

Webinar Panelists

V. Subramanian Secretary General, Indian Wind Energy Association
Christine Lins Executive Secretary, REN21

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Andrew Hunt Good morning. My name is Andrew Hunt representing the National Renewable Energy Laboratory this morning. Welcome to today's webinar by the Clean Energy Solutions Center in REN21. We are fortunate today to have Ms. Christine Lins and V. Subramanian joining us. This group of panelist will be discussing the REN21 Renewables 2012 Global Status with focus on India. One important note to mention before we begin our presentation is that the Clean Energy Solutions does not endorse or recommend specific products or services information provided in this webinar and its feature or it's featured in the Solutions Center [resource library](#) as one of the many best practice resources reviewed and selected by technical experts. Before we begin, I'd like to go over some of the webinar features for audio. You have two options. You may need to listen through your computer or your telephone. If you choose to listen to your computer, please select like the mic and speakers option in the audio pane. By doing so, this will eliminate the possibility of feedback in that field. If you select the telephone option, the box in the right side will display of the telephone number and audio PIN will be there for you to use to dial in. Our panel, mute when they're not speaking as that will help keeps your background voice down. If you have any technical difficulties, you can contact me, go to webinars help desk. If you'd like to ask a question, we have to choose the questions pane and then you can type the question in. If you're having difficulty viewing any of materials through the webinar portal, you'll also find PDF digital copy of the presentation at [cleanenergysolutions.org/training](#) and you may follow along with the speakers that they present. Also, after this is over, an audio recording of the presentation will be available and press to come in solution center training page will be up just in a couple of weeks. So for the agenda this morning, we have an exciting agenda prepared for you today. Let's focus on the REN21 Renewables 2013 Global Status with focus on India. Before our speakers begin their presentation, I will give you a brief informative overview of the Clean Energy Solutions initiative and following the presentation, we will have a question and answer session and wrap up with the discussion and a few closing remarks.

V. Subramanian Hi! Subramanian in here and I'm on line. Care to start?

Andrew Hunt Oh, excellent. Welcome!

V. Subramanian I come on the telephone line because of technical problem.

Andrew Hunt Okay. This so I can write a bit of a background in terms of how the Solutions Center came to be. The Solutions Center is an initiative of the Clean Energy Ministerial and is supported through a partnership with UN Energy which was launched in April of 2011 and it was primarily led by Australia and the United States and other CEM partners. I've come to this unique partnership includes supportive developing countries through enhancement resources on policies relating to energy access. No cost expert policy assistance and peer-to-peer learning and training tool such as this webinar that you are attending today. The Solutions Center has four primary goals. It serves as a clearinghouse of clean energy policy resources. It also serves to share policy best practices, data and analysis tools specific to clean energy policies and programs. The Solution's Center delivers dynamic services and enables expert assistance, learning and peer-to-peer sharing of experiences and lastly the center focus –fosters dialogue on emerging policy issues for innovation around the globe. Our primary audience is energy policy makers and analysts from governments and technical organizations in all countries but we also strive to engage with the private sector, investors, NGOs and civil society. A more key feature that the Solution Center provides is [expert policy assistance](#). As an expert is a valuable service offered through the Solutions Center. We have established a broad team of over 30 experts from around the globe are available to provide remote policy and analyzing panels to all countries at no cost. For example, in the area of rural electrification with renewables, we are very pleased to have Ibrahim Rehman of the Energy Resources Institute serving as our expert and if you have a need for policy assistance or renewables or any other clean energy sector, we encouraged you to use this useful service. Again this assistance is provided free of charge. To request assistance you may submit your request by registering to our African expert feature at cleanenergysolutions.org/expert. We also invite you to spread the word about the service to those in your network organizations. We encouraged you to explore and take a advantage of the Solutions Center Resources and Services including the expert policy assistance, subscribe to our newsletter and to participate in these webinars and there are other ways that you can get involved to ask supplements and now I'd like to provide a brief introduction of our distinguished panelists. First stop will be Christine Lins, executive secretary of REN21 who will provide an overview of the key findings of the 2013 Global Status Report and with that, I'm going to hand the presentation over to Christine.

Christine Lins Thank you very much Andrew. Good morning, good afternoon ladies and gentlemen. I am happy to be here with you today and to provide you with an overview on the next findings of the REN 2013 Global Status Report. I hope you can see my slides by now. Is that the case Andrew?

Andrew Hunt Yes, I see your slides are up. Yes.

Okay. Very good. So what I'm going to do over the next 20 minutes and I'm delighted to have Mr. Subramanian with me today is he is going to give you the first 10 an overview on the global status renewables and the mostly CCT information about India and before I go right into this, let me just give you a quick introduction about REN21. REN21 is a max stakeholder policy network probing people of private and public sector the key actors person in the field of renewables. We are what I would call the coalition of the weaving of all goals in the field of renewables that working towards rapid uptake of renewable resources. We have leading national governments, international organizations, industry associations, NGO as well as science academia and I'm very proud to say that the government of India represented by the Ministry of New and Renewable Energy Sources is an official member of REN21. We are since 2005 issuing the Renewable Global Status Report that is an objective report based on the information gathered by a team of over 500 contributors, researchers and reviewers worldwide and featuring information about global market overview, industry plans, policy landscape in the field of renewables with an especially focus also on raw renewable energy. It comes all renewable energy technologies as well in all sectors from power, heating and cooling as well as transport and it is launched August and June. So this year, on the 11th of June together with [inaudible] [00:08:45] in Renewable Energy Investment and it's really the most accurate up to date information on the renewables market that is a winner. Every year, we have the specific focus on an area in 2013. It was or it is on basically transformation and some affectivity notice that integrating a lot of renewables is possible and of course it has some implications on the energy system and then there is some focus on all these aspects. So, let me take you through the findings of 2013 in a nut shell. As I mentioned, all data are really up-to-date until 2012.

For this slide which is final energy consumption and the renewable share that is –they always like where data is provided for 2011 as it takes quite some time to get all of these figures and what we see is that in 2011 renewables supplied estimated 19% of global final energy consumption which is more or less half and half divided or provided by water renewables as well as by condition and biomass. So we also look into closer this report on the champions, the top countries vote for annual investment as well as the total capacity at the end of the year and this year. You can see the annual investment. Sorry. I have some background noise. Can you please mute your microphones? Thank you very much. So as far as the annual investment is concerned, India both in the wind sector as well as consumer water collectors was prominently or was offered permanent place trying to tell among the top 10, the top 5 countries, sorry and then if I can show you an overview of all the other main players. In terms of car markets globally, renewables comprise about 36% of global power generation capacity and about 22% of global electricity is produced from renewables and what we have seen continuing trend in the past we see that renewables accounted quite a lot share of estimated new electric capacity that came on line. In 2012 about more than half of the estimated

280 gigabytes of new power capacity that wasn't sold was renewable space. So basically more than half of all the new power plants that will be all around the world were renewables-based which already shows today your renewables are becoming a mainstream energy source. We're going to have status report we do not only look into electricity. We also look into heating and cooling as well as transport and we also see quite encouraging that technologies, renewable energy technologies in the form of biomass, solar thermal and geothermal are more and more widely used in the heating and cooling sector. There is a general trend towards the use of latch systems and we see that sort of are now used for more than 56 countries for water and electricity was basic need. As far as transport is concerned, the global census report provide an overview about the development of different biofuels where refined liquid biofuels provide about 3.4% of the overall transport fuels in 2012 and we also see that more and more countries put in place policies to promote electric mobility and very often those policies again directly tied with renewable energy support programs so that effectively electric mobility is increased. I still have quite some background noise.

- Vickie Yeah, Hi! This is Vickie. Someone has their device unmuted. If you could mute your telephone or computer, we can hear background noise.
- Christine Lins I think that's better. Thank you.
- Vickie Yeah. Thanks.
- Christine Lins Okay. So, let me take you to the—I still have an echo now online.
- Vickie There is very strange. Does everyone have their cell phone devices muted?
- Christine Lins It sounds like an alarm. Okay. I'll just try to continue and hope you can hear me well and now I'm gonna on energy so now is I'm take you to the different technologically areas and in 2012. So a records here installation for sort of guidance. The global technology overall capacity of sort reached the 100 gigabyte milestone and so when you look on the slide, you clearly see how long it took us. It took us about 15 years to get to 40 gigabyte and then in two years we more than doubled this amount. So very really steep rise first which is also that would say protected prices or sort of doing quite substantially over the past and then sell them more than 30% in 2012 which makes of course the technology very effective for many markets. By the end of the year of 2012 Australia, China, India and Japan had at least 1 gigabyte of capacity in Asia and there of course many other countries and about all people in the place in medieval. As far as wind is concerned, wind so there is steady cost over the last couple of years in 2012 almost 45 gigabyte of power up capacity begun –came into operation increasing the total wind capacity to 283 gigabytes. In China, wind power generation increased by 13 gigabytes surpassing generation from 4 and in India there were 2.3 gigabytes. I hope that the participants don't like this thing background noise like I do.

Vickie Can you—can you hear me Christine?

Christine Lins Yes I can hear you line 1.

Vickie Okay, I think might be Subramanian?

V. Subramanian Yes, I'm here.

Vickie Do you have—can you mute your device for us please. We're hearing a lot of background noise.

V. Submaranian Then I, this one is line 1 booth. I'm better now.

Vickie Okay. Yeah that's better.

Christine Lins Very good. Thank you very much. Okay. Now we continue. Concentrating solar thermal power also there we see developments on the rise particularly in Africa, the Middle East, Asia and Latin America. At the moment, both China, India and South Korea have small private planting operation and you also see since 2008 where we take off technology and find some substantiate of increase. As far as geothermal energy is concerned, we see quite—a peak use of braun source heat pumps but we also see geothermal electric generation capacity going quite quickly as well as geothermal for district routine use. As far as bioenergy is concerned the use of biomass and the heat power and trans protectors increased by 2 to 3% approximately to about 55 extra tool quite substantiate the few increase in biopower capacity, 12% to merely 83 gigabytes and notable increases in some Greek countries and there are again you see India prominently represented on the 1220 chart. As far as renewable energy is concerned, we see that worldwide about 5.7 million people are working in the sector. The bulk of employment remains concentrated in Brazil, China, India, the European Union and the United States and we clearly also see that development of renewables is often to rerun by policies and often these policies are put in place to create local jobs in the countries and to provide economic opportunities for many acres. So, as far as the old and new investment and renewable energy is concerned, we saw that this is what is visible on the blue line on the chart. There you see that investment when down in 2012 by 12% from the previous year and then it also grow. It is filled the second highest that we ever had investment number but what I think is quite important to remember is that installed capacity at the same time continue to grow and this is a direct result of the falling technology cost. So as you've seen before we had an addition of about 30 gigabyte of PD, 30 gigabyte of hydropower, 45% gigabyte of wind and at the same time investment dropped a little bit and what is also quite interesting is that these all are quite dramatic shift in the balance of new investment activity between developed and developing countries. So the 244 are composed of 112 billion that were invested in developing countries representing 46% of the world total and there was an increase off—increase up—an increase of 34% compared to 2011 and as I think religiously and on the contrary in the

developed countries investment fell by 29% to 132 billion and that was the lowest level since 2009 which of course is somewhat the direct intake of the financial crisis but which on the other hand is also very encouraging because the developing countries by energy demand is significantly growing and it's very good to see that renewables are really taking off this part of the world. As far as policy is concerned, we see that more and more time to develop renewable energy policies and on those countries with renewables targets is more than doubled between 2005 and 2012 and we now have at least 138 countries which have renewable managed targets in place out of this 127 countries with policies more than half of this being developing countries and we see as I mentioned before that policy makers are increasingly aware of the potential national development impact of renewable energy. We have a very detailed overview on the Global Status Report about the different instruments that when used will provide—to promote renewables but what I also have to say what we see in 2012 we see also some policy instability mainly in the OECD countries which of course provided quite some challenges for the new things. So, I will finish my presentation with a quick outlook towards 2013. Some of you might be familiar with the UN Secretary General's initiative on sustainable energy for all which foresees three complimentary goals by 2030 in to our universal access to one of energy services double the agglomerate with improvement in energy efficiency and double the share of renewables in the global energy needs. All these three clearly interlinked and if the baseline for this is 2010 where renewable energy supply in final energy consumption was about 18% that was recorded on the right side of the graph. Doubling of the share means roughly and increased from 18 to 36% which is honorably quite challenging because you might remember my slide from before where we saw that last year or half of the current renewable energy supply is provided by traditional biomass and within to some energy fall its ability of checking if it's to promote sustainable use of renewables. So, this means that the rating of this objective several studies show that it is possible if only one had the adequate policies in the man sector are put in place and it is possible can be reached at not with business as usual but with really the exploitation and the usage of all renewables where the small or big installations and the clean result also that establishing of the share of renewables by 2030 will need to result in at least tripling of the share of modern renewable including system to hydropower which of course I think from by slide a challenge but we have many countries all around the world where we see that this is feasible and again with this clearly what will be a big focused area for the years to come is how these shares of renewables can be integrated in energy systems. With this, I thank you for your attention and I handpicked to Vickie.

Vickie

Great. Thanks. Christine as always a great presentation and apologies to everyone for being late. I –myself had some technical difficulties this morning but I've worked them out so welcome to all. So with that Christine with your presentation, I think we will turn the next presentation over to the Subramanian and a little introduction on the Subramanian. He

is a secretary general at the Indian Wind Association and has been very involved in energy and government entities over several years. So without reading the full bio you do see there in front of you, I would like to go ahead and without further delay turn the presentation over to Subramanian. Welcome. Are you there? Subramanian? Are you still muted? Hello? Okay. Let me try something here. Subramanian, can you hear me?

Subramanian

Yes.

Vickie

Okay.

Subramanian

Now I'm able to hear you.

Vickie

Okay. You're –I have your –we have your presentation up from the screen. Can you see it okay?

Subramanian

Yeah. That's okay and thanks to Christine for the excellent presentation.

Vickie

Indeed.

Subramanian

And can I proceed?

Vickie

Yes you may.

Subramanian

I do not want to involve the participants with lot of figures, statistics and all that. So I made the presentation that is simple. One the issues in the India is that we are talking about renewable energy mostly in terms of power and heat energy, thermal, biofuels for transport, they have not reached great heights so far but part of it is a subject in the India that has dealt with bite both by the union government and the state governance. This is a major complexity in the growth of renewable sector as a whole. In fact, it has much problem even in conventional whole-based thermal part or large hydro power. So, we have certain issues where we are not able to come out with very effective coordinated policies across the country. So this is a fast issue that I thought that I should make it clear but—and we also have this Indian Electricity Act passed in 2003. That provided for a set of regulators both at the union government level and at the state level. So as of now, we had one regulator, when I say one regulator, it a multi member body. One regulating commission at the central level and regulating commissions at the state and as far as the investment is concerned, there are various models. I mean that are turbulent in India. Some of the models are locked by set up investors another model is like the get on that and it all depends on the resources that are available in the geographical region of the state entities. Can we go to the next slide?

I mean that's it. So I mean I said already said we are going to discuss mostly part generating systems and we are not going to concentrate on other aspects in today's percentage and there has been significant growth

in the global energy over the last 10 years. If we take 2003, the total renewable energy capacity in the country was around 2,000 to 3,000 megawatt. Today 2013, we have as much as 29,000 megawatts in the—that is a playing part to the filter. We had another 50 to 100 megawatts that operating in an off grid work and—but, unfortunately during the last two years in India we have a system of financial a year that starts from April and ends in March. Starting from April 2012, there has been a big set back because of the abolishment or withdrawal of incentives mostly for the wind sector and two significant incentives that existed until March 2012 was one A. The part generating companies will get half a rupee of incentive over and above the tariff that is fixed by the regulator per kilowatt hour that is applied to the grid. I mean this was a major incentive because A. They had different tariff. B. They had generation based incentive and there are hectares of facility that was available for investors. Most of the existing companies that have an appetite for depreciation could invest in renewable energy systems and take 80% depreciation in the very first year. This 80% depreciation virtually enable them to save, 33% of the 80% by way of tax savings so both of these incentives got abolished in April 2012. As a recent I mean there is a significant drop in the capacity addition of wind. In year before last year, the total capacity addition was 3,200 megawatts. Because of the withdrawal it fell down to 1600 megawatts last year. It is practically 50% but the good news is the generation based incentive scheme has been notified just this week but with the prospect and the effect from past April 2012. So, we expect that this phenomenal increase in wind capacity addition during the excess of the current years and in years to go by, this would be available for investors up to 2017 but this is subject to a maximum limit of 10 million rupees per megawatt of power and as of the—can we go to the next slide?

Can we just—ah next. I'm in the—I was talking about the capacity. We are touching about 30,000 megawatts and this is not a small amount but it is about 12% of the total power generating capacity that is stated in the country and the renewal power all portable. They supply over 6% of power to the grid. This is I mean considered to be low by some people but it is also considered to be significant contribution to the grid. In fact during the last—for the last six to seven years when the loan has been supplying power far higher than that of nuclear power energy. So, as of today, we have a capacity about 20,000 megawatts in wind, small hydro that is about 3,700 megawatts, biomass section. When I say biomass, biomass that is not left over the industries is 1,260 megawatts and industrial biomass and industrial biomass for example, the biogas that is generated by the sugar mills. That is also used to generate power. That is about 2,300 megawatts and solar that started just about five years ago. It suddenly touched 1,800 megawatts but when we talk about renewable capacity share in India—generation in India. I know it is slightly different from the formula or definition adapt with most others because we count in India only capacities of up to 25 megawatts hydro power as newbie. This is purely a cosmetic problem within the country. I have putting with government that they should take in to account all hydro capacity as

renewable but I do not know when that is going to happen. So let us consider the figures given in view. The fact that the renewable capacities that I have explained. They exclude large hydro power and if you include it the capacity share will go up to 33% and contribution share will be as much as 21% to the grid and we go to the next slide.

Ah. This –we have target when we call it a target whether it is a compulsion or a statutory right of it's only an ambition. The ambition is to have 15% of power that is written to the grid from renewable sources by the year 2020. When they talk about 15% power in 2020 from renewables they wanted to start at 5% in the year 2010. Go up by 1% every year reaching 15% by the year 2020. So it is not only a goal that is also a road map. The second issue is better the government has the competence to fix these targets and the road map. Technically speaking, that falls within the point of view of the regulators. The regulators again take into account the resources available, the kind of power market that exists in the stage and how much of renewable energy can be produced. So many regulators have fixed—have closed standards of renewable parts which is the obligation of the utilities starting from 2% in some stage to almost 11% in the few others states. I mean if you talk about—look at that states that have very high percentage even now. It is because those states are rich of resources especially wind and solar. The other states do not have the resources. They have very low utmost obligations but we also grapple with the problem of not being able to source renewable parts to fulfill the obligations. So, the government also came out with a system that is called renewable energy certificates whereby a generating company say a power company at a solar company since the part of the local utility only half part of it and then he gets a certificate. Some utility that he has so much applied renewable part of the utility. He clears us that on the exchange mostly the energy exchanges that is purchased by obligated entities in other states and its obligated entities are mostly the power utilities and the few active consumers who has the obligation. So, this is REC is something noble that has been discovered in India mostly because of the federal structure that was have and also the high variation of resources between different states and at the same time, there is also the acceptance problem whereby if we see that the renewable power obligations are not enforced by regulators when I say enforced if someone chooses to violate the obligation or does not comply with it that he get penalized. Technically speaking, amidst, I know it is still very, very magnanimous view that is taken by the regulators mainly because the utility say that they are not able to buy the power or they do not get the power that they want and they find the power to be costly. So far the enforcement has not been extremely good but we expect that to improve in the very, very near future. Can we go to the next slide?

As I said, the growth of renewable suffering the reason possibly because of policy level system, it is not something that we can say the investors were not available. The policy initiatives are both withdrawn. At the same time some of regulators were taking very, very proactive steps to promote

generation of renewable energy, transmission of energy and conservation of energy at the utility level. Some of them had to reverse their regulations under certain compulsion in specific states which is rather unfortunate but we are planning to persuade them and as an industrial person, we have also gone on and appeal to the higher judicial authorities for ensuring enforcement of the renewable power obligations but when it comes to utilities, are they really interested? Technically speaking there is –there are quite vague about this. They pay lip sympathy. One of the issues they say that they don't have sufficient transmission capacity to transmit renewable power from the point generation to the point of consumption and this is other thing, they keep criticizing about renewal power being intermittent or seasonal. Technically speaking if you really examine that we find that they are able to access power from generating companies at prices far below that is fixed for the renewable power grid wind does brought. The basic approach is purely commercial and that is not related to variability or their capacity to absorb the power and this is happening despite the fact that some of these utilities are not able to access sufficient power to distribute in the area of license. This is yet another problem which we have to keep grappling with continuously and we go to the next slide.

One of the other issues is India is very too short of power. We still have issues with Black Coats and Brown Ohs in a few parts of the country but in order to encourage power generation the recent emphases has been mostly on all based part generation and when I say, all based part generation now they are talking about very, very high capacity ultra-mega part plants with super critical technology each unit being of 600+ megawatt. Some people are talking about 800 megawatts. I mean the emphasis has been so much on coal especially to me the demand for power. I mean, to some extent renewable, takes a backseat or suffer in comparison. The other –this is some about renewable power is about its intermittent nature and seasonality which I covered ones earlier and there is an issue that is often quoted in BAC. Good integration and stability issues. I mean there are utilities who are saying that we are not able to absorb as much as of power because our transmission network is not complete but there is a significant amount of transmission investment that is taking place now. I think in another year's time, the evacuation of transmission of power from generating points should not be a problem. The other issue in the recent past that we have had is financing of all these renewable projects. I mean, both in terms of equity and debt. Unfortunately, I mean it is the coming in the next slide but to be –other issues on access to [inaudible] [00:43:09] but as far as political landscape is concerned I mean in India there are two major political parties. I mean, one is the congress which can be called slightly leftist and socialist in this outlook and the other major party which is known as VJP is considered to be a rightist and we have many regional parties and we have communist or the leftist. We have various shades of communist's parties in India that so far, no political party in India has ever been anti-renewable power. At the same time I mean they are no openly pro-renewable power. They do not have a political outfit that could support renewable energy asset and as the

Green Party does in Germany or other political parties do in the few other countries and when it comes to regional political parties I mean they are really not so much worried about power. They concentrate on local issues. It happens with linguistics, social and various small economic issues but at the same time I mean there are all—I mean nobody will oppose to it if they do not take a stand that they do not want renewable energy or renewable energy is not good. For all the things that request were done is for the—whoever comes into power in the union government next year is to take all this [inaudible] [00:44:40] in respect to political parties and they represent and probably had a major dialogue on renewable power for the country as a whole. So if the support from the political parties I mean it is there but it is more of a default other than big design or as a matter of purpose and we go to the next slide. Can we go to the next? Yeah.

I mean when I talked about power infrastructure it said—in terms of generation it is mostly coal and transmission is getting improved. Distribution network most of the power utilities in the country are in the public sector I mean ‘til about five years ago, there were all comprehensive. Past sector utilities that dealt with generation, transmission and distribution, all together. It’s only in the past, they have unbundles this electricity, utilities and separate it out generation transmission and distribution but the greatest problem that we are facing to the current year is since the beginning this year they had very of very high inflation. The rupee has depreciated sharply and one of the things that is affecting the Indian renewable sector is the increase in the prices of the renewable energy systems but then most of the –we have as many as 18 manufacturers of wind turbulence in India but most of them imports small components from abroad. It’s not a small percentage of the total production cycle. That is adding to the cost and as a result the wind mill costs are going to go up. Sooner I mean sales there is an ongoing dispute between the domestic producers of solar cells and the imports that are being obtained from China which are much cheaper than what the Indian modules but at the same time, the Chinese modules are becoming costly mainly because the rupee depreciates and as far as the policy goes, I do not expect any major policy initiated during the next 9 to 10 months mainly because there is a national election endorsing which will be held sometime in mid-April or May next year. Until then, renewable energy will not be at the top of agenda of any political party because it is not a vast issue or it is not an area that can be solved to the workers in general but if it all anything is to happen, I expect that to happen only after the elections. Even after the elections, we left and wait and watch. What kind of a system do we have—is it going to be one party government are polishing government. How are we going to take this forward? But one thing is sure as far as renewable energy is concerned, the scope is phenomenon. There are plenty of resources both wind and solar has its issues as far as logistics of getting the biomass to over there and have biomass based generating systems and biofuel mean even you knows some ethanol blending and gasoline is taking place but at the same time despite the fact that there was a major initiative about a decade ago the wind for

biodiesel by encouraging Jathropha plantations. It did not take off mainly because of availability of land to grow not edible oil seeds. At the same time when we talk about energy efficiency, we are doing well. We are focused on specific sectors like the steel, cement, non-ferrous metals. They are implementing energy efficiency measures and almost all major metro cities in the country. They are going in for mass public transport in order to replace moment of cost and small capacity vessels and in another 10 years' time almost at least with 15 major cities will have mass public transport systems via of metros, underground or over ground. I mean that will also take place but part of the mass transport again we need power and power systems have to be planned and seen that they succeed in giving interrupted power. One of the chair challenges that we would like to look at is I mean whether we can schedule the renewable power. I mean for casting and schedule has become an important issue. I think that some of us will have car headstone and work code. How exact the generation of power and injection so that we can take it forward. In fact it more of a not exactly the technological issue but it should be the information technology issue. There will be contradict how much of energy will be generated about that length of time and how much will be injected. If you can put our heads to we didn't have some good modules that should be able to help us. The second I mean unfortunately storage technology is pathetic. In India, most of the rural electrification schemes based on solar along with battery have failed mainly more because of battery than because of the solar cells and the battery are inefficient. They conk out soon and they have an incorrect capital cost given it three to four years to replace the batteries. So some of the options that we have to look at for taking renewable energy in India, one is improving the efficiency having technological solutions for costing and scheduling. Third, if you can look at storage options but returns are not that bad. The payment records by the utilities are good and the scope of wind they say it could be done at least about 4,000 to 5,000 megawatts a year and we're done for the next five years for as land is also available. The solar, there is plenty of scope again. The solar, many people hesitate to invest mainly because of its low capacity to replace sections and the cost. I mean if the solar cell efficiencies should work even by 1%, it would be something. I mean the industries would lap up in India. I mean there I complete the presentation and I welcome any question that you may have. I have deliberately not gone on anything on financing. If you have questions I can answer. Thank you.

Vickie

Great Subramanian thank you so much for that great presentation and Christine you as well. We have had a couple of questions coming from the audience during your presentation so I will go ahead and started with those. We will use our remaining time to address any questions that the audience has on the presentations. The first –excuse me the first question that came in is actually for you, Subramanian and the question is, as the RPOs are not mandated is there any enforcement that you foresee coming out in the future to make RPO mandatory? And there is also second part to the question which is this can possibly your perspectives on helping

renewable energy markets to grow in India and if you need me to repeat the question.

Subramanian

No its. RPO?

Vickie

Okay.

Subramanian

Yeah the question is whether the RPOs are mandated or do not?

Vickie

Correct.

Subramanian

Number 1 I may have to look at the legal problems. The percentage of power that has to take utility is issued by virtue of the law that is in the Indian Electricity Act. So then we say it is not only a mandate in English language context. It is a legal term in the same mandate. So if I was present electricity has to be consumed by utility and taken by utility it is a legal requirement. The problem arises not because it is the not there. The problem arises because of the mandate is not fulfilled. What is the penalty for not fulfilling the mandate? That is exactly they'll running of the other problems. Have I answered the question?

Vickie

I believe so and do you see—did you foresee having RPOs assisting renewable energy markets within the country of India?

Subramanian

It is very much I mean renewable energy for us. Standards have really help the renewable energy market mainly because of the mandate many of the utilities are absorbing the wind power at free in tariff which is slightly higher than that of conventional power tariff. It is mainly because of the mandate it is happening and renewable energy has helped a great deal by this mandated renewable energy portfolio standards. I mean on that there is no second opinion.

Vickie

Right. Okay.

Subramanian

But the one thing if you're developed in the utilities do you think that in the past are penalized. That's where we are?

Vickie

Okay. Thank you so much. Next question is also for you. The requestor is stating that from their knowledge three weeks ago in India's union cabinet of ministers officially approve the revived generation based incentive, the GBI scheme that was pulled off the table about 17 months ago with some minor changes. So the question is, is it again in place and how do you foresee for the wind sector concrete prices per kilowatt hour or some other areas?

Subramanian

I covered it during my presentation. The generation based incentive that was developed up in April 2009 has been restored by the cabinet decision three weeks ago but former notification act I believe is two days. So those people who were waiting the generation based incentive and there were full readiness to launch their projects that cushion their projects. I mean

they will go back to their road now. Now those incentives are in place. I mean this may take a few months and most importantly wind. The rain season in India will come to an end by November so there was—the investors would feel were that it may not be a great time to set up windmills because as we postpone the investment in March next year period will they be able to catch the wet rain season. We expect to do better than what we did last year in terms of wind capacity addition in place of 1,600 we can touch 2,000 or 2,000 because of this revival of the scheme but one [inaudible] [00:56:54] that is like in general that is then. I have only the next status starting from April 2014. Can we have the next one?

Vickie

Okay, certainly. Next question is the attendee is asking if you could address the status and outlook on the national solar mission in particular the current status on the chosen mechanism for funding solar projects via the National Solar Mission?

Subramanian

I mean that's exactly where there is a lot of haziness because a national solar mission is something that has been announced by the union government and in the union government announces a solar mission. I mean they have to operate necessarily in the states. They cannot be doing it independent of the states so National Solar Mission in the first phase available 600 megawatts. They are wanting to go into the next phase for another 600 megawatts but this is not going to increase the capacity addition in the country. What's really happening is the initiatives of the state governments for example. There is one particular state in India called Gujarat. I mean there alone they have touched almost 1000 megawatts of solar power. It has nothing to do with the national solar mission. It is purely an initiative that was taken at the state level where in they gave free rental not exactly a corporate by its distribution. On the business of free tariff, they did about 800 megawatts of power plus they did something on the National Solar Mission and there is no exclusive funding for the solar project on the neither from the government of India or from the state governments. The all projects have to be set up only on the basis of equity and debt that is available in the market in India. The incentives that are provided with—by the government are one the renewable portfolio standards which is separate for solar power. It is not combined with other sources of renewable power and second, the free trade tariff. These are the two important things and there are plenty of companies who are thinking of investing in the solar power generating systems starting even from 1 megawatt to some places, it goes up as much as 100 megawatts. Some of this states like Rajasthan and Gujarat, they have huge government lands which they are giving on a lease basis to solar power developers and this is possible only in handful of states. It will not be possible across the country. The land has to be procured basically by the investor and he has to implement the project with his calculations of debt, equity, return of investment and all of those things but the—there is no separate governmental generation based incentive but solar still has accelerated the

mobilization which was withdrawn for the—for wind for 17 months. Solar still has the benefit.

Vickie Great, thank you. Ready for the next question?

Subramanian Yes.

Vickie Okay great. So this person would like to know if you have any recommendations on how India can top in to international funds at low interest rates you know specifically directed for the renewable energy sector.

Subramanian I think that it is not that we haven't done it. We have certain dedicated funding not exactly funds from the Asian Development Bank and the Internal Finance Corporation also has a separate wind funds for renewable energies. Most of the IFC funding comes in the form of equity and [inaudible] [01:00:51]. The ADB does not want to fund the—normally they do not want to fund the projects directly but they go through other financial institutions up in India like Indian Renewable Energy Development Agency or the Bar Finance Corporation. I mean this all happen but at the same time equity funds. I mean my experience has been that I—the equity fund they look at returns us—they would look at in India their sector and they're not even looking at lower returns of reasonable returns. I mean it's—do we call it cheap or it's costly. It's something we have to wait and see. We have funding form The ADB and I am told that there is a negotiation that is taking place for renewable energy devolvement with the World Bank also. I mean these funds are being tapped but it is mostly multilateral and private funding we haven't seen much except some private equity performance and its taking—equity stake in solar generating companies. Can we have the next?

Vickie Absolutely. Sure. Next question is regarding feed-in tariffs and the question is that we have seen that feed-in tariffs are successful in larger parts of the world and the question is why is India shifting from feed-in tariff mechanisms to competitive bidding? Excuse me.

Subramanian That is a complex question. I am one of the passionate advocates of free trade tariff for renewable energy projects but unfortunately this coincided—its debates I mean wind grew mostly on the basis of feed-in tariffs deal until about year before last. Even today, it has some benefit of that and solar have in Gujarat that you are importantly based on quite a lot based on free trade tariffs but the period between 2009 and 2012 saw phenomenon shock decreases in solar module crisis and the competing investors where they pretend the government look it is not that costly. I will give you a lower tariff an I will give you even lower tariff so the government thought the tariffs will be givers systems on lower tariff. I mean, let us all be a system of competitive will. These exactly spoil the very fair atmosphere for free tariff. As of some tariffs, some of these are state government are talking about the shifting from free tariff from win to competitive within ready for debate. It is a major debate that is taking

place and we arguing that renewable energy is not a necessity and that can be in place only by trade and tariff and if we get into competitive bidding, it may not be the most efficient way of doing it because some people may caught lower tariffs and ultimately not be able to generate and deliver the part that they promised because even the arguments about imports from a specific country. There are those solar senses. They are cheap but are they equally efficient. I mean is there a significant amount of degradation of the solar sense. These are all arguments which are taking place almost on a daily basis in various seminar workshops but some of the government is still have the feeling that we should have the best price possible based on competitive bidding and we are still trying to argue that government that I mean they should be feed-in tariff not only for solar but also for wind and even some of these industrial cogeneration systems. Next question.

Vickie Okay. Actually, I think Christine has a follow-up comment.

Subramanian Yes.

Christine I would just like to add something here because effectively I mean I mentioned in my slide that we have about 140 countries in the world with renewable energy policies. We see that feed-in tariffs are very successful means of promoting renewables and it has been in the power sector team feed-in tariff when you reached certain standards that we use more frequently. We see there also that the policies are evolving and as a sharer of renewable source different needs should also need to be addressed by policy makers which of course can be fulfilled by evolving science keeping policy but what we see is throughout the world, what is the most important is that there is predictability and there is ability in whatever support system and whatever policy there is in place. We have seen in the past retroactive policy changes in some European countries and Spain for example that have completely made the industry collapse and we also see to certain extent that investment in renewable in India is isn't [inaudible] [01:06:08] plan went on because of our fluctuate in policy frame work and I would really I forget here that whatever the frame work is, it is important that it is predictable and stable so that those who are interested in putting their money in that sector really find the appropriate conditions.

Subramanian I think what Christine I tend to agree with what she said. I mean, I have no specific comments something to argue against what she said.

Vickie Great, well thank you both for that. Next question is actually a little bit directed toward the manufacturing sector and the question is what are the key issues Indian domestic manufactures are facing to produce less expensive modules and how is the government helping them to produce a low cost module? This is just one part of the question and then there is the second part of the question which is what are the key issues Indian domestic manufactures are facing?

Subramanian The question is about Indian domestic manufacturer. Does it relate only to solar or both solar and wind?

Vickie There are mentioning panel or modules so I am assuming for solar.

Subramanian Okay, India does not have very many solar cell manufacturers. The solar cell manufacturer in India was not readily available. It was only able at 70 megawatts until about five years. The Indian government came out the policy of assisting companies to set up solar cell manufacturing facilities. In fact until then most of the Indian companies are small business firms used to import cells as some of the government modules have aged and this government of India assistance gave to the few companies to set up solar cell manufacturing but at the same time, there was –the investment cost rather had then they ultimately came into production about two years ago. It so happen that global solar cell prices failed and today they are facing a competition. I mean, they would not cost higher so there is no way they will be able to reduce the cost because even the fixed cost are rather high and now, they have cheaper modules that are being imported from abroad so they have a basic issue of being viable as well as cell manufacturing units that’s, in fact I do not think any new investment will take place in solar cell modular manufacturing. I mean this has not happened if the existing companies would set up the facilities they can somewhat take over. That is one of the reasons as to why we have a great fight between domestic content requirement for Indian projects or basically imports by Indian projects. In fact that is a dispute that is pending between—I mean in before the WTO and so on this particular scope. I mean the Indian manufacturers want protection. They want a stipulation that all Indian projects should use domestically manufactured cell or modems I mean so manufactures unless they get the support. Probably they will not be able to stand this strain of cost. They might have to go out of business sometimes soon. So manufacturing in India now and especially the rupee depreciates. Someone has to import cells I mean that’s going to be very costly. I don’t know if rupee depreciation is going to be blessing in disguise for some of the Indian cell manufacturers. It may be slow but we have to wait for a month or two to see if the Indians cell manufacturers are recover and will be able to supply modules to Indian solar projects. Next please.

Vickie Okay. Great. Thank you so much. Next question again, it is a two part question. The first being—this is sort of being a capacity versus potential question so you know o the number that was provided for the renewable energy capacity is actually not potential so is there an estimate of additional potential and is the recognition of the potential for pump storage from hydro in relation to what was discussed regarding electricity storage?

Subramanian It’s like this I mean what is potential? We talk about technical potential. We talked about commercial potential if you have seen the Indian statistics about five or six years ago I mean we would have come across a potential of about 45,000 megawatts a week. Today they are talking about 100,000 megawatts a day and I think they are not either come up with an estimate of about 400,000 megawatts of wind. I mean this are like

increased of heights and by re-assessment of given potential but the problem is even if it is technically available do we have sufficient land in the areas that has not been potential of wind turbulence. So this big doubt that what we call potentially is at here or it is only on paper this is very – we are debating back but I still feel that India cans easily reach 100,000 megawatts in the near future with increased of heights and partly due to repairing of some of the old wind falls. In fact some of the best wind sights have been taken by a very low capacity wind turbines that were installed in the 90s and the early part of this 21st century. I mean so I think there is potential that has not keep debating about the potential because the potential as of today is unrefuted. I mean they can go on and on and it is easy and as far as solar is concerned, I mean some people tend to confuse Indian summer with high solar potential. Unfortunately the Indian summer is not a very pleasant summer it is a very hot summer. There is decreased in efficiency of solar cells during Indian summer so I mean how much would be generated is a question. In fact we have a lot of potential for having rooftop that reconnected. This is something we have to explore. We are trying to advocate the policy of having the rooftop connected system in India and as far as pump storage schemes are concerned that very much there at the three major pump storage schemes, one in Maharashtra, one in West Bengal, one in Tamil Nadu it is happening but again functional means it as good as a large hydro project and we have the actual the land, actually the land such a –where we can have a pump storage system and I do not think there is any other pump storage project that is being planned in India now. The existing systems of pump storage if they can be operated efficiently probably using the wind powers during night and the demand worse around the cool thermal part. It is welcome but even those pump storage schemes as of now they are not functioning efficiently but somebody has to pay a large amount of attention to it to make that work but I doubt whether we will have future pump storage schemes because we will have massive issues on land acquisition construction because it is no very easy. For every unit that we generate doing the because we left the pump usually there’s energy to pump the water back in the pump storage schemes. I do not think it is on the property agenda of the government be it for the union government or the state government. Okay. Thanks. Its

Vickie

Thank you and just real quickly we have Christine and Subramanian we have many more questions in the cue than we have time left to answer, I was just wondering if we have time for another one perhaps of if after subsequent to the webinar if I could send the remaining questions to you to look at.

Subramanian

Please.

Vickie

And perhaps answer it directly.

- Subramanian I'm more than happy. If there are one or two questions as long as –I promise after that you can send the questions to me and I'd send the answers.
- Vickie Okay, great. Thank you. So I apologize to those of you on the line that we may not have time to get to your questions but we will see to it that we do get answers to you after the webinar, but in the meantime, without wasting any more time on that I would like to, there is a question here Subramanian for you to sort of get your perspective on the renewable regulatory fund regarding if you feel if it is conducive or not conducive for wind developers in India?
- Subramanian The renewable regulatory fund is mainly based on the stipulation that has been issued by the electricity regulatory commission on forecasting and schedules. This commission has just tried all new wind projects to forecast and schedule wind one day in advance for every 15-minute loss. Unfortunately we do not have aspects of technical competence or experience to do that. There are people who are opposed to it. There are people who think they can get it done. A large number of players have also come in offering the services of forecasting and scheduling to Indian wind farm generating companies and it has just started a few months ago and even though there is a big difference to equipment as to how value, is it worth it or how badly it is worth. Most of the wind developers now they are saying we are not opposed to scheduling and forecasting in principle, but let us do it without the financial penalty for the past six months or one year then take it off from there and the matter is still pending before the commission. There are representations that are being given to impose this and penalize wind power generators or either short fall or excess part being injected to debate so is there on paper but I do not think any amount has been accumulated there. That is where we are.
- Vickie Okay. And then just one last question before we start our wrap-up is and this is a topic that is very interesting to me as well is how do you see the potential of off-grid solar developing?
- Subramanian This again since I have been in the sector for long enough I would say that off-grid solar itself is a misnomer. Unfortunately, solar cells will generate far only for 6 to 7 hours. What happens during the rest of the period? I mean very easy to say this off-grid solar has been necessarily integrated into other forms of renewables like biomass so that I mean there is 24/7 generation availability upon. Otherwise off grid part solar for giving just to see if a launch to a poor man in the village. I mean I would say that it is provision of lighting and it is not provision of electricity. I mean off-grid it solar everybody talks when they are occasional I mean projects here and they're sporadic. Well there is tremendous amount of concentration of financial and human sources to make it a success but it is not possible to replicate a model of an off-grid system based only on solar I mean all over the country I mean in a major way. So off-grid solar has its potential but it is also possible to have an off-grid solar that can be connected to the grid

when the solar part generation goes down. That is—are there more the lighting? We have to experiment with it but off-grid solar has such I mean business model means tremendous amount of concentration of financial and human resources. I mean that is where we are I think. Next.

Vickie

Okay. Great. Well thank you. Oh and again everyone that submitted questions that we do not have time unfortunately remaining to answer them all. We will make sure that they are addressed and we will e-mail you the answers to your questions after the webinar. Still with that, I just you know want to say thank you to all of you. We have had some really great questions from the audience. Our presenters were outstanding and so now we would like to just take a few moments to do a quick survey to get your feedback on your perceptions of the webinar how we did and this will help us know what we are doing well and may be areas where we can improve so. Andrew, could you please pass the post polling question for our audience? And I will read this real quickly. The first question is the webinar content provided me with useful information and insight. Now we will take just a few seconds to allow you time to answer the question. Very good. And Andrew when you are ready you can move to the next question. Okay, our second question is the webinar our presenters were effective? Okay, and Andrew when you are ready, the third question please. Excuse Third question, overall the webinar met my expectations? And fourth question when you are ready.

Andrew Hunt

Actually Vickie I think there is only three questions today.

Vickie

There is only three for this one? Okay, thank you. So I just wanted to say thank you to our attendees for taking the poll and we do take your feedback seriously and again this helps us understand how we might improve our webinar to make a better experience for all of you. So with that I just want to say that on behalf of the Clean Energy Solution Center I would like to extend a very hearty thank you to Christine and to Subramanian for their great presentations and taking the time to share their valuable information with us today. They're—your expert panelists and great to listen to and also we would like to extend again a very hearty thank you to our attendees for participating in today's webinar. You have been a great audience. You have had great questions and we very much appreciate your time and I invite you to check back to the solution center website over the next few weeks if you would like to view the slides that were presented today and we will also have an audio recording of today's presentations available for your as well and you can go back and listen to previously held webinars as well as fine listing of our upcoming webinars over the next couple of months and then we just really want to invite you to inform your colleagues and those in your networks about solution center resources and services that we offer including the no cost policy support that Andrew mentioned earlier. So with that I want to say again thank you and I wish you have a great rest of your day. We hope to see you again at future clean energy solution center events and with that this concludes our webinar. Thank you.