CLEAN ENERGY SOLUTIONS CENTER
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

Energy Access in Central America

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Webinar Panelists

Richenda Van Leeuwen	Executive Director, Energy Access Initiative, United Nations Foundation
José María Figueres	Former President of Costa Rica and current president of Carbon War Room
Arnaldo Vieira	Lead Sustainable Energy Specialist, Energy Division of the Inter-American Development Bank
Richard Hansen	Founder and CEO, Soluz Inc.

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Sean — Hello everyone, I'm Sean Esterly with the National Renewable Energy Laboratory and welcome to today's webinar which is hosted by the Clean Energy Solutions Center in partnership with the United Nations Foundation Energy Access Practitioner Network. Today's webinar is focused on energy access in Central America. One important note before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services, information provided in this webinar featured in the Solutions Center's resource library as one of many best practices resources reviewed and selected by technical experts. I just want to go over some of the webinar features; we do have two options for audio. You may listen over your computer or over the telephone. If you do choose to listen to your computer, please go to the audio pane in the GoToWebinar window and select the mic and speakers option. That will eliminate the possibility of echo and feedback. If you choose to dial in by phone, please select telephone option in the box on the right side will display the telephone number and audio pin that you should to dial in.

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Now today's webinar agenda is centered around the presentations from our guest panelists Richenda Van Leeuwen, José María Figueres, Arnaldo Vieira, and also Richard Hansen. Richenda of the UN foundation will be providing an overview of the Energy Access Practitioner Network. Panelists will share their reflections on various country priorities and approaches, the ongoing efforts around independent power producers and standalone solutions for rural electrifications in Central America, particularly in adjusting the needs of the residual underserved communities. Before our speakers begin their presentations I will provide a short and firm leave overview of the Clean Energy Solutions Center and then following the presentation we will have a question/answer session where panelists can address questions from the audience. This slide provides a bit of background in terms of how the Solutions Center came to be, the Solutions Center is one of 13 initiatives of the Clean Energy Ministerial that was launched in April 2011. It is primarily led by Australia, the United States, and other CEM partners.

Some outcomes of this unique initiative includes supportive of developing countries and immerging economies through enhancement of resources on policies relating to energy access, no cost expert policy assistance, and peer repair learning and training tools such as the webinar you are attending today. There are four primary goals for the Solutions Center. The first goal is to serve as a clearing house of clean energy policy resources; second is to share policy best practices, data, and analysis tools specifically clean energy policies and programs; third is to deliver dynamic services that enable expert assistance, learning, and peer to peer sharing of experiences and then lastly the Center fosters dialogue on emerging policy issue innovation around the globe. Now our primary audience is an energy policymakers and analysts from government and technical organizations in all countries. We also strive to engage with the

private sector, NGOs and civil society as well. One of the marquee features that the Solutions Center is proud to offer is the no cost extra policy assistance known as Ask an Expert.

An Ask an Expert program has established a broad team of over 30 experts from around the globe who are available to provide remote policy advice and analysis to all countries at no cost. For example, in the area of energy access in rural electrification, we're very pleased to have Abraham Raymond, director of the Social Transformation Division with the Energy and Resources Institute, serving as one of our experts. If you have a need for policy assistance in energy access, rural electrification, or any other clean energy sector we do encourage you to use this valuable service. Again, it is provided to you free of charge, so to request assistance simply go to cleanenergysolutions.org/expert and you can register through our Ask an Expert feature. We also invite you to spread the word about this service to those in your networks and organizations. So in summary, we just encourage you to explore and take advantage of the Solutions Center resources, go to the webpage and sign up for the newsletter if you would like to receive further information on events like this, including the express policy assistance in the database of clean energy policy resources.

Now I'd like to provide brief introductions for today's expert panelists that have been kind enough to join us. Our first speaker today is Richenda Van Leeuwen the Executive Director of the Energy Access Initiative at the UN Energy Foundation and then following Richenda we will hear from President Figueres, former president of Costa Rica and current president of the Carbon War Room, Mr. Figueres served as president of Costa Rica from 1994 to 1998 where he created a comprehensive national development strategy based on the tenants of sustainability to sound economics based on the tenants of sustainability through sound economics, investment in human development, and a strong alliance with nature. Mr. Figueres joined the Carbon War Room in 2009 and is currently serving as its president. Following Mr. Figueres we will be hearing from Mr. Arnaldo Vieira, who is the Lead Sustainable Energy Specialist at the energy division of the Inter-American Development Bank in Washington, DC, and then our final speaker today is Richard Hansen, who is the founder and CEO of Soluz Inc., which provides consulting services to organizations, advancing energy access, and delivers PV systems in Honduras. Now with those introductions, I'd like to welcome Richenda to the webinar.

Richenda

Thank you very much Sean and thank you to all of our panelists. It's a pleasure to have this opportunity to talk about energy access in Central America with you on this morning, next slide please. For those that are joining us for the first time. These webinars are a series that we've been putting on together with the Clean Energy Solutions Center for some time now for about a year and a half. The real focus for us in making these presentations is to look at the contribution, particularly of off-grid energy solutions, but also great extension to helping us to make a dent in global

energy access issue. Many of us is familiar with the statistics, 1.2 billion people worldwide still do not have access to electricity and about another billion more only have intermittent access. While many parts in Central America in fact are doing better in terms of the global numbers overall. As you will hear they are still areas with significant challenges and a lot of work that is underway to help address those particular challenges where both the combination of grid tide renewables energy solutions as well as grid extension and off-grid solutions to energy access where renewables energy options are particularly helpful are still relevant in each of the country that we will be looking at today.

So, bigger picture, this is part of the work under the sustainable energy for all initiative where we are really looking globally to help capitalize the universal energy access by 2030 as a global goal and as one of the three objectives that we're looking at under the sustainable energy for all initiative, which is jointly led by the Secretary-General of the United Nations as well as Jim Kim, the president of the World Bank. This is the decade of sustainable energy for all. We are now in the six months of the first year of the decade, which also provides an opportunity for member states politically to engage and to ramp up there on planning, expedite their own approaches to help us globally reach that goal, next slide please. Many nonprofit organizations/businesses have made commitments in their work towards helping to reach the goal of sustainable energy for all and in a moment you will be hearing—and it's very deliberate on our part that we welcome president José María Figueres, former president of Costa Rica, now the president of the Carbon War Room represent team a political overview and Arnaldo Vieira de Carvalho from the Inter-American development bank really focusing on the multilateral programming and then also Richard Hansen, who has been a tremendous supporter of the work and engaged in the work with the Energy Access Practitioner Network, representing the private sector for his work that he's been doing over many years with Soluz in Honduras.

The energy access practitioner network is a mechanism, a platform for bringing together private sector companies, multilateral finances, and nonprofits as well; really to focus on how collectively we can all help to provide a bigger push towards capitalizing energy access and in a specific context, looking at the contribution of electricity and energy services towards helping support better development outcomes. We have 1600 members in the network today and it's a very rich array of expertise that for those of you who may be joined for the first time. We encourage you to tap into, we are really about knowledge sharing, we are about learning together as a sector, where supporting the promotion of good solutions, we are helping solve problems in terms of the intersection between policy and business and really also very strongly focused on capitalizing the financing that is needed to help us reach universal energy access, next slide please. Just by way of background, we as a group collectively we are delivering energy services to about 20 million households per year, over

15 million have been reported back to us as electrified through the work of the membership.

We are really focusing at the country level as well in terms of looking at what are the policies that are working, that can be replicated, or scales, what are the approaches that are working, what is new and innovative that may well help us reach our households whether it's you pay-as-you-go systems, whether it's through new types of lighting solutions, whether it's through enhanced batteries and you'll be hearing a little bit more on the technical side in a few moments from some of our panelists . I'll conclude there just to say that we welcome your engagement and now work in Central America, in particular. We do see that off-grid solutions are still relevant in each of the countries that we are working in Central America. All our grid extension certainly is very relevant in that context and again I imagine that you will be hearing a little bit more about the different types of solutions from our presenters and to say that we also have a strong membership base in the region. We are trying to do more and although this webinar is in English, we're trying to do more particularly with our Spanish-speaking membership and so again we'd love to hear from you; how we can help to connect you more to those members that already have a very strong operational network in the region. So thank you very much and now over to our panelists who will talk specifically about work in each of the countries in the region so thank you very much.

José María Thank you very much Richenda, very kind and very helpful in the context of this webinar. Let me thank you for the leadership, the UN foundation has exercised for many years now in terms of energy access and particularly the practitioner's network. Thank you Sean for the very active participation of the Clean Energy Solutions Center in this webinar, last but not least [Spanish dialogue-00:14:26]. Thank you all who are on this call, participating with us on the topic of energy in Central America. I am talking to you friends from Colombia, where I am heading up the OAS Presidential Election Observation Mission and the meeting has been called this morning which I must attend and which we're there for—necessitate that I need this 15 minutes prior to attending. Nevertheless, delighted to be with you and share some perspectives. Let me begin by inviting all of us here on the webinar to zoom out for a moment from energy access in Central America, which is an important opportunity, but to zoom out to look at the larger picture and the context of the times we're living in where some of us believe we should be going.

The big due challenges we still need to face as humanity is on the one side, the issue of inequity linked with poverty and on the other side. The issue of climate change, admissions, and the trajectory on which the world is presently on which is leading us into a completely different planet from the one we live in only some decades away. Fortunately, we can fight those two challenges with the same set of instruments, both from a policy perspective and from a private sector investment perspective by transitioning towards a low carbon economy. That transition would create

the jobs, investment opportunities, entrepreneurial solutions, new business models that are needed in the world of today to fight inequity and poverty and at the same time, they would bring down carbon admissions from the present trajectory on which we are on. I often like to say that we did not move out of the Stone Age because we ran out of stones. But because we found something better. I firmly believe that after 200 years of the Industrial Revolution. We are at the cusp of finding something much better, which is the transition to a low carbon economy.

Zooming back into Central America that huge potential here within the region not only for energy but to get energy on the right track for renewables energies, let me address this. From a policy perspective and then let me address this from a private sector perspective. On the policy perspective, I would like to draw on the example of my own country Costa Rica. For many years now, we chose a strategy of going on renewabless as part of our competitiveness and the way that we would be able to participate in the global economy. Today, 92% of our energy supply is renewables outside of transportation where we need to do of course a lot of work and 99% of the country has good energy coverage, over the years that has made and rendered us a much more competitive economy. In that 92% of renewables, we have a good mix and what Central America offers as an opportunity for investment, in other words, we have Hydro, both big dams on the river, we have geothermal, we have wind, and we're now beginning to build on solar.

There are elements here from a policy prospective that we need to continue to work on in the region. The first one is that of course we could stand to improve a tremendous amount in terms of energy offer and necessities by implementing nationwide or regional wide demand side management projects. Because of our climate you all know we only have the dire needs of heating and as much air conditioning as some other parts of the world but nevertheless the lower estimates that I have seen indicate a relatively well run demand side management program could cut the man by 10-15% in the region, that is low hanging fruit, that is a tremendous business opportunity for companies with escrow models and other's that have that developed expertise and experience in other parts of the world that could come into Central America and develop that market which at this point in time is completely underdeveloped. If from the man side management we go on which is the first turn lowest cost renewables by the way we go on to renewables.

Here with today's current technologies in terms of renewables we could be powering up all of Central America with 100% renewables at competitive economic pricing. Let me just touch on a couple of those, geothermal for example, geothermal potential is in for America, is an order of magnitude where it is double –it could easily provide double the demand of the region by 2020. Let me repeat that, double the demand of the region by 2020 could be supplied only by geothermal. Let's talk about wind, last year Central America reached 2, 4, and 5 gigawatts of wind that was an

increase of 53% over what it had done the previous year and yet by many estimates we are still at less than 1% of our wind potential. Hydro goes without saying and of course, there is a tremendous opportunity for a distributed generation with solar. Seven million people in Central America are still off-grid, a major cause of poverty because poverty often starts with energy poverty. This is again a great opportunity for micro grid solar for the entire region beginning to move towards a distributed generation powers.

Now let me use this as a segue to talk about what we're doing with the Carbon War Room in the Caribbean. As you know friends in the Caribbean because of the fact that islands have traditionally relied on fossil fuels for energy sources and fossil fuels being imported in small quantities inefficiently, old generating plants, inefficient transmission, electricity prices in that part of the world are between $0.35 and $0.65 per US dollar. Here in Colombia, where I am on the islands of St. Andres and Providencia energy is $0.42 kilowatts per dollar. Those prices as we all know –any type of renewable is competitive without any need for government subsidies or any special economic incentives in that direction. That is precisely the market opportunity that we are working on. We started working two years ago with the island of Aruba, 30 kilometers long, 10 kilometers wide, 100 thousand people, 100 [inaudible-00:23:04] is their demand and by the way speaking about market opportunities in the Caribbean in some islands air conditioning alone is 40-50% of the load which can easily be replaced with existing technologies today for a much more cost effective providers of air conditioning that can use off peak generation from renewables to power off as well.

We started off with the island of Aruba that now has 20 megas of wind, is finishing since crawling three megas of solar, is on the second project of 120 megas of wind and moving towards [inaudible-00:23:49] normal air conditioners [inaudible-00:23:55] etcetera. We are evolved [inaudible-00:23:59] challenge learning from our Aruba experience. We have partnered up with Rocky Mountain Institute and both organizations working side by side in a very synergistic way today are tackling work on Providencia and St. Andres for Colombia, Renada, St. Lucia, St. [00:24:22], Bahamas, were the opportunities to move from fossils to renewables are just extraordinary, again, a combination of policy, but on the other side very good sound investment opportunities for the private sector. Let me stop here and turn it over to Arnaldo de Vieira for his prospective much more from a multilateral point of view.

Arnaldo

Thank you very much Mr. President. Can you help me with the slides please? Thank you very much. More specifically about energy access in Central America, but to let me start with a general introduction, how Latin American and Caribbean high river [inaudible-00:25:28] to an acoustic [inaudible-00:25:30] this figure shows the 10 countries that are responsible for 88% of your population without electricity in Latin America in 2012 including the Caribbean. We have in the other circle the

total population is without access to each one of those 10 countries and the percentage relates to the percentage of access, that's in total Latin America. That means Haiti has 7 million people without electricity and that represents 24% of the total population in Latin America without electricity. In the inner circle, you see the rate of electricity in each of those 10 countries. We need that in that case, Brazil has coverage of 99%. That means 99% of the total Brazil population has access to electricity. That figure now shows how the population without access in the whole Latin American Caribbean has been reducing since 1970 until last year, let's say.

You can see that the Latin American Caribbean did a great job reducing from one having 30 million people without electricity to about 30 million people today. Central America is showing below, showing that in 1970, there was like 10 million people without electricity and today we have about 6 million people without electricity in Central America. With more information about each country of Central America how we are respect to coverage. This graph shows the number of operational people without electricity for each of the countries so we can see that Guatemala is the country with the highest number of people without electricity and appeared from 1970 to 1995 the population without access was in fact increasing but after that I shelled the drastic decrease and Honduras showed about the same behavior. El Salvador started reducing the number of people much earlier. This next signal shows the coverage of his country in terms of electricity. Costa Rica has been the leader in the region in terms of coverage, except for the very early years in 1970, 1972.

Today you can see here what the coverage in this country is. It's interesting to notice that you have at the same time Costa Rica was 99% coverage and a neighboring Nicaragua is 67 so just crossed the river, the borders have a drastic decrease in coverage and that's why we are here to reduce this difference. I did this for those not familiar with the IDB we are Inter-American Development Bank, we provide more than $12 billion per year of finance in guarantees for the whole region in all sectors for the past two years about $1 billion of those 12 has been directed to the energy. We have about $4.4 billion of loans in execution on managing this moment was about more than 40 energy projects in this institution in terms of loans. Ratification historically has been about 15% of the total amount of loans, about 80 loans have been approved, and instituted for ratification in the 52 years of the IDB, most of them are directed to great extension but more recently we have more than 10,000 solar home systems and this is expected to grow.

In terms of Central America, we have ongoing loans in execution coverings and access in most of the countries including Guatemala, Honduras, Nicaragua, Costa Rica, and Panama. Just last month, we pulled another loan for Panama and I forgot the American approval and 91 in the coming months. I'm going to mention Nicaragua especially because it's the country with the least coverage at this moment than we have been evolved

in this so-called (PNESER) the National Sustainable Electrification and Renewable Energy Program is $418 million of loans that were put together by a different financial institutions led by IDB. Nicaragua as mentioned before has the least coverage in the region. In 2006 according to the official national plan of human development for Nicaragua was half of the population with coverage. The plan for 2016 is raised to 85%. It's a huge jump in the program that I mentioned (PNESER) is helping increase reach that target. This shows pictures of a program that we funded like eight years ago in Nicaragua.

At that time it was the largest off-grid program we had with 2000 homes with solar panels that were paying five dollars per month as a target for this month we fit for the maintenance of the service and we have a lot of lessons learned about that project that now we are applying to ongoing projects. We have also to give another example, a small program in El Salvador in that particular case [inaudible-00:32:09] community was about 80 homes and in that case, they were also paying a monthly fee for a fund to provide maintenance, but in this case was a community fund. It was not a let's say a micro enterprise it was delivering this service just to give a different perspective. One approach that we have been applying is the provision of incentives to the service provider meaning the distribution company or the solar home systems of service provider and these institutions can be an NGO, a private company or distribution company that provides the service, regardless if its grid connected or off-grid systems. Just to try to help understand how to approach any project you need to make any investment and provide operation, operation maintenance, along the lifetime of the project.

If we calculate this and half-present value you can estimate or calculate how much incentive you'll need in other words. Any project like solar home system requires investment, operation, maintenance, and on the other hand, receiving a revenue of the electricity bill for a monthly fee or any name you want to give, but usually you have seen that, but for rural ratification projects, the revenue of the system is not enough to cover 100% of the cost. So there is a need for a subsidy. An electricity bill can cover a portion of the investment in addition to covering the operation and maintenance. That red portion is the part of investment that's not recovered through the electricity bill. That corresponds with the subsidy that the government has to provide in cases necessary. Sometimes there is a portion of investment that can be recovered to the electricity bill and so that portion is, is an investment that service provider has to do. The IDB usually has financed the subsidy requirements that we call incentives to the service provider. To clarify it a little bit more so the IDB provided a loan, the loan is executed to what might be the office of ratification of use of energy the country.

The central government essentially compliments that budget. Those incentives from the company like I've shown before it is transferred to the distribution company or service providers in terms of when you have off-

grid systems, they eventually can get to the other loan from other sources. And with these resources, they can buy but goods and services necessary to put in place and receive from the clients a Tariff to make the business feasible. That is a fast summary of how we have done most of the loans so far for the government, now were talking about loans to the government. Now were coming to the Se4ALL program. As Richenda showed before we have three main pillars of the program. I'd like to show you some differences between the global situation and the Latin America situation. Of course, globally you have billions of people without electricity and without access to extend [inaudible-00:36:12]. The renewable energy share of the global energy mix is about 13% in 2011 so [inaudible-00:36:22] you should have 26% in 2030. It's an interesting note that the share of renewables is very similar to the scenarios, the international energy [inaudible-00:36:35] that corresponds to the 450 ppm scenario that reached 2% increase in global temperature in other words, we have that target net we will know very much the responsibility to the 450 scenario.

In times of energy efficiency and the target is doubling the rates of improvement of energy efficiency. Worldwide highs been reduced by 1.2% so that target is 2.4% improvement [inaudible-00:37:17] intensity reduction. LAC has a pretty much different situation. We have 30 million people not billions of people without electricity and 85 without clean clothes in five cities. A number of feedback on new and these things that we could reach full access by 2030 not usually, but it's possible; in terms of 100 and we have already 30% so three times more worldwide and according to the same, scenario, the 450 scenario not to double it but to gain to 44% but, on energy efficiency I'm not in a very comfortable situational because the [inaudible-00:38:02]. Even Latin America is reducing only 0.4%, meaning much less than the world. So we have to do a lot of work on that specific bill. How is the IDB related to SE4ALL? President Moreno is a member of the global SE4ALL advisory board. IDB was named the original hub for Latin America for SE4ALL and we have committed $5 billion and five years to the pillars of SE4ALL, $2 billion have been already been investing so we need to invest 3 billion more in the next three years or so.

Now we are averting much of our executive assistance resources to planning for SE4ALL to develop the national action agendas in this is, of course done very well, very awkward and native with its country so we could widen the application and help the countries with their commitments with SE4ALL. Specifically on access, two weeks ago with the last advisory board meeting president Moreno announced that the IDB will support any request to design the national plan for universal access to modern energy. In a couple years, we can have those bands designing the crew and he still pictured how much investment, we will need to reach universal access in Latin America. Let me go a little bit faster because I see here that I have spent 15 minutes already. I like just to mention when you talk about the new personalization detailed plans were talked about

like using geographical information systems that several countries in Central America has already in place. It shows an example for El Salvador, where you have a digital mapping of all population and existing creates so it's much easier to identify the distance from the grids from the population without access and you could do a very much detailed plan for [inaudible-00:40:36]. That's what I was planning present and I'd like to introduce you to my great friend Richard Hansen that will make the next presentation, thank you.

Richard

Thank you very much Arnaldo and also thank you Sean of the Clean Energy Solutions Center and Richenda thank you again for your introductions and the collaboration of the union foundation, I appreciate the opportunity to be able to present some of our experience. I'll just bring up my slides here; I'm going to assume the slides are going okay. Let me know if there's any problem on the slides. Briefly, let me just let folks know what our company is. Soluz, Inc. is a company in Massachusetts, I'm in the Boston area right now speaking with you, but we have roots in the Dominican Republic going back to 1984 but advancing photovoltaic in developing countries. We pretty much have two lines of business where we deliver products through Soluz Honduras which is our subsidiary there he founded in 1994. We provide consulting services elsewhere to assist on the Global Transition to Stable Energy. This map may be familiar with some folks. It just shows how the distribution of energy poverty around the world, now we can see and Latin America that it's a small number.

Arnaldo mentioned 30 million, I've got a map. That shows 31 million. The LAC regions pretty much are 95% electrified. One thing I'd like to look at with regards to that is if you look at the trend of the population, there's been a very significant urbanization and Latin America from 1950 until now. You can see that it's a percent urban, which is different, and some other regions of the world. In some cases, we can look at it as if the people electrify themselves by going to the urban areas and some maybe we can look at it at this point, will it continue with urbanization or how well will you do to reach the more remote areas of the Central American region to reach the universal energy access goal by 2030 without overly excessive urbanization, which has its own set of issues. Arnaldo presented very good information on this, I have a list of the country is greater than 10% of the lack of population of LAC access and many are in the Latin America region, many are in Central America. Looking at folks that are in those areas that are not electrified yet they are really drawing up on very expensive energy sources so we looked at the dry cells are in the order of $30-$100 a kWh with the high cost of kerosene so I'm going to give you a little bit of historical background of—showing over time how the introduction of affordable tax into the region and elsewhere has taken place it will give us some perspective in terms of moving forward.

In the 1980s there was a price drop to about $10 a watt that really made affordable tax an opportunity for off-grid electrification that was in effect cost effective compared with those energy sources, I showed you with the

kerosene and dry cells. I actually got started in this area and there's a photo of our first customer Felipe Martinez, first home and store in the Dominican Republic (DR) with PV combined with micro-finance in April 1984. If you're not good at spotting PV modules, there is a module on the roof. For me, keeping in touch with the customers and that each household is really based upon individuals and their needs and knowing Felipe Martinez for many years kept me grounded and the customers; continuing to know him through until he passed away last year. I kept in touch with that rural area. We found that at that point it was really a killer app so the domestic PV system became typically in the 20 to 100 W range about $15 a watt installed became a killer app and it became very popular because pretty much everybody is living in the house and they want to have energy so entertainment, your television sets, early on black and whites were making a lot of progress there and now everybody wants color and we'll talk about that a little bit later on, efficient lighting, compact fluorescence, that killer app became more popular.

We ended up with people visiting us the Dominican Republic and we actually—to introduce in Central America after having worked initiated in the Dominican Republic with both micro-finance and appropriate systems by locally trained technicians. We get a scoping mission with the US Department of Energy funding in 1989 to Honduras and Guatemala. Taking a look at what the potential would be to transfer some of the knowledge that was taking place in the Dominican Republic by about 1991. About 1000 systems have been installed through a network of technicians who have been trained and in '91 we had a planning meeting in Dominican Republic. We have folks from Peace Corp. one of the program managers and one of the volunteers stayed on an extra year; John Rogers and Mark O'Donnell was a manager. We had Sandia National Lab, so the US of National Energy actually put money into Sandia Labs and Max Harcurrt and Beth Richards was there sitting on the porch. This was a way to look at how to introduce technology through a network of some of this volunteer capability.

Also in this meeting another person who was there to work with students for many years, Harish Hande was a student at the point in 1991 from UMass Lowell and we were fortunate to have him there at the time. Of course, perhaps many people know Harish's work has really blossomed to incredible levels in India founding SELCO in '95 and it's a company with over 200,000 PV systems installed. We really value the exchange across borders and the work that the practitioner network has done to help this kind of exchange of knowledge. We value that over the years, we have some folks from Latin America reorganized a meeting over in India to learn from the work of SELCO , so it kind of goes back and forth between Latin America and India. It's a lot to learn that will continue spread around for these exchanges. Some of the early work in Central America from '91-'95 I was able to raise funds from foundations and US Department of

Energy. We threw an NGO Enersol, provided a lot of training and various people were involved.

One of the trainers Diana Solis is an engineer as the first female engineer in that country. She now works under the project now World Bank electrification project in Honduras but back in that time she was training with our work, another person I wanted to point out here Andres Carbujul. One of the people that just happened to be in a training workshop in 1991 and now has taken a significant role in Australia later on as we go forward. This capacity building has been very important early on to introduce technology. The other thing that's taking place kind of in paralyzes this is where the perspective comes in as well over the years. Back in '93, World Bank was looking at the best practices so they were looking at a number of companies. It was really the Asia Technical Department that was preparing for projects in Indonesia and Sri Lanka. Sri Lanka became a key project, became a model of the micro-finance linked with local businesses and that was a model that spread elsewhere including to Nicaragua, for example, with the Pairs Up project and I'll mention later on how it's rolled out in Honduras, some 20 years since this mission was done in '93 there were a group of people that came in.

The World Bank, at that time frame was already figuring out where it made sense to have high votes and extension of the grid at the least cost and what PV systems was least cost. Really in that timeframe kept in certain distance the World Bank became kind of a way to verify the validity of PV systems that started integrating with electrification. Here were talking about 20 years ago, I think one thing I'd like to point out is the sense of urgency. We need to have here. We've got the decade of sustainable energy for all, we really need to be able to move forward, coordinate, and get things lined up. We've had quite a bit of time to take our best practices; we need to be able to move forward. We do some good analysis to figure out what can people afford on a cash basis, maybe 3 to 5% for financing without subsidies, up to 22 100 W systems. This goes back a number of years, the World Bank it drew upon this and then bringing in micro-credit and then bringing in PV rental. Beyond that, it kind of looked like you either needed subsidies or you need some other solutions because of affordability issues.

In setting up Soluz of Honduras, I can draw upon the business experiences there and coming with a private sector perspective and also how that relates to where the policy is going. The basic business challenges are to provide that dispersed population with the product and service and make those systems affordable for the rural poor, that's the challenge. The solutions here, we establish local delivery structures to serve those customers and then target them with the right products. It's not like one product, one-size-fits-all. It's what product can they afford and also make it more affordable by bringing in micro-finance. The customers served by Soluz Honduras are not just households. I always have to mention the solar home system is not my favorite term, it was very catchy and caught

on, it's been the multilaterals across the board were using it. It rolls off my tongue occasionally but basically, PV is very flexibly used for many applications. Here is a rural store that has running refrigerator; households and enterprises, not just for home, although everyone who has a home was to have electricity.

We look very closely at what with the energy cost people were spending both in the Dominican Republic and Honduras, and figured we could target about 50% where people were spending five dollars or more. These numbers have gone up because they are fairly old, this was a survey done in 1998, but in any event, as we looked at the penetration of the marketplace with the range of offers we did bring in actually in 1994, the Dominican Republic, we introduced PV Rental, that's now called Pay-as-You-Go. By introducing it, we had to look at what the penetration would be as you brought in a more easy rental approach with a fee at that time; again, things were kind of more expensive. The PV modules were more expensive at that point, things have improved now and I notice a lot of places that have activities going on and I think it's a good emergence within the sector. We have a certain set of characteristics in Central America; make it a little bit different, I'll present that. But with $5-$25 a month for 20 W to 100 W systems is kind of the easiest offer for the customer.

Of course, the company had to assume the technology and electrification risks and I'll bring up some more on those risks later on. Here is a little photo of penetration, you can see with Soluz Honduras was a PV rental from 1998 - 2005. We have progress in 1998 until 2005 along kind of a private approach where it was us and the customer. We attracted $1.5 million of investment, we had the International Finance Corporation (IFC) of the World Bank and other investors involved. We developed this innovative PV Rental business model and serves over 5000 customers that are on an unsubsidized basis, we have good feel for what people could afford sized systems, and offers. We sold systems on a cash basis. We also provided microcredit to over 1300 systems, and then we had on the rental basis over 2500 customers that included churn related to grid electrification so we would essentially pre-electrify and after several years we may move the system elsewhere if they're electrified and collect over 100,000 payments. This was an early stage high-risk pilot activity essentially which we then learned cannot coexist as subsidized government PV projects.

There was a project by the World Bank in the planning pipeline in 2004. We had already learned in the Dominican Republic when the government came into the scene as they—the electrification risk was originally a great extension, which we felt we could handle then what happened was as government started to determine in the region that PV was a cost to the means to reach rural areas. The subsidy approaches came and the Dominican Republic—the government began to actually give away thousands of systems and that made it possible to really rent systems in

Honduras as well. Having that lesson the Dominican Republic, we essentially had to sell off our PV Rental assets to pay off the debt and adjusted our business model. So we avoided that and then joined in with what the new program was. Basically, the PROSOL project which from 2004-2012 were bank funded through the Honduran Social Investment Fund, Public-private PV Electrification Model, it took about four years to plan and for you to execute it. It was based on that Sri Lanka model which is I wanted to mention was used in Nicaragua as well as Honduras.

You can see how the models kind of crossed regions. That project utilized a capacity of five local PV companies. We were a star company and so was Honduras who was one of those and then the companies partnered with Michael finances to tensions. One interesting thing was we had micro-finance capability or the ability to finance our customers but when the project came in. We wanted to allow the micro-finance organizations to provide 12 maybe 18 months credit. We want to provide 2 to 3 months in credit but the project or industry said you can't do that because the finance institution has to do it "we said well customers would be glad to just pay over to what the repayments if they had that much money". Those kind of complications we have to work out, we actually did that through Washington to get it approved. We can provide our customers to get three months credit. Affordability was improved by this 40% subsidy and the project did about 5000 households, which was about what we had done privately, now we encourage that. If it's the World Bank coming in let's talk about maybe 50,000 households probably get a larger plan.

So we did 2000 of those and 50 school so between the household and the schools—one thing I wanted to mention the school you can see the name there is El Escondido and that's in Spanish, it means it's hidden. Providing PV for schools, we've been very proactive on this because we feel that is where not all of the schools are hidden but you've got hidden geniuses in all of these places. So really, the need for improving education in rural areas and human resource development is so important. Quickly I just want to go through that; policy wise what we are facing is this range of subsidies and right now in Honduras we actually have various projects, there's the COVELO project, which is the IDB through the [inaudible-00:55:33] Investment Fund backing micro-finance organizations to work with companies now. Our company is qualified for this project and it turns out there's also the PROSOL project which is going to do another phase, the COVELO project is about 3000 households and so is PROSOL. They are different models because the PROSOL project has a subsidy. They both use the micro-finance organizations.

We learned also that some of the micro-finance organizations prefer PROSOL because it has more benefits for the micro-finance organizations so there is kind of a competitive nature there and that is confusing. We also have coming on the scene some bilateral funding from the Koreans, PRONADERS project, which is already slowing down and did slowdown. Some of the later parts of the PROSOL project because the local mayors

were learning that these were going to be systems that we would be giving away so that was kind of a better deal there. You can see how between the multilateral, us, support of the government, and there's different government agencies and then bilateral support; they're all different agencies. You can have this chaos in the marketplace and projects cannot really coexist in the marketplace. So that is some of the work we have to do as we look at working together in terms of the government sector, private sector, and the civil society to get our universal energy access. Before I mention there are other subsidies that can come in to try to make things more affordable.

But then there are different solutions. I was fortunate to spend some time in Africa last year and also previously, I was over at the Lighting Africa conference in Senegal in November of 2012 where we learned some of the nice lighting products and in Ethiopia. I saw some of that work being done from Lighting Africa. There and so from Senegal to Honduras we brought in the Green Light Planet [inaudible-00:57:18] which can provide a good quality of lighting as well as a cell phone charging so it's a very nice packet where you can have that kind of system, looking back 20 or 30 years that didn't exist. These are fairly recently emerging and the quality keeps improving and gives a very nice basic level of service for under $50, which is less than the cost of replacing one of the batteries. You can see behind Marian here in the office that's Soluz Honduras, there is the Trojan deep cycle batteries, which can cost you $100 where you get this whole system for less than that. In some cases, people are very poor. It's better to not provide the big subsidized system because they cannot afford to replace the battery after three or four years, so it's more appropriate to tailor the systems to their needs.

They're also, if you look at the extending out of services. These Soluz Honduras telecom products bringing 6 kW PV systems overpower the telecom towers and for example there is 4G service in four communities in La Mosquitia region between the main populated area of Honduras in Nicaragua, it's a very remote area. You can only get access by rivers and people have access to 4G service so you combine those lantern products with the fact that they've got power for their smart phones so they can be very powerful for communications. What I wanted to show you, the fellow that I showed you in the training workshop back in '91. He's been with Soluz Honduras for a decade, Andres Carbajal is the general manager, so Soluz Honduras has been operating for the last 20 years doing off-grid but also in the grid-tied so here's a grid-tied system in Honduras, which also provides energy access. When you develop a hybrid system that would charge batteries as well as tie into the grids, take advantage of the energy to reduce the electric bill but also a backup power.

Access to some of the areas that we know this is the case in the Dominican Republic a lot of power outages as well as in Honduras, power outages that is part of the energy access issue so Andres is important in human resources running the company in our main office in San Pedro and then

there is to branch offices, one in the northern coast with La Ceiba and out near Guatemala and [inaudible-00:59:21] company has done over 20,000 PV systems in its timeframe and it's one of the solid companies in the country. What about getting these companies to come forward and achieve scales with the enterprises? Some of the key elements on this is we need and enabling environment and I've pointed out some of the issues with subsidies and all. You also need to have the enterprise finance. You've got to have the working capital for these enterprises to grow. These are some of the pieces coming into place and those were the practitioners that worked in the efforts to bring capital play. The other source of finance is needed for the consumer and the assets were there.

For long-term assets, you need debt financing and there has been some interesting activities related to innovation funding and recently the National Geographic effort to increase energy access through a couple of awards of $125,000 is a nice example of innovation funding. What do we need to reach the goal of universal energy access? Based on some of our experience over the years, I believe that we need to establish integrated off-grid electrification plans rather than having various—and this is strong on the case of Honduras it's not—I think Nicaragua seems to be pulling together with a better plan but rather than having wrist government agencies developing projects without any coronation better have an integrated plan, start to pull it together and have that vision of the 2030 goal, universal energy access trying to build a consensus around there with a national plan. I think it would be great if Honduras could have some assistance from the IDB to get that national plan in place. It might be helpful because there is a COVELO project that's trying to operate with several other projects that are in somewhat conflict there.

You need to establish a range of offers and models, both technical and financial to meet the variety of energy needs, not just solar home systems. I've mentioned that's kind of a blinding time because it's a wide range of what PV can do these days from solar lanterns to 100 MW utility plants. I really believe you need to support rather than obstruct. Sometimes, some of the projects are basically almost obstructing the technical and financial innovations of leading solar companies. We understand this is the company so giving the fact where we are today; I just want to close on this slide here. I've got a little competition going here. Kind of like we've got the World Cup goal, we've got the Team Bureaucracy versus Team Soluz. Team Bureaucracy has over designed a power panel for a 65 W PV system with 110 V invert it to power an old TV and a cell phone charger. We all know the cell phones can be plugged into a 12 V automobile charger, right? There is the inverter and there is the typical solar charge controller, but then you've got some breakers on here.

You have a heavy metal panel, you see this fellow Martine here from our office is leaning back, straining his arms to hold that heavy-duty more costly than a PV control panel up and then we've got the Team Soluz offer here, which is using and there is from last Thursday, the inaugural events

for Brazil, this is in the office. We're of course, promoting the 12 V LED TVs, which are on the market and there has recently been a worldwide competition for a 12 V highly efficient color TV can now draw just 20 or 25 W. Team Soluz is an efficient design 65 W PV system, which includes the 12 V LED TV and the 12 V phone charger. You don't need the inverter at all which is a costly device and one that can fail. I think in this case, there's a nice morning star charge controller on that little unit and I think that in this case the Team Soluz got the goal. Thank you for your listening and we will go back to Sean I think for questions.

Sean Yes and thank you everyone for the great presentations and I would just like to remind the audience that if you have any questions for the panel is today, you can submit those to the question pane and I will then present them to the panelists. Now we will move along to the question/answer section and I will read the questions we received from the audience and panelists please feel free to jump in and answer. If we need to—I'll let you know who goes first. We have several people jumping at once and so I would just start at the beginning from what we received and the first question was for Arnaldo and it asked how large is an average IDB rural electrification loan? Yes and thank you everyone for the great presentations and I would just like to remind the audience that if you have any questions for the panel is today, you can submit those to the question pane and I will then present them to the panelists. Now we will move along to the question/answer section and I will read the questions we received from the audience and panelists please feel free to jump in and answer. If we need to—I'll let you know who goes first. We have several people jumping at once and so I would just start at the beginning from what we received and the first question was for Arnaldo and it asked how large is an average IDB rural electrification loan?

Arnaldo Thank you, it of course varies. It varies from let's say $30 million-$200 million in the case of Nicaragua. It is speeding up. I would say that if you want to reach universal coverage until 2030. Those amounts are not enough. We have to increase the amount dedicated to this. One thing that I didn't mention is the IDB works with both government and private sectors so we are pretty much in the same line, Richard mentioned of supporting private public partnerships and all sustainable modules for delivering this service but not necessarily involving only private sectors of [inaudible-01:04:55] government. Thank you.

Sean Great, thank you Arnaldo. The next question is about electricity TARIFF and it asked to what extent is electricity currently subsidized and don't those subsidies slow down the speed of implementation of renewable energy and energy efficiency? This question was just for everybody. I can repeat it, if you need me to or should I move onto the next question?

Richard Sure I'll jump in if you want or Arnaldo are you going to respond to that?

Arnaldo Just repeat please.

Sean Yes, so the question is about electricity tariffs to what extent is the electricity currently subsidize? Don't tell subsidies slow down the speed of implementation of renewable energy and energy efficiency?

José María Richenda if you want to go ahead I can comment later.

Richard Sean I can just make a slight response on that, this is Richard. We are seeing in Honduras [inaudible-01:06:20] are kind of a lifeline level of 100 kWh and is subsidized pretty significantly. We may see a change, there is supposed to be some privatization of electric activity but clearly when the electricity costs are low. It will be hard. For example, to have a grid-tied system compete, if the systems are subsidized because it won't really provide much of a return. That certainly affects that into the business, not so much in terms of energy access in rural areas. We know that people are paying higher costs of energy in rural areas for small amounts, so it's a little bit of a disconnection between urban and rural set of conditions.

Arnaldo My comment would be that when we mention subsidies it subsidies to investments and we can justify very clear the need on a project by project basis, but when you talk about subsidies to tariffs it's really hard to justify—we see mostly negative impact than positive impact because according to the studies received from the international energy agency's for instance, most of the subsidies are not focused on the poor people. The level of subsidies is really extorting and damaging several businesses like [inaudible-01:07:47] sufficiency that you mentioned before. I would say that if I really justify the subsidies on tariffs it will be focused only on the very poor layer of the population and also an exit strategy and not making a permanent, thank you.

Richard Sean let me say if I may that I've worked with the government in the Caribbean. We have found some islands where there are important subsidies to consumers but that is not across the board, it's on a case-by-case basis.

Sean Great, thank you everybody for their responses. The next question also is just a general one for everybody. We have an attendee that is looking for additional information, they are wondering if anyone had any resources where they can access a list of the cost of conventional electricity at each of the Latin American countries and also a list of cost of rural energy sources like kerosene or diesel? Are there any resources out there where they can easily access and information?

Richenda This is Richenda, I'm happy just to say that we have a range of different resources available on the energy access practitioner's network website, which is www.energyaccess.org. Specifically, country by country, some of the members of the network have done surveys or energy audits if you will, of what consumers are paying in various types of rural communities and it does very much vary country by country but we do have some data points for specific countries and what the cost for the different types of

energy like as Richard mentioned in his presentation, kerosene, and what people are paying on a monthly basis for a lack of access if you will. I think they are very good data points out there as well for different types of solution setters. As Richard mentioned in his presentation again you are looking at the range between small scales on the lighting on up and we have a lot of good and rich information about those particular costs.

Sean Yeah, go ahead.

Arnaldo I was going to mention that there is another resource of data on energy for Latin America that is provided by the Latin America energy organizational lobby, it's called an energy economic information system that can be reached by their website [inaudible-01:11:01] dot org. They have a system working for the countries that each country provides them the data and then they distribute back to the countries. It covers thousands of data, including energy prices of electricity, gasoline, diesel, or whatever. What I would say is that we have been working with them regarding SE4ALL trying to focus on a group of data that could help the planning of SE4ALL which is not finished work yet. That's source of data they could reach right away.

Sean Thank you again, next question is for Arnaldo and it says that it states it's very important to support the government in order to get the universal access but the contributions of the civil society organizations are also important. Is the IDB intending to support the CSO specifically at the regional level?

Arnaldo Sure, we work with both civil society and government. For me that Richard mentioned is our –this member of the IDB group and has a group of people and projects dedicated to –and access we are working closer together regarding SE4ALL. All events and regional meetings we have we work together with [inaudible- 01:12:43] in this last advisory board meeting two weeks ago, we went together with the IDB to New York so we're very clear not the need to work for the civil society in a creative way with the government policies like Richard pointed out earlier, thank you.

Sean The next question is for Richard and the question is on making it affordable for the poor. Can you please discuss and go from the price prospective and durability prospective?

Richard Affordability is related to what people can afford in terms of the size of the system. I think that there's high quality products that are as small as those lanterns that are pointed out so if somebody can't afford a Mercedes Benz they might get a Toyota but if they can't afford a large system and I think that large systems that are heavily subsidized. Subsidies can help make things more affordable but then get people set up for problems with battery replacement. I would suggest identifying the best product and integrating, well you can; it depends on the local capacity to bring in

micro-finance can be directly from an enterprise or from a micro-finance institution in terms of a partner arrangement so you can create a payment plan and in the case of Honduras, our experience has been at the micro-finance organizations when extending into rural areas we'd rather not go beyond say a 12-month loan and that's even with support from the World Bank so you might get to 18 months. I think an organization is going into a longer term than you can get the monthly payment down. That's my sense so tailoring the product directly and then bringing the micro-finance. There are the Pay-as-You-Go arrangement that's more or less a rental can be one way to have the asset of the property of a particular organization, a company, and then it could be transferred, it could be a rent to own so you could have at least the assets perhaps owned for security and having that asset transferred over later on. There's work to be done on the particular financial product and the technical product.

Sean The next question is another generally just for all the panelists and it has how can we reach scale with every market approach including a close and affective after sale service to rural areas having low sales volume at the beginning? Again, the question was how can we reach scale with every market approach including a close and affective after sale service to rural areas having low sales volume at the beginning?

Richard I can try me in if you'd like. Sean this is Richard again, it is a challenge to reach rural areas. We've noted that in many areas for example, the micro-finance capability does not extend beyond where the grid is. It may get into some rural areas but rural beyond the grid is quite difficult and dispersed. I think that there is a need for building up business capacity during that period to get the volume and probably require some degree of fairly risk assuming concessional funding. There might even be some innovation funding to help build up those models in the early stages where is risking costly to get there but I think that's the type of support; one that has vision towards that scale, which would be that say as best possible unsubsidized in the future. There is a ramp up here I think is very important to look at, and it depends on the country. I think in Latin America. We know there's going to be a government involvement. I think there is other markets around the world where the government has decided to allow the private sector to pretty much play the role. One needs to look at that, but there is a need to be healed, that ramp to scale the capacity and bridge that.

Richenda I'd like to just add also that in fact and I think the after sale service question is a critical one, because we do find that all too often programs that are intended to help ramp up sales focus on the initial cost of the system but don't incorporate components to really encourage and incentivize the provision of appropriate service and maintenance over the life of the system. Companies such as Richard's company have a lot of integrity in their approach in terms of being available and providing those maintenance service opportunities but when you going to very remote areas, it becomes incredibly costly for the companies to be able to do that

and really is not commercial. One of the things that we would like to see overall is greater provision where you do have some concession now that he and the funding for ensuring and enhancing the ability of companies to be able to provide appropriate and robust service maintenance for very remote and rural areas without a really undermining the bottom line.

Sean Thank you Richenda and Richard. Next question is for all the panelists and asked if anyone has any perspectives on how to market clean energy to clients considering some of the cultural patterns that are especially hard to change, for instance people that prefer did cook with wood rather than an alternative? How do you overcome those cultural barriers?

Richard Sean if you'd like me to chime in, its Richard here. Cooking has a lot of issues because of it being so close to the cultural needs and habits in terms of cooking. So there's a lot of tailoring of stoves that is needed. Cooking is not my particular area of expertise for refining households that need both cooking technologies for electricity. We are arriving with local there with local NGOs that have tailored the product for places like Honduras, where people are making tortillas, and still developing stoves that address that. In our case, we are working with all Hondurans in Honduras and so people want electricity. We've raised the culture gap because Hondurans are working with Hondurans and tailoring solutions to what the market demands so there we are in Central America with Central Americans and I think that it's—in my case I spend a lot of time in the region working very closely, just got back from Honduras so that basically bridges the culture gap in that fashion.

Arnaldo This is Arnaldo I'd like to make not really an answer to your question, but call attention to a program that Ecuador is launching to promote massively the use of induction cooking and the motivation for that is the elimination of subsidies to LPG. This related to the question of the cultural habits, people change massively from one source of energy to another one. We are working with the Ecuadorian government; we don't have the answers yet. There's a lot of a lot of surveys and pilot project being implemented, but I think will have interesting results next year, thank you.

Sean Thank you and we have enough time for a couple more quick questions. Are there any plug-and-play solar battery inverter systems in a wide variety of system sizes that are currently being used, does anyone have any experience with all sorts of plug-and-play systems?

Richard This is Richard again. The small winter products are basically plug-and-play, there is no installation involved. We've also been reviewing some products that are a little larger scale with multiple light plug-and-play activities that are related to the smaller lantern products by enlarged than other systems have been installed by trained technicians, but I think there's a lot happening in that space in terms of more plug-and-play products which can be perhaps a way to overcome—we had a lantern product that can bring get back into the store. If there's a problem, so the technician

doesn't absolutely feel—so it can overcome some of the costs related to transporter or technicians and I encourage innovation and work to develop good plug-and-play solution for remote areas, ones that are appropriate and can assure ongoing operations of the systems.

Sean Thank you Richard and this next question is also directed towards Richard but please other panelists if you have something to add feel free to jump in. The question is to what extent does energy set and obstruct energy access programs?

Richard I've had interesting experiences, particularly in the Dominican Republic. There is extensive theft in areas where the grid has been extended, but there is no electrical meters people are connecting. There is a lot of power outages, is not high quality so clearly further than even subsidies in that case you've got, free energy. People can get free energy and that's very inefficient for the countries situation because it's losses in the system. I have some interesting experiences in renting PV systems to households that later obtained free electricity from the grid because of the power outages. They continued to pay us with what at the time was the equivalent of three dollars a kilowatt-hour for a rented system like a 50 W system. They would have to pay nothing to the government for the chuckle power but because they could have reliable power. They were paying that rate. It is an interesting story in terms of what are people willing to pay for electricity. People that know if they're renting a system for say $15 a month. If you calculate it out, a system will be providing five kWh a month while it was three dollars a kilowatt-hour, a lot less than the dry cells and the kerosene at a reasonable deal and then they stole electricity and got it for free but paid us, we collected on that. Theft is an issue because it's free electricity; it depends on the quality power so is interesting how you can see some competitiveness there in terms of reliable services and unreliable systems that are very poorly managed like the situations—electric system in the Dominican Republic. That's my input on that question.

Sean Great, thank you. Before we wrap up we have a number of attendees ask again, Arnaldo you mentioned a website earlier that they can access some energy costs data and other data for Latin America. Can you just repeat the website?

Arnaldo Sure its olade.org.

Sean I will send that out through the question pane as well for those attendees that asked that. So with that, that is all the time that we have for questions today, so if we did not get to your questions, I apologize for that. I will e-mail any remaining questions to the panelists so that they may be able to contact you regarding those. Now, with the remaining time left. I would just like to ask our audience to take a minute to answer a quick survey on the webinar today and we just have to be sure questions for you to answer. It helps us to know what we were doing well and where we can improve

for future webinars. Heather will display the first question, and that question is the webinar content provided me with useful information and insight. The next question is the webinar's presenters were effective. The final question is overall the webinar net my expectations. Great, thank you for answering our survey and on behalf of the Clean Energy Solutions Center I'd like to extend a thank you to each of our expert panelists into our attendees for participating in today's webinar. We do very much appreciate your time and I invite our intend these to check the Solutions Center website. If you would like to view the slides and listen to a recording of today's presentations as well as any previously held webinars. I did have a number of attendees ask if we will be posting the recording, the link right there is where we will post that in the next day or two and then we also have the YouTube channel; the Clean Energy Solutions Center YouTube channel where we post the recordings, it just takes a little longer for them to get up there, so in about a month I'd say will have the recording on you to. But, in the next 1 to 2 days you can go to solutionscenter.org/training and access the recording there. With that, I hope that everyone has a great rest of your day and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar.