

And I think for, you know, most schools, people go there to vote and they go there for a lot of public meetings and stuff so it's a good place to teach not only the students but the, you know, entire neighborhood.

This is another utility installation in California at Presidio Middle School and just to show you, I just happen to like this picture but it shows you how popular these projects are. There are lots of people that attend and sometimes there's hundreds of people that have gone to these, you know, ribbon cuttings or the opening events for the solar installation.

Now and a lot of the slides I've shown you have been from utilities but there are so many different projects around the country. In fact one of the speakers is from Salt River Project and we did several solar schools with them. But Illinois Clean Energy Community Foundation will hit 200 schools this calendar year and we just started a project with the Wal-Mart Foundation where they're doing 5KW's in select cities around the country.

And a number of state governments and counties and cities have also done solar school projects and put in money, not necessarily put in all the money but put in money to sponsor them, and as well even some of the manufacturers have started solar school programs - because it's again a nice way to introduce

the technology to neighborhoods and there's plenty of media attention. And we always say that if you do a solar project at a school that you're almost guaranteed to get the mayor and media there so the M&Ms usually come.

They come in all shapes and sizes and we're really flexible. Sometimes the sponsor like the utility will say they're all going to be a certain shape and in other programs like in Illinois they can be any shape that they want. So this particular one is a 5KW, it's not the easiest one to see but it's flat and kind of integrated into the roof there.

This is a 5KW near Seattle, Shoreline, Washington that was paid for by the Wal-Mart Foundation but that same Wal-Mart Foundation then paid for this installation in Chicago and you can see it's a totally different kind of building and a different kind of look.

But in each case we tried to accommodate what the school wanted and each school wanted something different. They look at a lot of pictures online and they go visit things and then they come up with their own sort of look that they think fits in with the school.

This is another of the PG&E installations. There was just an event there and it's an elementary school. People always ask me what grade level works best for this. And we find that really excited schools, elementary, middle school, high school, they all make it work if they really want to integrate it into their classroom activities and they gear it toward their particular student body.

And we have materials, curriculum materials for each of the grade levels so it works out pretty well. Again this is another utility sponsored project and this is a particular installation in Ohio.

One of the requirements that we have is that solar panels must be visible from school grounds and that's very important because we found in schools in particular there's a lot of turnover and if you don't make the solar panels visible sometimes everybody forgets that they're there. So we tend to - we always require that the solar panels be visible from school grounds. They don't have to be visible from the street but they have to be visible from school grounds.

And again, they must be tied to the classroom. We don't want them - we don't want to help a school save \$5 or \$500 a year or \$5000 a year on their utility bill without doing an educational connection. If they want to - if their business side wants to do solar that's great, and obviously many schools do that and don't tie it to the education.

But for us to help them they must tie it to the classroom even if it's just one classroom. And then again we require that they have live data so if they're unwilling to do that then we will not help them.

NEED which stands for the National Energy Education Development project does most of our teacher training and we found that teacher training workshops work really well. We bring in a lot of teachers from a lot of different schools and they do interactive, hands-on learning and they learn about skills that they can take back and activities and material that they can take back to their classroom.

So if they're a science teacher or a math teacher or they teach electricity there is in fact an activity and kits and stuff that they can use and go back and take back to their schools. And oftentimes since we usually have them more than one time a year and in more than one location, it's not very difficult if you can't make one then you just make another.

And again we use teachers that are connected to those individual states and always use ex-teachers or current teachers who are on leave. But our goal is to make sure that it's not an activity that they have to do in their one school that is outside of what they have to teach in order for the kids to graduate and meet state standards. We integrate those together and NEED does that for us in most cases.

And here's a picture of an entire room full of teachers who are from different schools. Sometimes there are two teachers from a particular school but they're all from different schools, from different parts of Illinois, and they come together in one location and they all learn and have to do activities together. And they're treated like students and they have a good time and it helps maintain their excitement level. And if it starts to wane then they just come to a future workshop and they get some of it back.

Again here's another utility program and again it's a little bit different. It's a wall mounted installation which is fairly popular in the Midwest because there are a lot of schools with that kind of really tall brick wall that isn't really being utilized for anything and this way it serves a purpose and becomes more of a showcase rather than just a big tall brick wall. And there's a lot of schools in Illinois and Ohio who have used that style but it's - again it's just a 1KW.

And here is an obviously different wattage on the panels because it's a 1KW but there are fewer panels because again space is more important. So if you've got a big wall and you want it to look like it's covered with solar panels you use lower wattage panels. If you don't have a lot of room you use a higher wattage panel.

And again I'd point out that Illinois Clean Energy will have over 200 solar school installations around the state mostly with the 1KW's but they will - that will - we'll reach that plateau by the end of this year.

K-12 schools are really ready and actually going ahead in a number of places with larger systems. It's a hot topic of conversation, especially if they've got a 1KW, almost all of them would be willing and excited to get larger installations. They need not so much help with a lot of money but they need help with hand holding so that they don't make a mistake.

Because them getting a 1KW even if they have to put a little money in isn't really that big of a loss if it's a complete failure. But if they put in a large installation and they have all sorts of problems, then it can be devastating to their entire district. So they need some hand holding and we're trying to do that a little bit.

But it's a little bit harder for us to work on larger projects because there's a lot of meetings. But most of the K-12 schools we work with would take larger systems if they could be done through PPAs or other arrangements that they don't have to come up with a lot of capital dollars.

They're also - we're going to start a one item energy efficiency project here very soon and I think schools not only want to do energy efficiency projects but they also want to connect them to the classroom. We did - we have done several wind schools in Illinois and I think the plan is to do a wind school initiative as well. So I think schools have gotten to the point where they're sophisticated enough that they want to go ahead and do these larger systems and multiple technologies.

Here is another project showing again all the different styles. This is a 24KW in Kentucky right near the Cincinnati Airport. And again they need help. What we say is that, you know, we'll help them but it's going to be educational and right now we have a 500 KW system going on a district in California that was a direct result of the 1KW.

It's just very time consuming because of all the additional permitting fees and inspections and designs and different things for us to help as much as we can on a 1KW where it's more of an installation package. And again we have to make sure that they connect it to the classroom.

This is a 65KW project in Worthington, Ohio, our first 1KW was in Worthington, Ohio and then now they're starting to add larger ones. So it's kind of a cool success story for us even though it's not quite as big as some of the systems in California.

This is a really large system in (Alpedas) High School in California and, you know, you can't possibly see the scope of it from this but these are carports and this is a 3.4 megawatt system and it's just massive. And it, you know, goes over several different parking lots and stuff. But the school had a 1KW, they've got this, and they're just sold on everything that they can possibly do.

And I think a lot of schools around the country are in this same situation, you know, that they're excited, they just want help, they don't want to make a mistake. And the more models that we can create for them that they can replicate and have people to talk to I think we've got an unlimited number of solar installations that can be put on schools around the country in every size.

So in summary, I'm trying to end a little easy or a little early. It's not easy. Each of these - I would say that each solar project has ten problems and they're always different but it's not impossible.

And every kind of organization that we have worked with that has done a solar school project has been happy with it. In fact usually the problem is that there are many more schools that want to participate than there - the scope of the project allows for. But, you know, schools put in money sometimes and sometimes the utility or whatever organization pays for it all.

So you can shape it any way you want. The systems can be shaped any way they want. We just have our kind of mandatory grant conditions where we always require that the solar panels be visible and that there be online data and that they be used in the classroom.

So my email is there if anybody has any questions later and there is NEED's Website as well as our Website. So thanks and I'm going to turn this back to Guy with four minutes early.

Guy Nelson: Very good Glen. A lot of good information and you are an excellent steward of time. And now let's learn about wind energy and we're - we've got the pleasure of having Larry Flowers with NREL talk about that. Larry, the floor is yours now.

Larry Flowers: Thank you Guy and thanks to Glen because Glen covered a lot of basics that apply to wind as well. You'll see that the solar schools program is considerably farther ahead with a number of installations and successes. We've only been doing wind program for a couple of years and are learning as we go and the solar schools program certainly is a good model to follow.

I'm going to walk through some slides that sort of talk about the two sides of our program. One of them is K-12 but the other side is the wind application centers at universities that are training the next generation of engineers to enter the wind industry.

So if you look at where we are today with about 35,000 megawatts installed in the U.S., across the country you can see with the exception of the Southeast there is significantly wind developed in all regions of the country.

As we go from 35,000 to 300,000 which is a 20% wind future, you can see that 44 states actually play significantly in wind. And therefore this is a national - much like solar, a national resource and it's important to have education programs in all regions so that both next generation of engineers as well as the K-12 folks are made aware of what the future of wind may be in their state and their region.

In this report, this 20% report, as you can see on the far right according to our calculations there is a huge economic development benefit, \$444 billion, but more importantly are the jobs, the new operations jobs. Some over 3 million job years will be associated with this build out. And that's one of the big challenges of successfully going to 20%.

As shown in this graphic, almost 200,000 direct jobs associated with wind and manufacturing and construction and operations and then a lot of support jobs in the indirect and induced situations.

So one of the key challenges in getting to 20% successfully is the workforce. You know, K-12, hopefully it will expose some folks to wind and say hey, that's an interesting area for the future, it's growing, it's clean, it supplies

energy security, maybe that's something that we'll get interested in and pursue in a variety of different vocations.

So our wind for schools program has several objectives. Unlike the solar program which has a lot of good applications within urban areas, wind really is a rural resource because that's where the resource is and that's where the jobs and opportunity is. So we're really focused on rural America with our wind for schools program. And so the - one of the objectives is to get these wind turbines, these small wind turbines, we're using 2.3 kilowatt wind turbines in a rural school.

And as Glen mentioned, the school is oftentimes the center of a community. They have community activities there, especially in rural America. You can't live in a small rural town without participating somehow in school activities. And so we want these wind turbines co-located with a school.

Now we - it's not as convenient of course to put wind turbines on school property. We can't put them on school roofs but we do want to site them on the school or close to the school property so folks coming to the school can see these wind turbines operating. So the other two objectives are to get the curriculum, we use the same organization, NEED as the solar school programs do to educate our kids on a wind curriculum, K-12. We also have this other element which are these wind application centers at the (SKIP IN AUDIO).

Well here's - I thought it was interesting that like Glen talked about, it's not simple but it's possible. Wind is even more complicated than solar as far as getting the job done. There's sort of a 12 step process we go through to do wind whether it be a 4000 megawatt project in West Texas or a 2 kilowatt project. You still go through the same 12 steps but with a 2 kilowatt turbine

the steps are quicker, they involve less - fewer lawyers, and lower costs and therefore we think we can get it done within a year.

And that's an important piece, because the wind application center at the university, this is a senior design project or an (EPSCORE) project so that the seniors can do the whole process of wind resource assessment and siting and economic analysis and environmental impact analysis, installation, data acquisition system analysis, and so forth within one year so they can get it done in a nice package.

Well there's lots of organizations that are involved in a wind for schools project. The key ones of course are the science teacher, we have to get a science teacher or at least maybe a math teacher or maybe even an FAA teacher to say yes I want to be the host of this project and therefore bring it into the classroom and talk about how wind impacts science, math, policy, whatever they want to talk about at that grade level.

School district administration has to support it because we require the school to put in \$2500, a \$2000 - \$20,000 installation, they have to put in \$2500 because they need to have scratch in the game in order to take it seriously. And then of course the community. When you put a wind turbine in a rural community everybody will be talking about it and will want to know about the issues and benefits.

The next group of folks are the wind application center. They are central to this. They interact with the teacher and the school and the administration and then there's a group of - on the outside sort of orbit, energy office provides funds typically to support the project. The Department of Energy supplies funds to NREL and NREL supplies funds to a wind application center and the state facilitator.

And the state facilitator plays an important role. This is a person that is already involved in rural America and therefore will be the one who interacts with the schools to make sure that the schools understand what their commitment is and what the process is. And then that facilitator basically qualifies schools to participate.

Not every school has its hand up saying we want a wind turbine but there are schools when you introduce this project that say hey, we want to do this. And we believe that over time as the rural school community sees and hears about these projects, the facilitator will eventually merge into the wind application center and they'll go directly to a wind application center.

So the last group of folks out there to make this happen, renewable energy grants. They are available through various ways. The stimulus had some grant money, some of these system benefit charge funds from utilities and states who have that are possibilities. There's also USDA rural development has some funds that provide support for these projects.

The wind turbine manufacturer we use right now is Southwest using their Sky Stream. They provide the components at a serious discount and then we typically have a company that buys the green certificates because they're generating these 3000 to 4000 kilowatt hours that avoids generation of coal or natural gas in general in these rural communities and there is value to that.

And we ask that a sponsor step up and buy ten years of those tags up front for about \$2500. In Colorado that's NREL and it goes toward our sustainability program.

And then over on the right the coop or local utility, this is a critical piece of the puzzle. We want the coop who serves that community to participate in this program and that's one of the qualifying aspects of qualifying a school that the coop says yes, we want to participate. So they bring a bucket truck out, they do the trenching typically, they do the installation, and they do the interconnection and they're a part of this process.

And one of the reasons we picked a small wind turbine typically - not typically, in almost every case, those electrons because there are very few compared to the whole load of the school, go into the school load. They aren't in a net metering mode. In other words they're not feeding the electrons back into the grid, that oftentimes controversial area with rural coops.

And we don't want to stir that up, we don't want to make wind for schools something that is a divisive piece of the community. We want to make it an inclusive piece and therefore we pick a small wind turbine that will have a very minimal impact on the revenues for the local coop. So the coop is engaged as well and that's a critical piece of the program.

Okay so we work with universities, these wind application centers. And they assist the community members. We work with the American Wind Energy Association and basically that's funded NEED to develop the curriculum for K-12. We do teacher training as Glen mentioned for solar schools we do it for wind as well. We have a wind for schools guide and we have a number of supporting materials. We do a state based teacher training as well as work over the Web on Webcasts on various aspects of wind applications.

Wind application centers, we start off with - we actually did our pilot program with Colorado State University up in Fort Collins and then we expanded that to several other land grant colleges that are connected to the rural

communities through their - the ag extension. So we have Kansas State, University of Nebraska, South Dakota State, Montana State, and Boise State were our sort of first six application centers.

And each one of those there is a lead professor and that professor teaches a wind class. And that wind class will be tailored to what that professor's specialty is. And for instance in Kansas State Nebraska it's in electric engineering so they really work on controls, electric engineering aspects. In the other states it's mechanical engineering so they sort of focus on the mechanical engineering side of that.

We've just recently last year added five other universities, three in the East, James Madison in Virginia, Penn State, and Appalachian State in North Carolina and then the University of Alaska in Fairbanks and Arizona University in Flagstaff. And so now we have 11 universities and 11 state programs.

And what we asked these WACs to do and facilitators is to put in three to five turbines per year per state. So we're putting in at this point over the 11 states somewhere between 35 and 55 wind turbines in rural schools per year.

So these are the state facilitators. The interesting thing about them as you may get a pointer here. Okay I'm having a little trouble here (Sue).

Woman: Just click it.

Larry Flowers: Okay the six people here, on the top left is (Steve Whiteman), he's from South Dakota and he was one of - a public utility commissioner for many years. He worked with a rural school so he knows many of the rural schools and

therefore he can qualify schools easily. (Tom Potter) over here, Colorado, works with energy efficiency in rural schools so he knows them.

(Mike Castani) over here was a wind for schools facilitator in Montana. He has gone around to all the communities working with them on (Credits) loans. (Dan McGuire) from Nebraska is the Corn Growers Foundation in Nebraska, knows the rural community. (Ben Nightingale) in Kansas is head of the rural energy center in Kansas. (Brian Jackson) in Idaho works a lot with wind in rural communities.

So these are folks that are already connected to the rural communities and can basically help in selecting the early numbers of schools and make sure they are successes.

Here's how much these things cost. Typically they as I mentioned about \$20,000. The second part of this as you can see the \$2500 from the school, the green tags, money from the state or USDA, and then in kind with utility and concrete manufacturer and so forth. That's how we put the (unintelligible) together from a financial standpoint.

We have again I mentioned the curriculum at the university level depends on the professor. We provide materials on the wind development process and then NEED works directly with the K-12 schools.

If a school wants to go larger, that's fine and we want to help them do that. It's just that is sort of outside of the wind for schools program and we will help and work with them to help them look at 100 kilowatts, 55 kilowatts, megawatt.

And there are wind for schools applications that have these kinds of turbines installed but it doesn't fit sort of in our financial realm so they sort of step outside of that. But they still get all the benefit of being part of a wind for schools program as far as curriculum, sharing data, future training, and so forth.

We have wind auxiliary program for those states that aren't official state wind for school states but again want to do a wind for schools program like Iowa has done and a number of other states. We want to engage them and have them as part of our network so that schools that are in the wind for schools official program like Kansas can learn from the experience and share experiences with those states like Iowa, Texas, Oklahoma, other states that have done wind for schools but on a larger scale and not as integrated as ours.

We have a Website which you can click on any one of these on our Website and find out what the details are for that wind for schools project. A couple of experiences we've had, this is a KSU student and they got an award to actually do some research on looking at turbulence and how that impacts turbine lifetime production. So this is a direct result of our wind application center at KSU.

What do some of the big names think about this program? Here is Senator John Thune from South Dakota who supports this. The wind for schools program is an important step in achieving the goal of putting America's energy resources to work.

Here is Governor Brian Schweitzer who oftentimes goes to the projects during installations and helps actually in the installation. He's kind of a hands-on guy. Basically he says this is great to educate tomorrow's leaders in the value and importance of renewable energy source for America.

Here is the counselor at Wellington Middle School here in Colorado. It's an awesome program. We saw this as the tip of the iceberg. Ruth Douglas Miller is our wind application center in Kansas State basically saying that this one teacher says that their project has basically engaged 17,000 students which is pretty remarkable.

Principal of (Tree Peat) Elementary, students get excited when they get to do some hands-on work. It's not just textbooks and tests. Senator Ben Nelson from Nebraska, conservative senator basically is saying set the stage. And then Governor Bill Ritter, our governor here, about the new energy economy educating today's young people about the benefits of renewable energy, prepare them for a wealth of future opportunities.

So we have lots of great testimonials about the success of these programs and the impact of these programs, but the one that really hit me the most as far as showing the real impact is we had a competition down in Dallas at the big wind conference and this came from one of the teachers of a special education teacher.

And he said the confidence and self esteem they gain in these types of competitions is priceless. We understand these kids are bright, imaginative, and resourceful, we just can't always convince them of that. When our kids do well in this type of competition results are felt throughout the entire school. Kids stand straighter, try a little harder.

The kids who did this project were afraid to speak last week and did an entire comedy sketch at a talent show today. So this really does have an impact on the kids and for that alone we really value this program.

So of course one of the big hitters in America, Ben Franklin says tell me I forget, teach me I remember, but involve me and I learn. So with that I want to - there's our Website, [windpoweringamerica.gov/schools](http://windpoweringamerica.gov/schools). We're interested in providing you with any kinds of information on this program and with that I'll turn it back to Guy.

Guy Nelson: Thank you very much Larry, great - again, great information like Glen and I like your quotes. I had the privilege of meeting Brian Schweitzer, the governor of Montana. I agree with you, he's a hands-on guy. He told the audience when he was speaking that if you see people on the street here in Montana that don't say hi they're probably visitors.

Let's now move on to Tom Weirich with ACORE and Tom, you're going to be addressing the higher education energy programs. Tom, again the floor is yours.

Tom Weirich: Perfect, well thank you so much and thank you everyone for joining us on this very timely call today. It's an honor to be representing our higher education committee and the 34 institutions that compose that here at ACORE. So I want to kind of take you to a 30,000 foot view.

I know we have many more able experts and specialists on the call today that can zero in like Larry did so well on wind and solar and things like that. So today I'm going to now take us through the presentation and we're going to actually start off with kind of a general who is ACORE and what we do and where we're going.

Then I'm going to really go into two programs here at ACORE that really galvanize the interest behind financing as well as looking at education as well

as how do we really connect the financial industry with the education industry and bring together viable, sustainable projects on campuses.

I'm going to take you then through a 30,000 foot view of U.S. renewables. As many of you know we're a big country with many resources. We're actually a market of thousands of renewables markets that are in counties and regions, so we can take a view of that and then go through, you know, two case studies that two of our members put together for us focusing on what they are doing to really transition us to a cleaner, more secure, more reliable, and less expensive energy future.

So ACORE, who are we? We are an organization of over 750 organizational members, members ranging from Google and Goldman Sachs and J.P. Morgan to over 64 utilities and entities, government entities including the Department of Energy, Department of Agriculture, the National Laboratories, NREL, (Oak Ridge, Sandia), as well as many universities and colleges, over 100 associations including U.S. Renewable Council, (Life Save) Energy, and we and many others as well as wind manufacturers and professional services firms.

We really assemble all the key stakeholder groups that are necessary to really scale up renewable energy in the U.S. And the kind of four cross-cutting issues that we really address using an essential technology agnostic. So what we really look at the end of the day with our members is clearly the financing behind the renewable energy, the policies behind renewables both on a federal as well as a regional level, the markets that will get us to the next level as well as international engagement, how the United States plays in the global industry.

As you'll see in the next couple of slides we'll go through some of our members from our educational side of things but members also include of course NEED and many of those other organizations that were mentioned before.

So looking at pieces of programs that I think for all of you will be very educational and very informative in your deliberations about campus projects and how to move forward, of course this whole year has been dominated by conversations about financing, especially financing coming from the government. Everything from RPE to stimulus as well as regional stimulus.

So here there's a program that we actually manage called the U.S. Partnership for Renewable Energy Finance or else being from the land of acronyms U.S. PREF. And U.S. PREF is a coalition of over 17 of the largest investors in renewable energy here in the U.S.

So Google, Deutsche Bank, J.P. Morgan, Madison Dearborn, Solar City, many others, Citigroup, Bank of America. And these folks come together to really educate politicians both on the federal and state levels as to what project development and project finance is all about.

So instead of lobbying for a specific policy or financial remedy like a national RPF or feed and tariffs, you name it, they take a step back and actually give them a MBA 101 class on what exactly does it mean to do project development in the U.S. right now, what does it exactly take. It's a very effective group.

And the reason I mention them for all of you is if you go to their Website which is [uspref.org](http://uspref.org) there's a tab called White Papers. What happens after their meetings let's say with Secretary Geithner or with Reed and Pelosi is they

actually put together a white paper documenting their conversation, specifying gaps that were there in the conversation as well as educating both the politicians as well as the readers of this white paper as to what the current conversation is around government funding of renewable energy.

So for all of you I definitely would take advantage of it. There's eight white papers that are there open for the public to view and, you know, definitely look at that and see how that could apply to your current work.

Our second program of course which is a lot more applicable to today's conversation is our higher education committee. It was formed about three years ago with the basic mission to really increase us of renewable energy on college and university campuses. Secondly to develop curriculum and resources for multi-disciplinary approaches to education from anything for MBAs, business degrees, engineering, research R&D, electrical engineering programs, things like that.

Thirdly the mission of HEC is actually increasing funding for higher education based research and development of renewable energy. You know, many of these universities and colleges actually are shining examples of a microgrid of what we could be doing.

So when you look at renewable energy technologies, smart storage, smart grid, things like that, you know, we really need to have the country be looking at these universities and colleges as perfect examples of what we could be doing on a grander scale. So this is something that HEC definitely is working on in collaboration with U.S. PREF as well as in collaboration with our 192 banks and VCs and others involved in our renewable energy finance and investment committee.

What does HEC do? Well, you know, how do they do what they do? The gut is we have informational Webinars every month which is open to the public. We also do a lot of informational in person meetings focusing on case studies, university by university, college by college.

And we also try to get a plug out there for universities and colleges that are perfect examples out there but really are not communicating the full value of what they're doing. So and we're developing a project on campuses as well as increased engagement in R&D research.

You know, our big feeling here at ACORE and I think all of us on the call would agree is that colleges and universities truly do have a vital and urgent role to play in mobilizing our intellectual resources that could lead to development of strategies for not only our nation but solutions also that almost every organization and individual can use here. So that's definitely something that the HEC strives to do.

And actually something I didn't put on the slide which I was really amiss that I didn't put them on there was we just actually launched with HEC and with our international programs a compendium of best practices which goes through and believe me, it was a project, went through 750 case studies across the country with the aid of 300 advisors.

And we put together 25 -- imagine narrowing it down to 25 was a task -- but 25 of the best local and state successes in energy efficiency in renewable energy in the U.S. So these 25 best practices ranged from examples from American cities and states and universities from everything from, you know, public benefits funds, energy code implementation, appliance standards, properties that clean energy, municipal bonds, direct cash subsidies. You

know, revenue stability mechanisms like decoupling, you know, net metering, interconnection standards, transmission planning, things like that.

So they really went through a great plethora of examples that are out there and this compendium is available for public download on our Website. So if you do go to [acore.org](http://acore.org) one of the four transition slides I think right now on our home page actually is the compendium blend so take a look at that.

You know, I myself am not an expert in this and, you know, in terms of a lot of these things but that compendium believe me is very valuable. And actually was named by the State Department as an official program or official project or product rather of the Asia Pacific Partnership.

The big key here is that the litmus test by which advisors narrowed down from, you know, 750 to 25 best practices were how many of them can be replicable in India and China as well as globally. So very interesting thinking that went into this but definitely a research for you all to take advantage of.

Another resource that the higher education committee has been working on along with many of our other committees and members is a launch of what I call, you know, the Desire database on steroids.

You know, all due respect to (Jane Whitesman) and (unintelligible) who are members, you know, we here at ACORE have been finding more and more the Desire database was very key to how we understand renewables on a state level and building off of that true success we wanted to complement (Jane)'s efforts in that.

And we'll be launching in a couple of weeks a 50 state database which will be going through all of the energy resources, all the projects our members have,

key energy officials in that state, jobs numbers, you name it, state by state, an applicable database format very comparable to Desire.

And so we're working with many of our associations and groups on that but that's something which again will be a resource to all of you when you're trying to figure out on a state level what renewables resources you have at hand and what you all can do in terms of partnering on a state level.

Lastly before I get into our 30,000 foot view of U.S. renewables, we are going to be launching regional councils very shortly. I don't want to jinx the interview date but we'll be hopefully in the next couple of weeks launching a regional council. So ACORE's 700 corporations and organizations will start to break up into five to seven regions across the country to really focus on how do we harmonize regional policies.

These days here in Washington everyone is concentrating on federal policies, on a state level everyone is concentrating on state policies. But no one is really figuring out to our knowledge how to really harmonize policies between the regions and then secondly how to then take those harmonized regional policies and plug them into a national strategy here in Washington. So definitely be on the lookout for that. It will be announced shortly.

Next slide as you'll see here is just a listing of our founding members of the higher education committee so just wanted to give them some due credence and visibility for all of their work. You can see here they range from private institutions to large public institutions to everything from, you know, Harvard to community colleges. So a very diverse bunch of people from across the country so we're very honored to have them involved.

By going to the crux of the matter as you all know we are a market of thousands of markets in the U.S. So just to reiterate and reinforce a lot of the other speakers' comments today, you know, for example if you're for solar, looking at this map of course we all know solar is, you know, mostly from the southwest.

However, the whole country really is ripe for solar. I mean, look at Germany and look at Ontario especially with their (unintelligible). They're utilizing solar up there in those northern regions. We can actually utilize solar everywhere.

So do not be dismayed. I know a lot of people think that, you know, the most optimal solar is only in the southwest but it's actually, you know, applicable everywhere.

Other technologies a lot of our universities and colleges are plugging into especially the University of Minnesota, Morris, is wind. So you see here the wind corridor going through the Midwest. Again, lots of pockets of wind throughout the country including Austin and especially Hawaii.

Hawaii universities there have been using wind as helping to (unintelligible) large scale wind as well as micro wind as Larry clarified and pointed to. So here again, lots of wind resources that have been utilized by our education committee members.

Another resource that really is an unsung hero in my personal opinion is geothermal so geothermal heat pumps. More and more of the U.S. (Billing) Council is pushing geothermal heat pump design in lead accreditation. So again, geothermal, okay most of it is in the west, you'll see here by the Rockies, west of the Rockies. However, there are pockets everywhere.

And in the case of geothermal heat pumps you can really access that in most parts of the country. So more and more a lot of colleges and universities are starting to implement this technology, learning more about it, researching more about it, as well as in their own facilities' designs.

Last, you know, our Chairman here (Bill Holmberg) tells us that biomass is the big player in renewables. So giving credence to him, here you see a map of biomass resources. And this is actually a place where the southeast really can step up.

We see our members Southern Company as well as many of our other southern members really picking up the slack and really looking at biomass, biofuels, and bio based power generation including waste energy including, you know, waste from biomass and bio (woody) biomass from agriculture waste as well as from lumber pulp waste and things like that. So here of course is a map just focusing of course on biomass by NREL.

Now given all of this and given that we have, you know, gone through ACORE's program, kind of key players in that, and looking at these resources, how do you all as universities and colleges and others really start to work on really providing universities and colleges a platform by which they could really demonstrate their sector.

So beginning here off the bat we're going to go and look at University of North Carolina Chapel Hill. Before I begin I definitely want to give thanks to (Cindy Shea) who helped me actually put together this presentation. She is of course the Director of Sustainability Office at UNC Chapel Hill.

UNC really took an interesting approach and actually looked at solar thermal and really they're one of the big demonstrations of solar thermal in the southeast which you really don't, you know, mostly hear about.

Here is a picture of Morrison Hall and their solar thermal installation which included 172 semi attached panels as you see over there which are each 21 square feet large which is perfect. And they actually produce 200,000 to 600,000 BTUs per hour for output which is - it's a powerhouse to say the least.

And what it did was it provides all the domestic hot water as well as reheating for the entire building. That's a big dorm that facilitates hundreds of students on a yearly basis so definitely something to look at there.

The second thing that UNC has been doing is definitely going the lead route. Here you see they're the lead platinum education center, the botanical garden powered by geothermal, PV, technology that (unintelligible) as well as new daylight technologies using skylights and other technologies to provide natural forms of lighting.

It has resulted in automatic 48% energy savings in the first year alone which is amazing. So right there is an example of them demonstrating leadership in the sector and automatically reaping the energy savings from the installation.

Another interesting program they did on the campus and what's really progressive about UNC is they have actually a renewable energy special projects committee of the Sustainability Office, they put together a campaigns both for the faculty as well as for students and it has really cut down energy consumption and here they have, you know, (unintelligible) contained which was actually held this last spring, lots of results.

And here is an example of some of the - a sign they actually hung in one of their halls, you know, everything - basic stuff from turning off lights, using natural lighting to how to conserve water to how to really facilitate energy savings in regards to their cost and air volume, you know, that's wasted in many of their buildings. So definitely a campaign to look at. And of course this is available on our Website too to view.

Another really cool tool they had was a campus wide accessible applications tool that actually looked at their carbon footprint and their emission. And here you have, you know, a snapshot of what that looked like and their goal at UNC Chapel Hill is to be carbon neutral by 2050. And they actually are right now well on their way to achieve year 2000 emissions by 2020.

So you can see them already going back and really being leaders in that but this tool is an example of how facilitators and administrators many of the sustainability offices across the U.S. to be really monitoring this and making sure to reach their reductions by 2020. And also help and assist in voluntary renewable energy standards for the state of North Carolina especially in this case.

I'm kind of flying through this to make sure we're on time. The second case study is actually Eastern Connecticut State University. And special thanks to (Bill Lahee) over there who is the Sustainability Coordinator. And they have been doing a lot of work especially for being a northeast school, doing a lot of work in terms of putting together a center for excellence and sustainable energy studies.

So they went the curriculum route and starting in 2001 they put together this institution for sustainable energy studies to pursue sustainable energy and

really put together programs which promote and improve awareness and understanding of sustainable issues not only for the college but statewide.

So an example of a college partnering with the state that put together a really robust program that not only educates the immediate stakeholders within that university campus or community but also stakeholder groups that are vital in the conversation statewide, in this case the state of Connecticut.

The application sector which is a vital part of the institute has basically four core activities they really focus on in terms of strategy. The first one thinks of four year development of public policy in Connecticut. Secondly, providing education outreach be it both in the format of education to students as well as general education to the broader public. Thirdly demonstrating comfortable, sustainable solutions on campus which is so key.

You know, many of our politicians as well as other corporate leaders really have never touched a solar panel, they've never seen a wind farm, they've never done many of the things that we all have done. So these universities and colleges facilitate that opportunity for many local politicians to be able to touch, see, smell the technologies we all endorse and work with.

Lastly they're also a source of information on sustainability. More and more as you all know, there's tons of information, there is a plethora of information on renewable energy out there and there's really not a lot of mutual players that really pull together sources of information. So this is something that the university has stepped up and said that they really want to be a leader in.

Next, you know, they worked on a clean campus initiative and high performance school initiative which really led to adoption of a lot of these initiatives on a high school level which is just fantastic. So you'll see here

they worked on everything from green building standards to renewable energy standards working with all public local schools and universities and focusing on construction projects starting January 1 of 2009.

So here is another example where a university or college can step it up and partner with other institutions of higher education or education of state and really provide kind of a connection to those looking to put these projects in the ground. In this case they reached out and worked with the clean energy funds of Connecticut and scored over 87 school projects to really create renewable energy in many of these school designs.

As well, you know, they worked on their green campus initiative and, you know, as we all know they went on to many of the locals and campaigns are out there that include ACUPCC and here are just two other things that are of interest. The eastern of course is the second largest geothermal exchange system in Connecticut plus many PV systems. So again another example of where the northeast can step up.

And lastly here are some links that (Bill Lahee) wanted me to pass on to all of you in terms of some interesting Websites from Connecticut. So for all those folks on the call who are looking to the northeast specifically, here are just some valuable links that might be of interest.

Also if you go on [acore.org](http://acore.org) to our higher education committee page we have links there from all of our educational institutions kind of looking to challenge the investments behind renewable and integration of renewable on campuses. So definitely be sure to check that.

And last but not least of course they want to tell what they've done over there so here are some of the many awards they've done. And for all of those of you

who are colleges and universities looking at well what are some monetary awards that could help facilitate fundings on a project, here are some fund awards that you definitely want to take a look at.

So I think with that, you know, I'm done. But of course if you have any questions of course I'm here to facilitate any transactions with our experts, with our utility folks here at ACORE as well as with our higher education team.

So for any questions or any ways we could be of assistance, please let us know and we'll be happy to be here to help really scale up renewable energy in America. So thanks again for the opportunity and look forward to being in touch with you all.

Guy Nelson: Thank you Tom for that presentation and there is going to be time for Q&A at the end and you can input your Q&A even now as I speak by going to the Q&A button at the top of your screen, click on that and then type in your question and then click Ask.

Okay with that let's turn now to utility perspectives and our first speaker is Gary Hoffmann who's in charge of the equipment loan program for Western Area Power Administration and Western serves about 800 utilities across the west. And Gary, what's going on with the equipment loan program?

Gary Hoffmann: Thanks Guy. I'd like to talk a little today about a relatively new program we've got going on here with the equipment loan program in partnership with Wind Powering America. And it's new enough that (Randy Manion) and I were talking yesterday trying to figure out what exactly we're going to call it. And so for now it's Renewable Resource Weather Station for Schools.

The equipment loan program that Western has briefly is a program to provide Western customers which are as we've heard earlier a lot about rural electrics, these are coops, rural electric municipalities, Indian tribes in the western United States and as Guy said we're about 800 of these.

It was started to provide them with equipment that either is too expensive for them to buy or something that they only use occasionally. It started originally in the 70s, the late 70s. We had some 30 foot anemometer towers and loaned those out and we covered about 200 sites with those.

Later on as equipment became available we went to the 200 - or 200, to 20 meter towers and loggers as those were coming into the market. And this was a cooperative between Western and NREL and included both Western customers and a lot of tribal customers.

About the same time we also added infrared cameras that were used for power line substation distribution by diagnostics looking for hot spots, potential faults, and initially it started off a little slow but it grew for the energy auditing market.

Currently we've also added things like power quality meters looking for things like harmonics, energy use measurement equipment. We've got a lot of educational type things like energy efficient lighting displays that demonstrate the efficiency of compact fluorescents and LED lighting and some fuel cell displays that are popular with the schools and a lot of renewable and energy efficiency publications and materials, CDs, things like that.

Why did we look at this program? Well the 20 meter towers we ran into, we're starting to run into a lot of issues with that and something needed to replace those. Basically this equipment is no longer being manufactured and

replacement parts are no longer available and so as it wears out we've got to replace it.

The other thing is that the shipping costs have continued to go up where we've got sometimes exceeding - we're spending more to ship it than it originally cost. The data loggers don't provide a lot of feedback to the user at the site.

There is a one line digital display that you can scroll through and it will give you an average wind speed and an average direction I think. So there's not a lot of feedback at the site. What happens with those is a data plug is sent in every month or two to NREL, they analyze the data, and provide a very good report back to the user, several pages of really complete data.

The main thing too is that now the 20 meter tower has kind of gone out of style there - for commercial development obviously there's a need for a much taller tower.

So what were our goals in here with these weather stations? Again we looked at the size of the tower that we have now is that we can't afford and we don't have the budget to go to a larger towers and that's left to the people at NREL and other ones that have that as their area of expertise. But we were looking for something that we can still reach the needs of our customers.

And we've heard a lot in the previous speakers about how important the students are and since they're the future of the communities that we're working with, this is very important to us. We wanted to get a way where we can work with them, help teach them about conservation renewable energy.

The equipment loan program in the past has always loaned equipment, like I say we have a lot of educational things and we're getting an increasing

demand from our customer utilities for these educational type things that the lighting displays, the fuel cells, and the literature to work with their school - the schools in their service territory.

Again this is a developing program and we've got a couple out right now that one is in Fowler, Colorado, the other is in Cedar Ridge, Colorado. We've gotten really good feedback from both of them on that. Fowler, Colorado has used one for almost two years now and they've gotten a lot of community involvement.

That town has done a lot of work to look into renewable energy. They've added a lot of solar panels, they're looking at wind, a lot of things like that. It's quite a progressive town and they have managed to get the students involved in that. One of the students that was involved in the wind program that they did with the weather measurement went on to win an award in a regional science fair and did a project on wind power.

We had also loaned to them a 20 meter tower and they put that up on a hill north of town and found that they had a fairly decent resource and they're investigating further into putting wind power in their town also.

Another thing that we want to do with this program like I say is to get the schools, the utilities, the communities, and Western all involved in working together and we would also like to upgrade some of the Web pages that we have to add links to information and to other schools.

The piece of equipment that we're using right now is the Oregon Scientific WMR200 and it's a wireless weather station. And I know the purists are going to say well if you've got this up on the top of a school building you're going to have turbulence and we realize that you're not going to get always the best

wind speeds. But what we're looking at is kind of a trade off of cost versus really accurate data.

And we have found that it does give some pretty good data. It comes with a large graphic desktop unit. Again it's wireless so there's no wires to have to hook anything outside. There's a solar panel on the outside unit that provides backup power during the day and then batteries powered at night.

It has temperature, humidity, wind speed, direction, water, rainfall. It comes with a short mast, about a six or seven foot mast, all the mounting hardware that's needed, all the computer cables, everything to get it up and running. On the display itself it will give indoor/outdoor temperatures. It gives the wind speed and direction and the average for 15 minute intervals on the display itself.

But one of the important things is that it has an internal storage mechanism and that will depending on the storage interval which will run from every 3 seconds up to 15 minutes, you can get up to several months worth of data that will be stored in there and then it can be downloaded into the computer. There is also the ability to hook this in and provide online data. Like I say what we did find out that with this unit, it costs considerably less than what we were paying for shipping just one way with the 20 meter tower.

Another piece of this is it comes with the software to get into the weather exchange network which is literally thousands of users of home and professional type weather stations that put their data on Website - on this Website and so when the school has this and they can go and look and see what else is in their neighborhood, compare data. They could also use it to compare with other schools that are participating in the program.

When I loaded the software on my computer here at work I found literally dozens of sites within a five to seven mile radius of our office here in Lakewood. And like I say, we see this as one of the advantages to them being able to participate.

We're working on a Website where the schools that are participating in the program, and this would be similar to the wind for schools program that Larry talked about, their type Websites where there's a real interest from all these schools to want to see what the data is with the other schools.

The town of Fowler wanted to know hey, what - are there other schools that we can see what's going on and so they're really interested to see just what other schools are. And if they have the opportunity say to tie in with a school that actually has a wind turbine they can compare wind data at their school to wind data at other schools and to what they might be able to generate.

One of the things that we were looking at too and we've just gotten the equipment to compare that is that the Oregon Scientific does have the ability to add an ultraviolet - down here in the lower left hand corner there is an ultraviolet index sensor. And that's a relatively cheap addition.

Part of the problem, we'd like to add something to measure the solar insolation. That adds a considerable cost to the unit itself so we're trying to correlate if the ultraviolet index somehow correlates into the insolation value and we've got one of those that we'll be putting up on the roof here soon to compare those two to see if this relatively cheap addition would give them an idea of what they might have available in solar also.

And with that I will - here is my contact information. One of the things is that we talked earlier that Western serves a group of rural electric and public

power customers in the western United States but since this program now has gotten some extra funding from outside we're able to expand a little.

So if you have questions about whether the school in your area would be able to participate, I would suggest that you get in touch with me either off of our energy services Website or off of my mail which is on the slide here. And one thing that's important is to make sure that the Hoffmann has two N's on the end of it. And with that I will turn it back over to Guy.

Guy Nelson: Hey thanks Gary, good stuff. And I would just say - warn you that now you're not going to get as many Christmas cards from FedEx, UPS, and DHL. Now we're going to hear from two of Western's 800 customers. These two customers of Western have active energy education programs with their local schools. And we'll start with SMUD and Suzette, you are in the bucket now. It's all yours.

Suzette DelBono: Thank you Guy. My name is Suzette DelBono and I'm here to show you some of the renewable energy programs offered by the energy technology center at the Sacramento Municipal Utility District.

I know we're kind of short on time so I will gloss over some of the slides that do not deal directly with renewable energy. I understand the PowerPoint presentation will be available online so if you have any further questions feel free to contact me on those programs.

My major purpose here is to provide professional development workshops in classroom curriculum for teachers, educational opportunities for students. We supply electricity education and safety resources. We support local STEM events so anything dealing with science, technology, engineering, and math in the community.

I sponsor grant and scholarship programs and we provide a public presence supporting wise energy choices, climate change education, and environmental stewardship. A little bit about our territory, we have just under 300,000 K-12 students and I always like to remind everyone that 1 out of 6 Americans sells into this category here.

I have 8 districts, 44 high schools, 48 middle schools, 254 elementary schools, and I also support the community college district and California State University in Sacramento.

So let me overview some of our major programs. The first one up is the Youth Energy Summit Leadership and Action Program. This is an award winning partnership that SMUD works with (unintelligible) electric utility and the electrical project at California State University. It's only available to high school juniors and seniors because one of the effects is scholarships and we like to see this money applied to their future education.

It begins with applications then followed by a two day summit here at SMUD and the summit involves presentations from subject matter experts, utility experts. We have displays, many hands-on activities, and the students also receive one unit college credit.

Students wanting to continue on with this process will go back to their schools and perform a service learning project. There are no constraints to how they design or implement the project other than it somehow be energy related. The final step is on Earth Day at the state capitol. The students will meet and display their projects to the public and legislators and they are judged and we give out the scholarship awards. It's a very lengthy project but well worth it.

Here pictured are students at the summit. We have very many notable speakers. You see pictured here is Dr. Daniel Kammen who was a recipient along with Al Gore for the Nobel Peace Prize. Also pictured is Karen Baker, California Secretary. Not pictured here but another notable presenter was Chelsea Sexton from the movie Who Killed the Electric Car. She was here promoting EVs down in the lower picture.

Next are some pictures from the presentation at the state capitol. You see the students making presentations on the community service learning project and their energy projects range anywhere from instituting local community organic gardens to providing community outreach to local schools. So we had really excellent projects.

Here are more pictures from the state capitol on Earth Day and pictured here you see Mayor Kevin Johnson awarding a check to one of the students, California EPA Secretary Linda Adams, and assemblyman (Roger Nelo). And you see a lot, a whole gang of students at the very bottom who participated in the final scholarship event and we gave out over \$30,000 in scholarships.

We also have a fulfillment program. Now most of the program involves dealing specifically with electricity or electric safety. But we have giving out some electric - some booklets on energy efficiency and renewable energy targeting specifically grades 5 through 6. This is another program that we have that targets 4th grade with electric information and safety. Again we're starting to focus a little bit more on energy efficiency here as well.

This next program, Living Wise program, is a partnership with selected water districts in that area and it educates 6th grade students and their families about water and energy conservation.

And we use the school to home approach so the teachers provide a curriculum to the students and the students then take their knowledge home with a kit that they help their parents implement energy saving devices through the house. This is actually a third party vendor that supports this for us, Resource Action Programs.

This next program is called Energize Minds for Solar Design. We provide grants for solar projects and it's open and available to high school and community college students and teachers. The amount we give out varies but it generally is around \$20,000 a year. We give out cash, we give out use PV, and a combination of cash and use PV.

You see here pictured a student here who came up with a design for a portable PV display that he takes around and teaches elementary students about solar and the positive effects of renewable energy. The cycle begins in January.

Another program we have that's also solar related is the Solar Summer Institute. SMUD provides five stipends to local teachers to attend the summer institute which is sponsored by the (Rahos) Institute. The teachers stay for a week, they have community college credit available, and they learn everything about anything to do with solar from the geometry of the sun to wiring their own PV panels to implementing curriculum and projects within their classrooms.

We also sponsor a solar car race every year. This starts in January. We offer a how to build a solar car workshop for teachers. That is open to any teacher in Northern California. It's free of charge and we give each teacher a kit to assemble a solar car.

The teachers who are within our service territory who would like to participate in the solar car race which is held at the American River College in May also get enough materials to sponsor a student who would like to participate in the race. I have attached a link so if you're interested in seeing the video from this year's race you're more than happy to do that.

We have generally anywhere between 200 and 300 students participate each year, and the students will convene in May at American River College and not only participate in the race but also that is a time when the college classrooms are open and the students can talk with professors and sitting students who are currently engaged in a PV program or engineering or automotive design.

SMUD is a certified GEMS training center and that's Great Explorations in Math and Science which is supported at the University of California Lawrence Hall of Science here in California.

All this curriculum is correlated to California Department of Education standards and some of the titles that we cover deal with renewable energy. For example, Environmental Detectives, Global Warming, the Greenhouse Effect, and the Reasons for Seasons are some of our more popular workshops that we offer for teachers.

So one of our major goals here is teacher professional development. We provide curriculum, class materials, and a variety of science, math, and technology topics. Since I have such a very large district with so many schools and students we work the top down approach by approaching teachers giving them the curriculum and the materials available to teach renewable energy.

In science I am a former science teacher and I found that many teachers lack of background are credentialing to teach science and that teachers need

alternative methods to meet the curriculum standards in a way that interest the students and students are very engaged in the environment, they are interested in this.

So we hold anywhere between 10 to 14 workshops a year and you can see here we have a group of teachers looking at a biogas facility at a dairy digester on the left. And on the right we have teachers actually looking at turbines at the wind farm.

Solar is very, very popular. We have generally two solar workshops a year. The workshops are divided into two major topic areas. Half the day is devoted to solar as electric, the other half is solar as thermal. So you see some teachers here working out electric circuits using solar panels and some teachers practicing in how to build solar cars.

Other science workshops, we have a workshop that's sponsored by NASA that teaches educators how to connect the sun-earth connection and how to bring that back into the classroom. We also have had hydrogen fuel cell workshops and this workshop was supported and sponsored by NEED. We had a 100% solar powered hydrogen fueling station here. It was the only one in California that was 100% clean.

Wind workshop, that seems to be a really popular topic today. This is designed specifically for high school teachers and community college educators. We have in-house designed curriculum as well as hands-on activities and we give the teachers kid wind kits to help have the students teach - learn the principles and physics of wind.

Another popular workshop that has been very, very well known lately is that the Energy and Me workshop and it's really well known because it's targeting

a group that hasn't really been reached before and that's K-3 students. We use the Energy and Me by Billy B. It's a music and video how to dance and sing on energy topics with anything from solar to energy efficiency and we found that this was a great way to engage younger students.

Since we are an electric utility obviously electric circuits is a very popular workshop and in addition to teaching educators about circuitry and how to teach that in a way that interests students we have been including a lot of information on energy efficiency there as well.

Brand new this year, this is the first year in very many years that Sacramento will sponsor the 2010 California Science Teachers Association conference. So we have a one day field course that will be available to teachers who are registered for the conference and we're calling it the Renewable Energy Sustainability Bus Tour and Field Course.

So the teachers will board a bus and tour the (Solano) wind farm, the (Castelini) Brothers Dairy Digester and (unintelligible), they'll get to see hands-on utility solar scale, residential solar, green building lead certification, and alternative transportation. We'll be teaching on the bus as we travel and the teachers will actually get to see up close exactly what we're talking about and they will figure out ways in how to include that into their curriculum. This is a great renewable energy resource.

Also at this conference I'll be teaching a workshop that's titled How to Make Most of Sixth Grade Science Standards through Solar Cooking. And that is really a fun way to engage students because who doesn't like to eat food.

Another topic that we cover besides science and technology, this is - this covers K-8 as well as high school and we found that teaching teachers how to

access new tools available on the Internet and especially social networking is now very, very important. In fact the Used Energy Summit has its very own Facebook page and that's how we communicate much of the information we have to the students who are engaged in the program.

Another topic is math. We support math for all and especially algebra because we found that is a stumbling block to many students who would like to pursue degrees in engineering but feel that they're lacking in their math background.

I also offer a grant writing workshop again principally to support the solar grant that we have every year. But this is actually open to any teacher who would like to be able to write grants and sharpen their existing skills and either applying finding grants or actually writing and supporting the grant.

Another seminar that looks brand new this year, it's called Green Courses Certificates, Colleges, and Careers. I had originally designed this to be open to high school counselors but decided that it would be great to have it open to students and parents as well who are looking for ways to integrate energy sustainability into their future educational experiences.

So in addition to having a speaker giving an overview of what is available not only nationally but specifically locally, we're also going to have exhibits by local colleges. They will have tables and they will have representatives talking about their specific programs.

For example we'll have (Aloni) talking about their wind program, Sierra College and American River College will be discussing their solar certification program, California State University in Sacramento will be discussing smart grid applications and their power utility program, (Consume

This) will discuss green building, and Sac City will talk about their mechanical program.

SMUD is also very supportive in the community for STEM so Science, Technology, Engineering, and Math. So you will us represented at the Sacramento Regional Science Fair, Science Bowl, Science Olympiad, Expanding Your Horizons, and Science in the River City. We do this through either financial support, volunteers, or providing mentors.

We also have information on our Website and you can access our Website you will see at the end at smud.org. We have games for younger children on energy efficiency, we have links to sites for educators and students offering opportunities and other Web based games available as well as a way for teachers to register for the workshops that I mentioned previously.

Special events, this is on an ad hoc basis. We had (Marcello Louis) come with his Power 1 solar car. This car holds the record for distance covered by a single solar car. You'll see that pictured in front of the customer service building. Solar cooking happens to be a personal passion of mine. I put on many solar cooking demonstrations not only for here at the utility but for other utilities and other people interested in renewable energy. It's a great way to hook people into solar through solar cooking.

We also sponsor what we call eco movies. We will sponsor a movie along with a speaker to discuss a particular topic, have it open to not only SMUD employees but the public as well. You see here pictured Who Killed the Electric Car. That was one of our more popular movies that we showed to the public.

The Energy and Technology Center also has a lending library so for teachers who are interested we have all the GEMS guides available, not just one specifically for energy units. We have solar energy classroom kits and energy related movies and DVDs.

Speaking of which, MUD produced a movie called The Climate Change Challenge and it was our response to Inconvenient Truth and I can attest to this as a teacher in the classroom, there are many problems in the movie primarily coming from parents in that there are political differences that prohibited the movie being shown many times as well as the length of the movie didn't really fit into a class period.

This movie is available streaming online. It's 18 running minutes. The thing that I really like about this movie is that it's not all the doom and gloom that you saw in Inconvenient Truth but has a very positive message. It's student centered featuring students from area high schools and it gives a great message about what each of us can do to make wise energy choices personally that can make changes in the environment. And if you're interested in watching this is available on [smud.org](http://smud.org) as a streaming video.

I also produced an energy education newsletter that was started off monthly but now unfortunately more like quarterly. And in this newsletter we highlight existing programs, upcoming events, and opportunities for teachers and students who are interested in energy education.

And let's see, now this last slide. You're probably asking yourself how do we accomplish this on a small budget and very little staff. And the secret to this is leveraging partnerships. I've found that with all these projects there's always someone to help whether it be the California Auto Museum when I'm looking for a car to loan for a display or the Get Wet Festival when I'm looking to find

new ways to create water efficiency and energy savings. There's always a way to leverage with partnerships.

So with that I'll just - I'll leave the following slide and this is the information where you can contact me here at the Energy and Technology Center at SMUD and again for just general information, if you would like to look at some of our workshops that's available at smud.org. And I thank everyone for listening and I'll give it back to you Guy.

Guy Nelson: Thank you Suzette, very good stuff. You had over 30 slides and you stayed pretty much within time, that's fantastic.

Suzette DelBono: I managed to stay in the time, I worked really hard.

Guy Nelson: Great job. Okay let's hear from Tina Drews with another - Tina is with Salt River Project, another great customer of Western Area Power. And Tina, tell us about your programs.

Tina Drews: Hi, well thank you so much. I feel like SMUD has so much going on. I'm a little intimidated to go after that. So we have a lot of similar offerings as they do but I'm really going to focus today on a few key projects that I am involved with.

So just to give you a little bit of background on who SRP is, we are over a century old now and not only are we a public power utility, we also supply water to the valley. So we have a lot of, you know, a variety of interests. But what I'm going to focus on today is why it is that we support education and how it is that we support education.

So basically we have a business model for supporting it and our executive management really feels that it's a workforce issue that we need to continue to have high quality education not only for our employees' children but for all children in the state. And we really see these students as our foundation of future scientists, engineers, and people that are going to hopefully one day come to work for our utility.

We have a few programs that fall under what's called the earth wise customer program. So in this particular area we use rebate programs, donation programs, education, and then grants kind of fall under this earth wise customer program. And I'm going to focus on three of the pieces that we work with, first being the Powering Our Future renewable energy curriculum. This was developed for SRP about five years ago now.

We annually train around 100 teachers each year on how to use this particular curriculum and it is available for anyone to download, you know, free of charge from the Website which is [poweringourfuture.com](http://poweringourfuture.com).

Just to give you a little bit of background on it, there's really three units. There is an upper elementary unit and this one is - we call it an e-journey. It's kind of an online Web based journey that students go through. There is a solar e-journey, a wind e-journey, and a hydro e-journey and they learn about these different technologies throughout history.

So we have a middle school range that has got around 20 lessons that go from basic understandings of electricity all the way up to how solar works. We also have a high school module that is specifically targeted for PV. All of the activities are very hands-on. They are all based on an inquiry model and they all are correlated to Arizona State academic standards.

And I know that a number of the presenters have talked about how important that is in order for the teachers to be able to use the materials inside of their classrooms and as a former science teacher myself I absolutely agree with that. If it's not correlated to the standards then it's not going to be able to be used in the classroom.

If you take a look right here, this is sort of the opening page to Powering Our Future. And you'll see it kind of just gives an overview of the three modules. If you're interested in looking at it you just click on Entering the Site down in the lower right hand corner and each lesson has complete teacher pages and student pages, all the directions, background information for teachers. It's quite comprehensive.

We do offer to go along with the Powering Our Future curriculum because so many of the lessons are hands-on, we understand that it costs money to purchase those materials that are going to go along with the lessons. So if a teacher comes to one of the workshops that we offer on Powering Our Future, they're usually - we tailor them anywhere between three and eight hour workshops depending on how in-depth the educators are interested in going.

If they attend the workshop they receive a \$350 mini grant to fund their purchase of the materials and supplies that they're going to need to teach the hands-on components of the curriculum. So for example if they wanted to purchase, you know, small solar cells and fans, things that you may have seen in some of the other presentations, that \$350 could be used to go towards that.

We have a lot of different curriculum support materials very similar again to what SMUD is offering, everywhere from water and electric safety to energy efficiency to basics of electricity and water. So we have an online catalog and

Arizona teachers just go right on to that catalog and order those materials directly from us and we ship them out to their schools.

This is the third year that we have been doing what we call a global climate change in the southwest educator academy. So we partner with a non-profit organization here in Phoenix called the Center for Teacher Success. This is the first year that we actually - the first few years we offered the academy for teachers in grades 3 through 12 altogether and we found because of the varying knowledge that the teachers had we decided to split them up and now we do an elementary and then a middle school and high school academy.

So this last year we had 60 teachers join us. Some of our key explorations as we look at what is climate change and we look at a lot of the research and data, the current science behind it. And then we look specifically at Arizona, how is our water and energy supply, you know, where is that in relation to this whole talk of global climate change.

We look at some of the environmental economic and social implications because, you know, there is - when we talk about climate change it's not just a topic for science but it's so involved with those other indicators. And then we also take it to how do the educators use this new learning in their personal life and then how do they apply it to their classroom.

So when we invite people to apply we really emphasize to them that not only are they going to enhance their own understanding but we do provide - one of the full days of the - it's a four day academy. The last day is really time for them to work with the team members that they have brought with them to the academy.

We give them the sheltered time to develop an instructional plan and to use the academy facilitators who are all very experienced educators to create an action plan. What are they going to do with this information with this new learning, how are they going to take it back to their classrooms. And then as another just added bonus for them we do provide a \$400 stipend to each teacher that participates in the academy during the summer.

The last program that I'm going to talk about is our Solar for Schools program. This is a relatively new program for us. It is a grant program that installs 10KW systems on schools here in the valley. We also will be providing educational materials and training related to solar energy.

And I foresee Powering Our Future being a large component of that but we want to have a little bit different focus with these PV systems to use that data that will be coming from the systems for some more mathematics applications to those classrooms.

So right now we have 12 schools here in the Phoenix metro area and 2 schools in northern Arizona that were awarded systems and those systems are going to be installed, completed, up and running by the end of December 31, 2010.

When we were selecting the schools we had 120 schools submit applications so it was a very tough selection process. We evaluated those applications and, you know, did a lot - had to do a pretty extensive rubric for each one of those and then of course go out and do site surveys to see which one of those schools was going to be best suited for the PV system.

So what they received again was this 10KW system, a 10 year contract for maintenance, so we wanted to make sure that the system is taken care of. Then

those materials related to solar energy and then each system will come with a data acquisition system, a DAS system.

We're actually going with Campbell Scientifics so there's a little monitor and they have weather stations attached to them so they'll not only monitor the PV output but then also the local weather conditions.

We foresee that DAS system, what's going to happen is the 14 schools that received the system will kind of be networked and they'll be able to evaluate not only their own school's data but data from the other schools within the system. And then of course there is a variety of analytical applications that they will be able to use.

The lessons for use the DAS information are still under development right now but they are going to be specifically correlated to Arizona academic standards.

So for the future, what we're working on right now at least related to these are we're updating some of the Powering Our Future lessons, we're adding new modules and we're actually going to be focusing one of the new lessons on climate change.

There will be a new set of lessons coming out from us on energy and the environment which is going to cumulate some of those talking points that I just mentioned. And then we're going to be continuing to develop more resources on how to use that real raw data in the classroom.

So if you have any questions feel free. This is my contact information. You can send me an email or give me a call and then also if you're interested in seeing more from SRP we're now on Facebook, Twitter, and YouTube. I can't

believe it. So we're up with the times. That is all for me. I'm going to turn it back over to Guy. Thank you.

Guy Nelson: Well thank you Tina, very good information. And we've been getting questions online and also over emails and so we'll go through those. And it looks like we've got questions enough for - it looks like we've got it covered for just about everybody.

The - one of the questions was what about geothermal and that's indeed a renewable technology. However, it's just that wind and particularly solar are more let's say geographically compatible with getting onsite demonstrations at schools than some of the other renewable technologies. But there is a GRC annual meeting coming up October 22 through 27 in Sacramento.

It's very well run and students are free. It doesn't cost any money for students to attend and they would get a lot of good information on all kinds of geothermal technologies and applications and also there is an exhibit floor where they can actually get hands-on experience with what equipment and services are available there.

There is a question I've got for Larry Flowers. Larry, a question over the email was for large systems, large wind systems, what kind of technical assistance could NREL or your partners provide to schools?

Larry Flowers: Well we have some good information on successful wind projects for larger turbines. I think it depends on which state you're in as far as how do you access and what funds are available to do the project. Particularly for a larger wind project you have to have the right state policy or utility policy as well as you typically need some access to some funds. Because larger projects, especially once you get over 100 kilowatts, get pretty expensive.

Guy Nelson: Okay good, thanks Larry. And a question for Glen regarding what's an ideal size PV system for a school?

Glen Kizer: Well I think it depends on a number of things, but the biggest thing to remember, if you are in a state that doesn't have a lot of solar then I think that a 1KW is a great way to start off, because if you want to know what a 50 KW would do and how big it would - how much space it would take up, etc., you put in a 1KW and then multiply it by 50.

If you're in a state that has a lot of solar then probably most of the schools are going to want to do larger programs. But if you're a utility or a foundation you might want to stay with the smaller systems because they tend to be a little bit more visible and you can do a lot more of them. So I think it depends on where you're coming from.

Guy Nelson: Okay thank you Glen. And to Tom, a question on utilities or potentially recruitment from companies with the various universities you're working with. Do you find for example that the utilities ask you who are the best and brightest students coming out of the institutions?

Tom Weirich: Yes, we actually are, you know, I have a running joke that we're almost like a placement agency because we actually have our own internship program here with graduate school students that we select each quarter from about 400 students, we select 8 and usually all 8 then have 100% job placement with some of our member corporations. So yes, we do, you know, here at ACORE we have a whole alumni board of interns that are really highly qualified, skilled folks.

But also yes, our higher education folks have various, you know, access to alumni networks, things like that but we then connect our utility folks with as well as our finance folks and any other industries looking to hire folks. But yeah, we do that kind of tailoring, that kind of for lack of a better way to describe it, matchmaking.

Guy Nelson: Oh good, good, excellent. And this is a question from Tina and Tina to Suzette. And I might be poorly phrasing it but Suzette, how big is - do you have 100 people on your staff with all those programs you've got going?

Suzette DelBono: No, I have a staff of one and that's me.

Guy Nelson: Well then how do you do it?

Suzette DelBono: Exactly how I said, I leverage partnerships whenever possible with the community.

Guy Nelson: Okay well I can tell you...

Suzette DelBono: And I drink a lot of coffee.

Guy Nelson: Well speaking personally, I was a proud SMUD customer for eight years and you were not ashamed of asking me - I planted trees for you and ran and helped put on the science bowl. So you take advantage of the existing customer base.

Suzette DelBono: Well good, I'll be asking you for donations to the scholarship fund next.

Guy Nelson: Okay. Oh hey, could you plug that scholarship a little bit more? Because I think it's a real value where you're doing the bus tour.

Suzette DelBono: Sure well again, that's different. The Youth Energy Summit is a year long project with students finally meet at the state capitol to present their energy service learning projects and we have a panel of judges examine their projects and award scholarships.

Now last year the first ranking team, each member got \$1200 and it went all the way down to \$200 and we gave out a total of \$35,000. So this is not SMUD funded, this actually through the community so I'm always looking for donations.

Guy Nelson: Great, great. And again on the bus tour, can you touch on that a little bit more?

Suzette DelBono: The bus tour, you have to be a registered teacher of the California Science Teacher Association conference and the fee to attend the tour is payable through the SCTA and it's around \$50. And you can get information on their Website.

Guy Nelson: Okay and you're looking for sponsors on that too to help the teachers out?

Suzette DelBono: Well yes, if you're a local California utility and there are teachers in your territory that you'd like to have attend this workshop yeah it would be great. Teachers can always use a little extra financial help.

Guy Nelson: Okay, all right great. A question to Gary and to Suzette and Tina. Do you find with the energy education programs, do you see some cross fertilization with other curriculum too? Like I'm thinking in particular with science and math. Do people get more excited about science and math once they know about renewable energy?

Gary Hoffmann: Well let's see, this is Gary. I guess the only - well I've got a couple to go with but there was a lot of interest in science and math I think from the two nanometer and weather stations that we had installed especially in power.

Unfortunately I think the school in Cedar Ridge said that they had to cut back because of budget. They had a full blown curriculum last year and I think they said that they were going to have to cut that back this year. So I am going to talk to them this year, I think they just started this week so I'll have to see what they're up to. But I don't know if that answers the question.

Suzette DelBono: Well I - I'm sorry, Tina did you want to go first?

Tina Drews: Sure, I'll go ahead and speak. Just one thing that we've seen especially with high stakes testing focusing so much on math and language arts, we found that as much science as we can add in with those literacy and mathematics components, the more jazzed teachers get. Because, you know, a lot of them are dictated by their districts on how much time they can spend teaching science.

And unfortunately at least here in Arizona I can speak for often science and social studies are just kind of left to the side because they're not on the standardized tests except for 4th and 8th grade. So we find that the more that we can correlate our curriculums with literacy and mathematics the more likely and the more excited teachers are about using them so we see those correlations.

Suzette DelBono: I'd like to add my two cents on that one as well too. I think science and math is extremely important but I take on a slightly different strategy. One of my objectives is to promote students to become energy ambassadors so I like to

focus on students who are not mathematically or scientifically inclined but who have an interest and maybe burgeoning people skills because I find if you're interested the science and math will come naturally. That's my tactic.

Guy Nelson: All right, good. Well we have perhaps a few grace minutes before our gracious host NREL kicks us off. Is there any questions among the speakers that you want to ask to yourselves?

Tom Weirich: Well I want to just one point, this is Tom Weirich from ACORE, just one point of clarification to you. I forgot to also mention in terms of sources of young people coming out of these colleges that have renewable energy backgrounds. There is a program called Sustainable Energy Fellowships. Actually Salt River Project, I know you guys have put some money into it along with Arizona State University, Cornell, and Duke.

But it's a program that's held yearly with about 500 to 800 students that are highly selected. And that also be another pool of folks you want to concentrate on. So if you Google it I think, Sustainable Energy Fellowships, and you see Cornell, Duke, and ASU involved, that's the fellowship program I'm talking about.

Guy Nelson: That's Sustainable Energy?

Tom Weirich: Fellowships.

Guy Nelson: Fellowships, okay.

Tom Weirich: Yeah they have a conference once a year where they gather and they go through at least 5000 applications for it and they probably gather about, you know, 500 to 800 people, yeah.

Guy Nelson: Great. Anybody else? Well I really am excited, pumped up here. I really appreciate all the speakers and the contributions you made. It's - let's again acknowledge a number of organizations that made this possible including some of them are speakers representing them, the American Council on Energy or Renewable Energy rather, Interstate Renewable Energy Council, Salt River Project, Sacramento Municipal Utility District, the USDA One Power in America program, and especially the National Renewable Energy Laboratory and Western Area Power Administration.

There is a bunch of people behind the scenes here on this call that's helping making this happen and it's just great to have your support. And with that I thank you and look for the presentations on the NREL and the Western Websites. Thank you very much for attending.

Coordinator: And this does conclude today's conference. All parties may disconnect. Thank you.

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