

Webinar Panelists

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Sean Esterly Hello, everyone. I'm Sean Esterly with the National Renewable Energy Laboratory, and welcome to today's webinar hosted by the Clean Energy Solutions Center and REN21. We are very fortunate to have Christine Lins and Morgan Bazilian joining us. This great group of panelist will be discussing the REN21 Renewables 2013 Global Status Report with a focus on North America.

One important note of mention 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 is featured in the Solution Center's resource library as one of many best practices, resources, reviewed and selected by technical experts.

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And panelists, we just ask that you please mute your audio device while you are not presenting. And if anyone has any technical difficulties, with the webinar, you may contact the GoToWebinars Help Desk at 888-259-3826. And if you'd like to ask any questions during the webinar, which we always encourage, we ask that you use the "questions" pane where you may type in your question. I will then present those questions to the panelists during the question/answer session at the end.

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posted to the Solutions Center training page within a few weeks of this webinar.

Now, I've had a great agenda prepared for you today that is focused on the REN21 Renewables 2013 Global Status Report and also provides an overview of the status of renewable energy in North America. Now, before our speakers begin their presentation, I just want to provide a short informative overview of the Clean Energy Solutions Center initiative. And then following the presentations, we'll have a Question and Answer session, and wrap up with closing remarks, and a very brief survey.

I would just like to provide a bit of 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, was launched in April of 2011, and is primarily led by Australia, the United States, and other CEM partners. Outcomes of this UNE partnership includes support of developing countries through enhancement of resources on policies relating to energy access, no cost expert policy assistance, and peer-to-peer learning and training tools such as this webinar.

The Solutions Center's 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. Third, the Solutions Center delivers dynamic services that enable expert assistance, learning and peer-to-peer sharing of experiences. And lastly, the center fosters dialogue on emerging policy issues and innovation around the globe.

Now, our primary audience is energy policy makers and analysts from governments and technical organizations in all countries. We also try to engage with the private sector, NGOs and civil societies.

Our key feature that the Solutions Center is proud to offer is the expert policy assistance. It's known as Ask an Expert and it's a great service offered at zero cost. So, we've 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.

For example, in the area of Renewable Energy Finance and Sustainable Energy Planning, we are very pleased to have Wilson Rickerson of Meister Consultants Group serving as our expert. If you have a need for policy assistance on renewables or any other clean energy sector, we encourage to use this useful service. Again, this assistance is provided free of charge.

And to request assistance, you simple submit your request by registering through our Ask an Expert feature at cleanenergysolutions.org/expert. We have to invite you to spread the word about this service to those in your networks and organizations and we encourage you to explore and take

advantage of the Solutions Center resources and services, including that for policy assistance, subscribe to our newsletter, and then participate in webinars like these.

And now, I'd like to provide brief introductions of our distinguished panelists. First off is Christine Lins, Executive Secretary of REN21, who will discuss the key findings of the 2013 Global Status Report. And then following Christine, we will hear from Morgan Bazilian, Deputy Director of the Joint Institute for Strategic Energy Analysis at NREL. Morgan will be discussing findings from the REN21 Renewable Global Status Report relevant to North America. And we'll also provide an overview of renewable energy in North America. And with those introductions, please join me in welcoming Christine Lins to the webinar.

Christine Lins

Thank you very much, Sean. Good morning, ladies and gentlemen. For me, it's good afternoon. I'm speaking to you here from Paris, France. I understand that by now, you can see my screen and we are set to go. And it's a pleasure for me to be here at this webinar hosted by the Clean Energy Solutions Center. I'll give you an overview on Global Renewable Energy Status with a focus on North America. It's also particularly a pleasure to be here today with Morgan Bazilian, a long-time colleague, and we hope to be able to share interesting insights with you in the next hour.

So, in a nutshell, I'm going to present to you the key findings. But before doing these long status reports, let me give you a quick overview on REN21. REN21 is a multi-stakeholder of the Policy Network, Renewable Energy Network for the 21st Century that was created at—the renewables, 2004 in Bonn, Germany in 2004. So, we had an operation for about a decade. It's what I would call the [inaudible][00:07:02] of the willing. Also they call this [inaudible][00:07:05] from the private and the public sector, national government, international organizations, NGOs, Industry Associations of Science and Academia, that all work on advancing renewables. We have acquired the American Council on Renewable Energy as a member. We are closely working with the US government who has been on the REN21 Steering Committee up until the end of last year and then currently as we have slightly changed structures working on a procedure to have them back on board. And we work also closely with NREL, the National Renewable Energy Laboratory in the US, towards the uptake of renewables on global level to get [inaudible][00:07:46] of the IEA as well as IRENA, and several of the UN agencies as well as the World Bank.

We are producing an annual report on the status of renewable energy. Their result was launched in June along with UNEP's global trends in renewable energy investments and that is based on a team of over 500 contributors, researchers in the US, worldwide, giving an overview on the global markets, industry trends, policy landscape as well as it has its special focus on decentralized renewables in developing countries. It [inaudible][00:08:25] all renewable energy technologies both the power

sector, heating and cooling, as well as transport. And we always introduce new elements in each year's report and in 2013 that was a feature on system transformation as we see that at the moment when shares of renewables increase, the importance of integrating them into energy systems is becoming more and more important. For North America, we work together with the Worldwatch Institute and the report is downloadable free of charge from the REN21 website, www.ren21.net, while you also find a lot of country documentation on the renewables *interactive methods*.

So in a nutshell, where does renewable energy stands in the world? At the end of 2011, renewables supplied an estimated 19% of global final energy consumption. Also, all the figures in the Global Status Report 2013 are from 2012. When it comes to shares of renewables in global final energy consumption, this is the only figure that is going up to 2011 as we have to also get the share from final energy consumption there in order to put the renewables development into perspective.

So, you see that this share is comprised of roughly half modern renewables and another half of traditional biomass. And it is clear the objective to significantly increase the share of modern renewables in the years just to come and to find ways of limiting the traditional use of biomass locally and mainly in the developing countries. We'll also give an overview on the top renewables energy champions and markets. You have there in the bold red-surrounded columns, you have both new capacity investment as well as total capacity as of the end of 2012, and there you will clearly see that the United States are very prominently represented in this list of top countries. And not only the United States, but also Canada when it comes to ethanol production or also in the field of hydropower, or also renewables power capacity excluding [inaudible][00:11:11].

And it's just here that I hope you can hear me alright, because I just got the message that the connection might be bad, but I think we have [inaudible][00:11:22].

So, what does that mean in terms of power? In the global market overview for the power markets, we see that the renewable energy for the power markets, we see that renewable energy comprised about 26% of global power generation capacity in 2012, and in the United States, renewables accounted for 12.2% of net electricity generation, and globally, roughly 22% of electricity are generated from renewable.

We see that for the first time in 2012, more than half of the new electric capacity installed was renewables-based in some parts of the world such as in Europe. This year it was even higher in Europe, 71% of all power plants that came online to the system in 2012 were renewables based. So, this figure clearly show that renewables are making their way into mainstream energy systems.

We are not covering only electricity in the GSR, but we are also focusing on the heating and cooling as well as the transport market. And there we see that the heating and cooling, there is a general trend for the use of larger systems and we see quite an impressive spread of solar collectors of more than 56 countries for water and increasingly for space heating.

As far as transport is concerned, liquid biofuels provided about 3.4% of global road transport fuels in 2012, and we see that many countries, more and more countries are putting in place policies promoting electric vehicles, and we also see that these policies are closely tied with renewable energy promotion especially at the local net.

So, I'm not going to go through all these in detail, but generally, in the Global Status Report, you have a very detailed overview on the trends in emerging markets for the different technologies. Just a word on hydropower, in 2012, 30GW of new hydropower was added and we see also the United States and Canada are playing a top role in this market, and we see that the more and more tried ventures put in place all the local and international level as the size of projects increase, and we also saw recently a revisiting of the decision of the World Bank to finally regaining funding hydropower projects. So, with this, we will also probably see more developments in the years to come.

As far as solar photovoltaics is concerned, development has been impressive. Total global operating capacity of solar PV reached the 100GW milestone last year. That was something that nobody would have estimated that the development go so quickly. If we just look at the graph, you will see that basically, it took us 15 years from 1995 to 2010 to go to 40GW quite slower, but steady increase. But then, when looking between 2010 and 2012, you see that this capacity more than doubled within two years with on the one hand which was prices of solar PV modules significantly down. They fell by more than 30% in 2012, but also, this clearly shows that the technology is becoming more affordable also for developing countries and in many parts of the world. It is now a [inaudible] 00:15:18] and so solar becomes really a competitive source with information of use. The United States is in the lead in the field of PV with the world's largest PV facility that's 250MW thin film plant in Arizona.

Moving on to wind power, you also see a continuous development in 2012, almost 45 GW of wind power capacity that came in operation that was an increase in total capacity by 19% in North America alone, out of this 45 and 14 GW. And you could see the graph just towards a very continuous and annual growth rate which is quite impressive and which speaks I think for itself.

We have similar development in the concentrating solar thermal power. Also, there was a very steady market and steady situation for the last decades. We basically see a rush on significant increase in the market with

a total CSP capacity increasing more than 60% in 2012 to about 2.5G, and there the US remained the second largest market ending the year with 507MW in operation. The US and Spain traditionally being the— [inaudible][00:17:06] markets we see right now that there is also a lot of development in the Middle East and North Africa as well as growing interest in Asia and Latin America for CSP technologies.

Bioenergy, also a very important component of the renewable states. We have already seen bioenergy being used for the production of power in the cooling sector as well as for transport. And here you see a big proposition of the United States in biopower generation and also Canada in quite a [inaudible][00:17:49].

I mentioned before, liquid biofuels providing 3.4% of global road transport fuels. There you see that in 2012, the global production of fuel ethanol was down, and that is basically the yellow graph, whereas the production from biodiesel increased slightly. The United States accounted for 61% of the global ethanol production and is the world's leading biodiesel producer, so, a very, very strong dominance of the US in this market.

Geothermal energy. There, the United States added 147 MW of geothermal generating capacity increasing the total capacity by 5% to 3.4 GW. And there also, we have both big plants, but also small scale heat pumps used in geothermal energy.

I mentioned before the increasing trend of solar thermal with 56 countries around the world having solar thermal in use for heating and more and more for space heating. Global solar thermal capacity in 2012 reached an estimated 255 GW thermal for glazed water collectors. And there is one more use of this technology for industrial processes.

Industry trends. In a nutshell, we saw continued growth on the one hand. However, we saw uncertain policy environment and declining policy support especially in the [inaudible][00:19:40] countries that effective investment climates in a number of markets and then slowed the momentum in both Europe, China, as well as India. And of course, also the continued price reductions to a certain extent presented quite some challenges for the industry. So, we saw some industry consolidation, but we also see that here, trends, that renewables are being more affordable nowadays in both the developed and the developing countries. And we also see that more and more countries are putting in place local content requirements where actually the manufacturing shifts towards these markets and we see it here a shift in investment towards developing countries [inaudible][00:20:33].

As far as jobs are concerned, worldwide, renewable energy employment continues to increase. We have an estimated 5.7 million people now just working in the renewable sector with the bulk of the employment still

remaining concentrated in Brazil, China, India ,the EU and the United States.

As far as investment is concerned, there you'll see that the global investment in renewable power went down 12% from the previous year's record, is still the second highest ever investment. At the same time, installed capacity continued to grow due to falling technology cost. Investment in the United States went down 35%. So that is effectively challenging for the industry and it was in peak boom before recovering money that had to be spent the production takes credit that was discontinued and then put in place again, technically having an impact, showed an impact on the investment pattern.

And the thing for this most interesting is the shift in the balance of investment activity between developed and developing economies. So, this 244 billion US dollars are composed of 112 billion that were invested in developing countries. So not just 46% of global investment in the renewables sector is going to developing countries. That was increased compared to 2011 by 32% and the developed economies on the other side, their investment fell by 29% to 132 billion. That was the lowest level since 2009. I think that really shortened the one hand being picked up the financial crisis, but is on the other hand also very encouraging because we see that the markets where energy demand is going steadily are the ones that are also increasing investment in renewable, which I think, is a very encouraging effect.

As far as policy is concerned, still the most important enabling effect of renewables, the number of countries with renewable energy targets has more than doubled between 2005 and 2012. We have nowadays around 140 countries with renewable energy targets in place and about 130 countries with clear cut policies. Most policies, to support renewables, are found in the power sector with feed in tariffs and renewable portfolio standards being the most frequently used, but we also see there's a merchants of use of *tenders*. I just came back in South African where the government has just very successfully completed a second bidding round and is about to announce the third one where prices have gone down quite significantly and project development industry seems to be very happy with that system we see all around the world, and policymakers are increasingly aware of the potential in national development impact of renewable energy, and there are a lot of different policies in place throughout the world which are all comprehensively portrayed in the policy table of the global status report where you can view the instruments used on a country by country basis.

A quick outlook. You might have heard of the UN Secretary General's initiative, sustainable energy for all, which said three complementary goals to be reached on a global scale by 2030, which consist of ensuring universal access to modern energy services by 2030, which consist of doubling the global rate of improvement in energy efficiency, and last but

not the least, doubling the share of renewable energy in the global energy mix. All these three goals are complementary.

And early this year, under the coordination of the World Bank and the International Energy Agency, we completed a global tracking framework which basically sets a baseline which is set in 2010, where renewable share in total final energy consumption was 18%, which sets the objective of doubling share of renewable in the global mix from 18 to roughly 36%.

So, you might remember the graph has showed that the beginning, in 2011, we were at 19%. So, development is slow and of course also—but continuous in the right direction. Of course, to share all these also depends on how the global energy demand is effectively advancing. But still, we have another different scenarios where we see that reaching this share of 36% renewable energy in 2030 is feasible. It's feasible when following conservative energy scenarios like the ones outlined here in brown and yellow. But when it comes to the higher renewables and high energy efficiency scenarios, we see that the 36% in 2030 definitely are in the range of what's feasible.

And effectively, just finally shown you that I think we must not forget that the future of our energy sector depends on the decisions that we take today and we see that historic projections have fallen short. So, we had just brought on the left some analysis of scenarios that we did in the framework of the renewable global futures report that we launched early this year, which just showed that the IEA in their projections where global wind would be in 2010. These are protections done in the year 2000. They got it wrong. So you see the projected amount in gigawatts as the blue part and the actual amount affecting the red bar where we actually ended up.

World bank, 1997, the forecast for wind power in China for 2020 and then the red bar showing where actually we were in China with wind in 2011. So they came earlier than these protections, which I think [inaudible][00:27:47] many of the developments of [inaudible][00:27:49] sector could not have been anticipated a couple of years ago because we really saw massive changes, massive increase in the renewables an it's eating up all technology development, prices coming down, and also deployment.

However, it is clear that this doubling of the share of renewables that is outlined and that is Sustainable Energy4all, we need to result in at least a tripling of the share or modern renewables including sustainable hydropower, and we do not want to increase the share of traditional biomass, what I mentioned before. And for this I think it is important to remember that we will need both the centralized as well as the decentralized renewables and we also—we need to put the focus on integration of renewable energy in the energy system both in the technical way, but also in a policy way. This is, I think, something that both NREL and REN21 are interested to presume for the research. And with this, I

would like to thank you for your attention and I would like to head back to the Clean Energy Solutions Center for the next presentation.

Morgan Bazilian

Thank you very much, Christine. And Sean, I've see you've got my slide back up. It's very difficult to follow up Christine. She gives such a lovely overview and the work of the REN21 keeps getting better and better, and more and more useful for all of us. I've been engaged with that work since it started about 10 years ago, as Christine chatted. It's an honor to speak on this webinar both with her and be supported by the Clean Energy Solutions Center, which I think, likewise, is doing tremendous work.

I'm going to give a fairly brief presentation given that Christine has covered a large amount of materials. These slides are going to remain available for you and will remain available offline for questions as well as if we don't get to them today. I'm going to cover my aspects for the REN21 report on North America. In that, I'm going to include some small discussion around Canada, Mexico, and the United States. I'm also going to turn to an issue that's not normally covered on global status reports for renewables issues interaction with natural gas since it's become a such a large issue across North America.

So Heather or Sean, if I could have the next slide. Thank you.

So. I'm going to look briefly at the leads tables or the table rankings. Christine showed those briefly. A little bit of somewhat eclectic look at some of the technology that appeared in the Global Status Report and then turn to money; cost, production, and funding. And then as I said, a little bit of interaction with natural gas.

So, if I could have the next slide.

Great. So, we've highlighted in these slides the United States and Canada. Mexico does not show off on this Annual Investment Lead Table. You can see where the United States—this is Annual Investment Additions, so this is from 2012, from last year's. And United States has been number one on that big table on wind power, biodiesel, and ethanol. And Canada, of course, also deeply engaged in hydropower and ethanol. We'll touch a little bit more on the solar PV capacity. As Christine said the new plant put up in Arizona 650MW [inaudible][00:32:01] up to 2012. And I think one of the points will come back to this capacity investments. I also want to raise although it doesn't show up in the leads table that Mexico has investments in renewable energy increased more than fivefold according to that status reports from 352 million in 2011's to two billion in 2012. So that is a significant increase obviously, something that I thought was worth highlighting when we discuss the lead table.

Next slide, please.

So, wider of the lead table. And this the status as of the end of 2012, but this is not an annual, but a cumulative figure. And see, Mexico show up as

the fourth largest country at the geothermal power significantly. And of course, Canada showing up always very high on the hydropower—the United States and Canada, Canada getting an enormous percentage of their electricity from hydropower.

I think a couple of the more interesting ones include the total—the concentrating solar power. The United States is second on that, and also Canada in renewable power, in total number four there. So, those are some significant parts of this table. The tables themselves, I think, are really useful product of the GSR and while I don't need to direct policy design on energy planning, what they do is show off the country that are making either big increase within a year or showing off as the leaders in clean energy, and now there seems to be China and Germany at the top of a lot of those which we won't be covering today.

Next slide, please.

So, just a little bit of a summary slide here. If I can draw your attention down to the bottom part of this slide, the per share of electricity generation from renewables. I know that said Canada very significant at 63%. It's primarily hydro and you will find that number slightly higher and slightly lower in different forms, but the GSR's methodology showed that at roughly 63%. Mexico at 16% and the US at 13%. So, that's the share of electricity generation from renewable.

I've just done some parentheticals there to look at the total final energy. So, very significant, 17 in Canada as about our 7% in Mexico. So, just to give you a sample scale across North American country than the—what they look like in comparison to other countries you might have seen. Let's say Norway showed up at the GSR 65% on final energies, which is hugely significant there.

Next slide, please.

A couple of key stories had struck me as I was going through the GSR and sort of searching for Canada, US, and Mexico. And one of them, North America is the top ethanol consuming and producing region that remains the case. Those numbers are a little but flat. It's all a slight upwards when you share, but generally flat and, I think, as many of you know, heavily dependent on regulation and standards to the market side. North America saw PV 3.6 GW and new PV installed in 2012. And I think Christine mentioned the PV sector thrilled to beat their 100 GW overall total capacity. That enormous accomplishment so [inaudible][00:36:05].

Yes, one big story is about the late 2012 wind installation, the timing of that had a lot to do with the production tax credits in the United States which [inaudible][00:36:20] drive just kind of a temporal installation process that may not be ideal. About 13GW installed in the US mostly in [inaudible][00:36:34]. Also, I think this is maybe the biggest priority overall of the GSR, but that in the US, the renewable energy power

comprised about 50% of total power installed. That story, I think, it's going to be the big one coming out of the Global Status Report from the last couple of years. The renewables is now installed and about half or even more than half in some places, that's a huge change. Mexico saw a hydro plant go up 750 MW. It has this huge vertical space of 220 meters. They also saw that investment go up as I highlighted in one of the first slides. And Canada ranked number five in renewables per capital, not on hydro. And that might be one of the better indicators that the GSR give, but per capital figure, it's really, in my mind, one of the more useful metrics you can look at across country in comparison. And Calgary, interestingly became—uses 100% renewable energy electricity for their municipal functions. That's quite an achievement.

So those are just some of the ones that struck me out of the roughly three to 400 mentions in the GSR of the US and Canada. I just picked out about six of them.

Next slide, please. [Long pause]. I'm not seeing that next slide. Sean or Heather, are others seeing the next slide?

Sean Esterly Yeah. It's up there, Morgan.

Morgan Bazilian Okay.

Sean Esterly I'm not sure why it might not be showing on your screen, but I believe everyone else can see it.

Morgan Bazilian I'm just going to move so I can see what the next slide is.
[inaudible][00:38:43]. [Long pause] Sorry about these technical difficulties. There we go, Okay. So, we will go into Renewable Energy Support Policies. This is just a breakdown of just the Canada, US, and Mexico as you see, and ranked according to regulatory policies, fiscal incentives, and public financing. I highlighted this just to show—I think this table is an extremely useful one. It links back to some of the REN21 outputs where they mapped this on a—you can go click on the country and see the details of all of these including the regulation, and that's something we're also working on at the Clean Energy Solutions Center . So, just a really useful piece of information.

Next slide.

In the next slide, you should see as Wind Capacity and Additions. You can see the gigawatts there installed in 2012 and the total wind power capacity becoming a big [inaudible][00:40:13] power sector growing very quickly. And, the US and Canada are playing their role there.

Next slide.

This one, we just put in as Mexico. It comes from CFE in Mexico, capacity growth in wind, and you can see some nonlinearities starting to

happen in 2011 of the lines. It's really the total lines going up exponentially and we'll hope to see that growth continue in the future. Next slide, please.

Great. The next few slides are drawn heavily from one of the national labs here in the United States. I'm talking from the National Renewable Energy Lab, NREL. Which, largely comes from the Berkeley Lab at Southern California. Some of you or many of you maybe have heard of it. This was actually one of the original points I was making about the total capacity addition. So, renewables are really becoming very mainstream part of the energy mix and what you see there on the right hand axis is the capacity additions *fare*. So wind became about—just wind became—between 40 and 50% of the total. And you can see how significant renewables were in comparison to gas and coal, in capacity additions in 2012. Again, I think that's going to be one of the big stories we'll look back on the GSR and last year's who showed that shifts.

Next slide, please.

So we move a little bit of a few minutes in money and investment. This is taken directly from Bloomberg Energy Finance, one of my favorite resources for this information. I'm sure most of you are [inaudible][00:42:10] fantastic resources. This something they—a table, but I believe they do it in cooperation with UNE, and they work with many other in the international community. But just showing the new investment in clean effect in 2012 of Clean Energy and the percentage change over the year before. And you just do see a significant investment in, say, the United States in 2012. They're showing 35 billion year, but a significant decrease from the year before. That decrease is a little bit more complex and just less money being spent. The technology there are costing less and they're a myriad of reasons why that goes down because overall investment, they're overall installed capacity goes up. They don't look at that to [inaudible][00:43:02]. But just to give you a sense of the scale whose doing what and not, and the money is [inaudible][00:43:09] on some of the technologies in the next couple of minutes.

Next slide, please.

So, this again comes from our friends at the Berkeley Lab. They're doing tremendous work. I'll give a shot out to Ryan Riser who did much of these work and has been producing fantastic works for the last, well, long time. This is the Installed Wind Project Costs and they look at all kinds of different individual projects and forces a wide range of installed project costs that's due to technologies and localities, and regulation, geography, etc. But it looks like the installed project costs coming down again from 2011 and 2010 sort of peaked in the recent past under this \$2000 of kilowatt number. Just interesting to see the trends there and the wide range of the project costs. It's not simple to give a single number as you can see.

Next slide, please.

And this is from the United States installed PV price and comparison between different countries not comparing North American countries, but just looking at the US, Australia, and Europe. And you see the installed price of PV just continuing to drop down very, very low numbers, but a high variability between countries from Germany that's showing 2.6 up to Japan of 5.9 per watt. So the number is very tremendously and that's a regulatory issue of balance of system issue etc, but a great piece of work and for those of you interested in the price per watt.

Next slide, please.

So the next two slides, I just wanted to show you some work coming out of the National Renewable Energy Lab that has to do with the United States. They are extremely deep on scenarios, took several years to come up with these scenarios, and the idea was to look at can the transformation in US electricity system handle very high penetration of renewable energy up to 90%? And the answer was that generation from technology that are commercially available today, being in combination with a more flexible electricity system that includes market operation and system operation, is adequate by 80% of the electricity generation for 2050. Those are pretty ground-breaking study and I think, for this audience, a very useful sentence to look at the studies online you could see the breakdown in that 80%. In one scenario there are literally hundreds of scenarios in the work using [inaudible][00:46:15].

Next slide, please.

So this is the—just looking at several days during annual peak coincident load and how the renewables combine with the gas and coal and nuclear would look like to show the daily load. And so there is both a general expansion scenario, but also this kind of [inaudible][00:46:45] to make sure that the finding were robust.

Next slide, please.

So I said I was going to talk about the Elephants in the Room. In North America, it's more than an elephant in the room, it's a significant part of the room, if you will forgive my *butchering* of that specific cliché. This is true across North America, not just in the United States or in Mexico, deep off shore, and in Canada, and heavy oil and the United States in both shale gas and *type* oil. The two slides I showed are some of the EIA, the Department of Energy, and the Energy Information Administration. On the left side will show gas production per day over time. You can see that is an absolutely exponential growth in that resource and one that no one predicted even a couple of years before it took off. That's the significant part there, that it is not predicted. And the slide on the right shows the price prediction over many years from EIA and the actual New York strip [inaudible][00:47:54]. Again, no one got it right. And so it makes a very difficult piece of information for energy policy planning that the amount of the resource and the amount of that are being produced of this

unconventional oil and gas in North America is of a scale that we have to find ways to gather explicitly with the more renewable energy community.

Next slide.

Just a snap shot of how natural gas and coal—it just a growth in the power sector. I don't want to go into that one too deeply just to say that perhaps the most enormous shift in that.

Next slide, please.

And so what we did about all or what we've looked at so far with the research on this, can we find synergies between natural gas and renewables? This is power generation. We have to look at how unconventional oil or is it renewables as well, but to start with the liquid gas and renewables. And I think, the important part of this conversation that's been ongoing is to make sure that we keep in mind that this two sectors can play with some synergies and there are going to be interactions whether they like it or not. So, just something to highlight there.

And the next slide is to show that I finished my presentation. Again, it's been—I'm absolutely honored to speak on the GSR. I've been a big supporter of it, as I said, for many years. I think it's provided all of us with a little sound basis for analysis and decision making. And thank you so Solutions Center for having me speak.

Sean Esterly

Morgan and Christina, I just want to thank both of you for the great presentation. And again, remind the audience that if you wish to, you can submit questions to the panelists through the "question" pane in the GoToWebinar panel. And with that, I would like to ask the first question that I received. And I believe this is directed more towards Christine, and that is, what is the total worldwide installed power capacity in energy generation? [Long pause] Are you on, Christine?

Christine Lins

I'm sorry. I muted my phone. The total renewable power capacity worldwide in 2012 exceeded 1470GW. That is about 8.5 % from 2011. So, we see that effectively, there is quite some significant increase there. And as Morgan has indicated, it is impressive to see that nowadays more than half or about half of all the new power plants that were added to the system were renewables based. I am just in the process of checking. We also have to put actual figure of what that means in terms of terawatt hours. I don't have it right here. I'm going to find it and then we will provide it in writing to the person who asked the question, I suggest.

Sean Esterly

All right. Thank you, Christine. And the next question just mentions, how it is inherently difficult to get accurate figures especially from developing countries? And they were wondering, what is the approximate accuracy of the figures included in the REN21 report for installed capacity and energy generation?

Christine Lins

Yes. Thanks for the question. Effectively, it is challenging to get data from developing countries. Yes, we do work with all network of contributors. We have about 500 contributors and reviewers for the Global Status Report plus another 200 contributors from developing countries. That has evolved significantly back in 2005 when the first Global Status Report was produced by Eric Martinot. He was mainly the lead also in portraying what's going in the renewables market. Now, there's a whole author and team in place that relies on contributions from many people.

I could say that figure in the Global Status Report is about as good as it gets. We'd see however in the global discussion that they are still involved with challenges when it comes to, for example, biomass, and their statistics which also [inaudible][00:53:06] of the IEA. They still have some deficiencies there that's [00:53:11] here. I mean, there is, for example, a situation in place, but all fire and energy used outside all city countries is considered as traditional biomass. So, you'll see that you share all of division between modern biomass and traditional biomass is a thick arbitrary. There are many organizations including Athens, ARENA, the World Bank, that working on making the situation better. But I again, I think it is as close as it gets as accurately as we can portray.

Sean Esterly

Thank you, Christine. And the next question is also directed towards you. So, with respect to global renewable deployments, how impactful have feeding tariff? It's wholesale distributed generation [inaudible][00:54:05].

Christine Lins

What we see right now is the feeding tariff policy is responsible for the majority of wind and for the PV developments all around the world. It is clearly a policy instrument that has generated, that had been to success in many markets. However, I'm just coming back from South Africa as I mentioned. There, the government is putting in place the society to do [inaudible][00:54:39] and has issued, had bidding rounds. Their industry is extremely satisfied with the process. And what we see when talking to many industry people and investors this year, the more important is not which policy it is, but it is about the stability and the predictability of the policy framework.

We will need huge amounts of additional investment in the sector if we were to reach our targets and our objectives, and I think it is very important to bear that in mind that what counts is stability, and then of course, each country has its preference of the instrument chosen with the fact that renewable prices for equipment have come down significantly. As I mentioned, in many markets, solar electricity is becoming now competitive with retail energy prices, and also policies promoting [inaudible][00:55:50] for example showing a very good result and a very impact.

So there is no one solution fits all approach, but clearly the need for whatever framework it is, to be stable and to be predictable, and a lot of

good change retroactively like we have seen in some parts in Europe, which effectively makes it very, very difficult for the industry to operate.

- Sean Esterly All right. Thank you, Christine. That is all the questions I received from the audience. We did have one come in through email, but unfortunately, we seem to have lost Morgan from the webinar, so I will email that question on to him.
- Morgan Bazilian Sean, I'm here if you want me to cover it.
- Sean Esterly Okay, great. Yeah. I saw your name disappear so, I wasn't sure. Sorry about that. So, they were just hoping, Morgan, that you could elaborate on the financing mechanism particularly in the US?
- Morgan Bazilian I guess that's such a very broad question and so it's probably best the we do answer that via email, but in the US, the one I referred to is the production tax credit that's been in place for quite a number of years. The issue with that is that it requires US government a congressional approval. And so, it also has deadlines for when things have to be built and has a somewhat uncertain future that tends to go up and down, and the GSR did a nice job of showing that when the PGC was gone, the production numbers or the capacity editions in the following year tend to decline, and they see a little bit of an up and down or a lot of up and down with that specific mechanism. But of course the wider financial support for renewables in the United States is rather large and complicated, and so we'd be happy to get that information to you. That's some great work on the NREL website about things as wide as the investment has accredited and securitization, and MLPs, and [inaudible][00:58:06], and all kinds of other instruments in the United States. Thanks, Sean.
- Sean Esterly Definitely. And I will email that question along here as well. We did have another question come in, and that is, are renewable growth rate getting up anywhere near climate change goals?
- Christine Lins I guess it's an interesting question especially and probably motivated by the current or the recent published publication of the IPCC's reports. I mean, we see that the world has crossed recently the 400 PPM. It is potentially not to trigger a global warming to the [inaudible][00:58:51]. We see that with the current IPCC report outlining, we are more on the track of reaching an increase in temperature of 4.8 degrees. I think that it even underlines the need to further [inaudible][00:59:16] those renewables. I think renewables alone will not be able to address the type of challenge. I think it had to be coupled with very stable and strong missions on the demand side. It's absolutely key to get the demand set right and energy efficiency is absolutely needed. But clearly, I think, there is —[inaudible][00:59:44] something need of decarbonizing the energy sector and their renewables will definitely play a leading role. It should play a leading role in the years [inaudible][00:59:59] to come.

Sean Esterly All right. Thank you, Christine. The next question is wondering if you can recommend an educational program for an attorney interested in developing project finance expertise?

Christine Lins I think there are a lot of capacity gaining progress now existing throughout the world. IRENA, The International Renewable Energy Agency has done, set up a great platform, which is called International Renewable Energy Learning Platform, IRELP, that you can access from the IRENA website that gives an overview on different capacity feeding programs and different opportunities, and I'm sure that there will also be something in the field of renewable energy finance. Should a person not find anything there then I would be happy to provide by *lecture leads* some ideas and some suggestions.

Sean Esterly All right. And just to clarify—someone wants to clarify on the point you made earlier about the total installed worldwide power capacity. So, as you said, 1.5 terawatts renewable power capacity is installed. What they were wondering is the total worldwide power installed capacity. Their knowledge is that it's in the range of 15 terawatts. So that makes the RE percentage about 10%? Are those the figures that you've heard?

Christine Lins No. We have it right now at about—if I go back to the slide, we have at the moment a situation where about 26% of total global power generation capacity is renewable space and they are about 21% of electricity that is consumed is coming from renewables. Or we will have to look into this again, but actually the renewables are comprised 26% of total renewables product generation capacity.

Sean Esterly All right. Thank you for clarifying, Christine. We do have a question regarding Canada. They state that energy is largely an area of provincial jurisdiction leading to widely varying enthusiasm for in approaches to renewable energy. What role do you see the federal government could play to overcome these varying levels and enthusiasm? Are there any parallels from elsewhere?

Christine Lins I would say that one variable I could see is effective in European Union where we have by now 28 members. It's a 28 individual practice. And have all agreed to reaching an overall markets finding objectives by 2020. And this overall objective is then translated into very different objectives for the individual member states taking into account financial capabilities, potential [inaudible][01:03:24] so that could be a model. And then effectively, we just see that in many parts of the world, provincial government and local government are also more proactive than national ones because they clearly—they are offering closer to the citizens, closer to voters and they also have even more bright [inaudible][01:03:47] government and it's probably also sometimes easy on that level to change things on the federal level. So, there are examples and there's definitely also on the regional level or provincial level the possibility to make sketch [inaudible][01:04:09].

Sean Esterly

All right. and next question is specific to wind energy. They note that some countries, notably Australia and Canada, are starting to see more organized opposition to wind energy development claiming how it impact other impact. Do you foresee that's affecting growth forecast for wind? And in addition, are there any lessons from other countries that have not seen such pushback?

Christine Lins

I think it is important to notice that the ownership structures of wind development are very different from one place to the other. And we have seen, especially in Europe, we have seen that projects involving citizens, involving local municipalities are often facing much less resistance from opponents to wind then projects driven by utilities. I mean, I think it's very normal that once people are involve in the project and in the profits that are generated, they are much less critical about those and I think also there's not a trend which makes me optimistic that the development will continue with the fact that we have seen some tremendous development in the field of offshore lately. And of course, with offshore taking off there the impact on population is much less given. And also in many other countries there are models showing how opposition can be overcome. But in general, I think with all renewables programs involving citizens and reaching out to communities are the ones being most successful and are the ones showing the way.

Sean Esterly

All right. Thank you, Christine. And that is all the questions that I received from the audience. I will forward along through email those couple of questions we came across for further elaboration on them. And now I'd just like the audience to—I ask them kindly to take a brief minute to answer a survey that we have. Heather, if you could display the first question please?

That first question is, the webinar content provided me with useful information and insight. And next question please, Heather. The webinar's presenters were effective. And the final question, the overall, the webinar met my expectations.

And thank you to the audience for answering that survey. On behalf of the Clean Energy Solutions Center, I just like to extend a highly thank you to each of our expert panelists, Christine and Morgan, and to our attendees for participating in today's webinar. We had a great audience and we very much appreciate your time. And I invite everyone to check the Solutions Center website over the next few week if you would like to view the slide and listen to our recording of today's presentation as well as previously held webinars. Additionally, you will find information on upcoming webinars and other training events. We also invite you to inform your colleagues, your network, [inaudible][01:08:29] and resources and services including the no cost policy support.

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. And this concludes our webinar.