

Clean Energy Innovation in Mexico

—Transcript of a webinar offered by the Clean Energy Solutions Center on 30 May 2017—
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Webinar Panelists

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Nelson Mojarro	Energy Sustainability Fund and the Hydrocarbons Fund of the Ministry of Energy International Cooperation UK/Europe.
Hermann Tribukait	Mexico’s Mission Innovation Team International Cooperation USA
Araceli Cordero Vilchis	Ministry of Energy Clean Energy Prize PRODETES.

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Stephanie Hello, everyone. I’m Stephanie Hernandez with the Clean Energy Solutions Center and welcome to today’s webinar which is hosted by the Solutions Center in partnership with Mission Innovation. Today’s webinar is focused on the clean energy innovation in Mexico. Before we begin, I’ll go over some of the webinar’s features. For audio, you have two options. You may either listen through your computer or over the telephone. If you choose to listen through your computer please select the mic and speakers option in the audio pane. If you choose to dial in by phone, please select the telephone option and a box on the right side will display the phone number and audio pin that you should use to dial in.

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[channel](#) where you will find other informative webinars as well as video interviews with thought leaders on clean energy policy topics.

Finally, one important note of mention before we begin 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 Solutions Center's resource library as one of many best practices resources reviewed and selected by technical experts. We have a very full agenda for you all today which we're excited to get started on. Today's webinar is centered around presentations from all of our guest panelists who have joined us to discuss goals and vision of clean energy innovation in Mexico, updated information on mission innovation initiatives and the innovation challenge on discovering advanced energy materials that Mexico is co-leading in this initiative.

And before we jump into the presentations, I'll provide a quick overview on the Clean Energy Solutions Center. And following the panelists' presentations we'll have a question and answer session where the panelists will address questions submitted by the audience. At the end of the webinar you will automatically be prompted to fill out a brief survey so we thank you in advance for taking a moment to respond.

The Solutions Center was launched in 2011 under the Clean Energy Ministerial. And the Clean Energy Ministerial is a high level global forum to promote policies and programs that advance clean energy technology to share lessons learned and best practices and to encourage the transition to a global clean energy economy. 24 countries and the European commission are members covering 90 percent of clean energy investment and 75 percent of global greenhouse gas emissions. This webinar is provided by the Clean Energy Solutions Center which focused on helping government policy makers design and adopt policies and programs that support the development of clean energy technologies. This is accomplished through support in crafting and implementing policies related to energy access, no cost expert policy assistance and peer to peer learning and training tools such as this webinar. The Clean Energy Solutions Center is also cosponsored by the governments of Australia, Sweden, the United States and in-kind support from the government of Mexico.

The Solutions Center provides several clean energy policy programs and services including a team of over 60 global experts that can provide remote and in person technical assistance to governments and government supported institutions. No cost virtual webinar training on a variety of clean energy policy topics. Partnership building with development agencies and regional and global organizations to deliver support and an online library containing over 5,000 clean energy policy related publications, tools, videos and other resources. Our primary audience is made up of energy policymakers and analysts from governments and technical organizations in all countries but we also strive to engage with the private sector, NGOs and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across a suite of different platforms. Several of the partners are listed above and include research organizations like IRENA and the IEA, programs like SE4ALL and regionally focused entities such as the ECOWAS center for renewable energy and energy efficiency. A marquee feature that the Solutions Center provides is no cost expert policy assistance known as Ask an Expert. The Ask an Expert service matches policy makers with one of more than the 60 global experts selected as leaders on specific clean energy finance and policy topics.

For example, in the area of green growth strategies we are pleased to have Thomas Heller of climate policy initiatives serving as one of our experts. And if you have a need for policy assistance in green growth strategies or any other clean energy sector we encourage you to use this valuable service. Again, the assistance is provided free of charge and if you have a question for our experts please submit it through our simple online form at cleanenergysolutions.org/expert. We also invite you to spread the word about the service to those in your networks and organizations.

And before we begin the presentations I'd like to provide brief introductions for today's panelists. Our first panelist is Carlos Roberto Ortiz Gomez. He is the director of general research, technological development and training resources with the ministry of energy in Mexico. Our second speaker is Dr. Edgar Santoya-Castelazo who is the director of technical innovation with the ministry of energy. Our third speaker is Nelson Mojarro, a representative in Europe of the energy sustainability fund and the hydrocarbons fund with the ministry of energy. After Nelson, we will hear from Dr. Hermann Tribukait who is a task force leader of Mexico's Mission Innovation team. And our final speaker today is Araceli Cordero Vilchis, director of talent undersecretary for energy planning and transition for the Mexican ministry of energy. And with those introductions I would like to welcome the director of general research and training of human resources with the ministry of energy Carlos Roberto Ortiz Gomez. Welcome, Carlos to the webinar.

Carlos

Thank you so much Stephanie and thank you to everyone that are joining in today for this webinar. Also thank you to my colleagues that are here with me today too to do this presentation. I'm going to do a brief intro on what our office is and our responsibility. And I will be handing off to my colleagues to explain separate elements on the different programs and initiatives that we undertake here in Mexico to promote clean energy innovation. First, I'd like to start with presenting ourselves. We are the key office of science and talent development. I think that would be the most adequate translation to English. This office has too many responsibilities. The first one being conducting the science and research and science development policy for the energy sector in Mexico. And the second one is doing that by investing the—sorry—sorry about that. The energy funds, energy sector funds that we have.

So for this presentation I will briefly mention what the objective and structure of our office and our mechanisms are and then we'll explain a little bit on different resources and initiatives that we use. The first thing is that these

energy sector funds that I mentioned receive resources from a tax on oil and gas production here in Mexico. So every oil commercialized is taxed with 0.56 percent and that percentage goes into what is called the energy sector funds. These energy sector funds at the same time are divided into two main blocks, three main blocks actually. One of them is the IEP fund, the Mexican Petroleum Institute fund which we don't manage. And the two other funds are the hydro carbons fund which aims to develop capabilities throughout the carbon sector with a heavy focus on workforce development and the second one is the sustainability which most of the programs and initiatives that we'll be discussing today derived from this sustainability fund.

Currently the sustainability fund has a portfolio for around 450 million pesos which translates to approximately \$300 million allocated amongst a series of projects and available resources for investing in new initiatives. As I said, these two energy sector funds have four main goals as stated in the law that described them. The first one is talent development, capacity building, research development and deployment and energy education and awareness. To give you an example in the talent development front we are the second largest scholarship granter in the country right behind _____. At any given moment, we have somewhere around 3,000 masters and doctorate level students throughout the world and also an additional 3,000 here in Mexico studying energy topics with scholarships from the fund.

Additional to post graduate school we also do work force training certifications. We do STEM education with middle schools and high schools. And I would say that our entire portfolio of scholarships whether it's a master's scholarship or just a STEM program in a middle school amounts to around 60,000 beneficiaries around Mexico. In regards to capacity building, we work with institutions in Mexico, universities and research centers to invest in the capabilities that they need to address energy sector challenges. So we go from developing curricula with institutions around energy topics, developing research groups around specific topics. We promote faculty mobility. We invest in laboratories. So we have a very large array of activities that we do on the capacity building front. In regards to research development and deployment we have a very large portfolio of research projects. It's always growing and throughout today's presentation we'll also mention how and what are we doing to focus that portfolio to make the results of the research that we invest in more relevant to the energy sector. And that is a key pillar of what we do. Everything that we do we focus on how is this going to be relevant to our industry, to our energy sector.

And lastly, on the front of energy education and awareness as I said we have a very large array of programs to bring people into the energy sector, students, young people, to bring awareness of different energy topics and those are our four main goals. Just briefly mentioned the right-hand side of this picture shows the energy sustainability fund. Just to mention that by law our key focus areas are energy efficiency, renewable energy, clean technologies and portfolio diversification. This is something that is stated in the law and this is together with the mandate that I explained a little while ago, the intersections where we focus all of our work.

Very briefly explaining that the fund has a technical administration committee which is basically the highest authority. So I act as a similar to an executive director for the fund. But everything that we do has to be presented, evaluated and approved by a technical committee. The technical committee is comprised by people from all around the energy sector. When we initiated this administration all of the seats in this committee were allocated to SENER which was a little bit not very objective if you will. So one of the first items that we took in our agenda was to distribute these seats throughout the energy sector. So everything that we do has to be very objective, very well presented to have a chance to be approved.

Second, there's also an evaluation commission that is presided by CONACYT. CONACYT is our sister agency involved in this programs and initiatives and they run the entire evaluation structure for the fund. So whether it's a proposal being evaluated for resource allocation or follow up on a project that is being executed, the evaluation commission plays a critical role. It's set up by a number of specific experts but it can also leverage any external capabilities throughout this mandate to do the job that they need.

And finally, I'm going to use this last minute that I have to explain a little bit of the process that we have to go through. So for everything that we do, whether it's a very small STEM program or a multi-million-dollar research center, we have to undergo this process which is the standard operating process. Everything has to go through an open bid. So what we do is work with CONACYT and we establish the priorities that we feel are necessary for investment in the energy sector. We will develop the bid document and then we'll have an open bid system, very standard you would see anywhere around the world. We'll receive proposals and as I said previously CONACYT is the one in charge of evaluating the proposal.

They will be presented to the committee and any proposal that is approval will be formalized with a fiduciary which is a financial institution that works for our interest. And then we'll have a follow up of all the projects and then we'll measure short, long, short, middle and long-term impacts. So that's the general intro and I would hand out to Edgar so he can explain one of our key research initiatives which is the Mexican centers for energy innovation. Thank you.

Edgar

Thank you, Carlos. I'll just wait for my presentation to be loaded. I would like to thank Stephanie for the introduction and the opportunity to provide the community of clean energy solutions about the what the efforts, the main projects that Mexico is carrying out the energy _____ that Carlos just described. And the focus of my presentation, the main objective is to provide the international and national concepts in terms of the clean energy, clean innovation centers for clean energy in Mexico. In terms of the main challenge worldwide as you know the commercialization of the global energy system. The key aspects while we would like to secure the energy supply, economy growth, environmental sustainability.

As you know, COP21 in Paris was agreed to limit the greenhouse gas emissions so the temperature of the global temperature increase would be below two degrees. To these ends it has been estimated to reduce greenhouse emissions between 50 percent and 85 percent by 2050 where renewable energy and energy efficiency are one of the top hot spots to be able to do this. Another mechanism is the mission innovation which is aimed for countries to at least double their investment in R&D to be able to provide the energy technologies for a low carbon _____.

In terms of the energy innovation system in Mexico, the previous situation that we can see at the left is that even though we have an excellent academic institutions, most of the time they work in an isolated way and not to meet common goals or targets. The migration at the right of the slide we can see the first project of its kind to be able to conform consortium of the main institutions from academia as well as participant from industry to communicate and to be able to meet their demands in terms of energy technology and to develop strategies or project, specific projects to meet these demands. So the objectives of this mainly to provide technology based services and products for the industry as well as to put a training center for specialized human resources.

So today we have five CEMIEs in operation. We have solar, geothermal CEMIE, wind, ocean and bioenergy CEMIEs. The first three on the left they have started operations three years ago and the ocean and bioenergy CEMIEs start operations last year. This means investment of more than \$170 million US dollars. [Break in Audio] CEMIE has been approved and will be starting the next month. In terms of the CEMIE GEO it's a consortium led by a CONACYT Research Centre called CICESE in Baja California State. They have around 22 members among academic and industry and international partners. And the strategic research line in this CEMIE is mainly the evaluation of the national geothermal resources, the research and technological developments for exploitation, drilling and exploration of the sources and direct uses of geothermal heat. The main point of contact of this CEMIE is Dr. Jose Manuel Romo Jones and here is the email to—The CEMIEs work independently with a board where they make their own decisions about which projects they should be able to support in order to optimize the resources and objectives of the CEMIE. So all of the main areas for opportunity of collaboration or working in terms of these projects can be contacted via Dr. Jose Manuel Romo Jones.

The next CEMIE is the consortia led by the institute for renewable energy UNAM. There are around 43 members between academic, industry and international partners. And there's a bigger research lens for heat for processing either industry or domestic uses, development of solar cells, development of alternative fuels, the inventories to be able to assess the solar potential as well as laboratories for testing and photovoltaic models. This part of main contact is Dr. Jesus Antonio del Rio Portilla which is the director of the institute _____.

Then the CEMIE wind is a consortium led by the national institute for electricity and clean energy INEEL with other 32 members between academia, industry and international partners. It's a bigger research line with among the most important would be available wind resources, materials and coatings, aerodynamics, application of artificial intelligence and mechatronics as well as power storage and integration of wind technologies into the grid. The main point of contact would be Dr. Jose Manuel Franco Nava. In the case of CEMIE bioenergy it's been mentioned they started operations in 2016 and is led by the Instituto Polosino de Investigacion Cientifica y Tecnologica IPICYT. And this is integrated through five thematic clusters which are biogas, bio alcohol, solid biofuels, bio jet fuel and biodiesel. And as you can see in the lower part you can find all of the main contacts for each of these clusters.

The CEMIE Oceano is a consortium led by the Engineering Institute at UNAM with around 44 members. Also started operations last year. And the main strategic research lines are focused on the exploring R&D for thermal gradient, saline gradient, wave energy, current and tidal power. The main point of contact here is Dr. Rodolfo Silva Casarin from UNAM. And the last but not least is the consortia led by Universidad Michocana de San Nicolas de Ildalgo. This CEMIE will integrate the efforts of the other CEMIEs into renewable energy into the grid. And this will start operations in July of 2017. With the strategic research lines focused on integration of distributed and renewable generation, management and improvement applications in the distribution and transmission network as well as advanced measurement infrastructure. The main point of contact Dra. Elisa Espinosa Juarez from this university. Thank you for your attention. If you have further questions this is my email to contact. Thank you.

Carlos

While they change the presentation, I would just add to Edgar's presentation some information of things that there's several key industry and international partners along with CEMIEs. I would like to take an example in the bio jet fuel CEMIEs where Boeing, _____ Mexico which is the largest aircraft carrier in Mexico and many institutes are actively participating in that initiative. So there's a lot of potential for these technology innovation centers to develop new solutions for the Mexican energy sector.

Edgar

As well as to add these CEMIEs as well connected to the international best practices, they form part of the technology collaboration programs of the IEA in the case of the CEMIE lab, wind and ocean CEMIE.

Carlos

Thank you, Edgar. The initiative that I'm going to share with you now is something that we're calling national priorities for energy research capacity building and talent development. This initiative is mandated by law and the same law that defines the funds; there is a mandate for the secretary of energy to develop these national programs for research. And as one of our first approaches were the CEMIEs in terms of how do we address key technologies that are already worldwide standards in terms of renewable energy technology deployment. We are working with this initiative to address

other topics that are not necessarily covered by the CEMIEs but are of high strategic importance.

So one aspect here is that as I mentioned before the distribution of resources that is still mandated by the law is that of 80 percent to the hydrocarbon fund and 20 percent of the sustainability fund. Let me say without this being an institutional comment that we believe this should be flipped around. Hopefully sometime soon the legislative branch will have, will promote an initiative to flip this. But at the moment this is a reality. So you can imagine that the resources that we have allocated for these topics are much slimmer than the ones that we have for hydrocarbons and that makes it a very important task to prioritize our investments and make sure that every single investment that we make is the best investment that can be made for our country and meets the energy sector needs.

We've achieved these by two main ways or we're working to achieve these by two main ways. One, Edgar explained what the CEMIEs were. The CEMIEs have worked for the last year and a half in their technology roadmaps. So we commissioned each of the CEMIEs together with expert consulting groups to develop these road maps in order for them to identify exactly where it is that they could add value to the energy sector, R&D capacity building environment. But for an additional set of challenges that where we don't have CEMIEs we are working with this initiative. So basically, we call this the next generation of clean energy challenges for Mexico.

We will be working with three main topics for this year which are energy storage. We believe that there is a lot of work to do in the energy storage front. It is a technology race that is still open for bids if you will and we are very enthusiastic about setting up our capabilities and joining that race so we will be working within that energy storage front. The second one is clean cities. To any of you that have visited Mexico City will be aware that air quality is an issue. This is not necessarily a climate change issue. This is a local air quality issue associated to fossil fuel uses within the city. So we will be developing a strong working group to understand how can we transform our cities. How can we reduce and eliminate fossil fuel use towards 2040 within Mexico City and other urban areas in Mexico that face very similar challenges? And the last one of the energy priorities that we'll be working with in this year is the clean energy materials. This is associated to Mission Innovation that [Break in Audio] further down this presentation.

One thing that we believe is that all of these are complex multidisciplinary topics that are not necessarily just technology based. Ah ok. Sorry. I thought this was ten minutes. Ok. So we will bring stakeholders for this. So I'm going to skip some elements here. Just going through the process very quickly. So these topics of interest have been defined and we will be holding workshops where we bring people from all around the world, specialists in these topics to help us break down the challenges into different areas of need and determine where it is that we need to address with R&D capacity building kind of development investments in order to identify sort of like a roadmap if you

will for the following years and make smarter investments. So that would be a very quick summary of these research priorities that we will be promoting this year. Ok. So now I'll hand off to Nelson so he can explain a little bit of our international cooperation strategy especially with the focus of Europe and the UK. Thank you, Nelson.

Nelson

Thank you very much, Carlos for this introduction and hello everyone. I'm very glad that you could join us today and learn about what Mexico is doing on clean energy innovation. I would like today to share with you some of the activities Mexico has been developing on clean energy innovation with Europe UK for the past two, three years but mostly to share with you the opportunities ahead for cooperating with Mexico. After the energy reform initiated, after the energy reform initiated back in late 2013 laborizing both the oil and gas sector as well as the power sector, this allowed for private participation across the energy value chains. And with that there was also, there was a strong interest in supporting the energy R&D, innovation and capacity building on energy topics.

We can group the activities that we have been doing with Mexico and Europe on four themes, developing funding opportunities, building capacity links, promoting international engagement, this being an activity what we do based in London and the UK with European universities, institutions and the connecting parts in Mexico, their counterparts. And the fourth one would be, which has been very relevant for Mexico joining I would say the international platform for clean energy innovation, Mission Innovation and taking a co-leadership role on one of its three main pillars which are joint research and innovation, information sharing and private sector engagement.

Mexico has started to open to the world through funding mechanisms or matching fund mechanisms. We did not have a cooperation with the largest EU funding program for innovation which is Horizon 2020 therefore a top priority was to engage with this program. We successfully launched together with the European commission and the energy sustainability fund a code for developing a joint program on geothermal energy. That cooperation has been launched started late this year and it's for 20 million euros. Also, we have identified that we have strong synergies with the UK for low carbon innovation and clean energy. And we have developed different mechanisms for corporation for both researchers and firms are able to participate.

One, with the Newton Fund and the Sener-Conacyt energy sustainability fund worth 5 million pounds where projects were allocated for clean energy cooperation. This was led in the case of the UK by UK firms and in the case of Mexico it could have been either firms or national centers or researchers. And we currently have open a call on Newton Fund or in coordination with Newton Fund and Sener-Conacyt Energy Sustainability Fund for a program called Institutional Links providing money for working groups to get together on different themes and present project proposals. These project proposals are expected to be on Mission Innovation related topics. This cooperation is open until the 13th of June.

Now moving on for Mexico's role on Mission Innovation. Mission Innovation was launched at COP21 and Mexico is a founding member of Mission Innovation. The creation of Mission Innovation has allowed for our international cooperation with 22 other countries by the European commission to cooperate on different activities on that purpose. Also, that member conscious participating in Mission Innovation accounts for 80 percent of the world's clean energy R&D. For Mexico, joining MI has been a game changer activity. It has helped us on an international agenda but also as a driver for linking our private sector to international clean energy activities. Mexico participates in both the business and investor engagement subgroup as well as with other innovation challenges that we'll hear later on.

So using this platform to engage research and businesses for cooperation has been extremely useful. And we're planning an event, an MI public private clean energy innovations summit on the 12th and 13th of September in Mexico City. You'll hear later on more about this after the ministerial in Beijing. Also as part of the activities that we have been undertaking in terms of a cooperation with Europe is as I said developing capacity on energy topics for Mexican students. There is a large, very large ambitious program on capacity building for Mexico, a 60,000 scholarship program where 20 percent of that 60,000 is allocated for post graduate studies. We have a very large number for Mexican post graduate students doing energy courses in the UK, about 430. And also, UK universities and Mexican universities have started conversations in developing joint master's programs as well as joint PhD activities promoting capacity building for Mexicans.

In terms of partnership, we have also been successful in developing Chevening-SENER-Conacyt program for outstanding students going into energy programs in the UK to do a one or two-year master's program. The next call for this program will be launched in 8th of August and it will be open through the Chevening website. As well as having programs for masters and PhDs there's an excellent program on post doc for Mexicans where we are able to support Mexican candidates going to any university in the world leading programs for one or two years and then a grant and award to come back to Mexico as an incentive of a quarter of a million dollars to support for their activities back in Mexico.

In order to develop and further promote our international engagement, we have what we call in Mexico, Mexico's future of energy conference series or lectures where we have a one EU expert each month in Mexico visiting different universities. You see down in the slides the names of some of the people that have visited Mexico. In addition to that also we have ran different workshops with over 30 European universities with Mexican counterparts. In some occasions those workshops have been directly led just prior to the call of different CEMIEs so promoting engagement of different UK and European counterparts in generating discussion to prepare for a consortium that includes international cooperation for the CEMIEs. Also with the support of the IEA, we have been able to organize a workshop on a how to guide for smart grids in Mexico. Just before our planning for the smart grid CEMIE which was extremely useful for gathering international practice as well as

learning technological barriers and different barriers to get the smart grids on the agenda in Mexico.

All of the past activities have been the building blocks for international cooperations with Europe and have led to international cooperation mechanisms and new opportunities that will be announced soon for example with UK universities. Overall you can see in the slide these funding mechanisms have attracted 27 million euros for cooperation. There are the topics in the slide that we have been interested in developing, not only the innovation challenges but supply issues, energy efficiency as well as now some topics on energy demand. We will be hosting as said public private clean energy summit in Mexico for Mission Innovation topics and you have my contact details on this slide for further information. Now I would pass forward to Hermann Tribukait, my colleague from the United States. Thank you.

Hermann

Thank you, Nelson. Hello, everyone. My name is Hermann Tribukait. I represent the energy R&D funds in the US and Canada and based in Silicon Valley here in _____ California. So today I will just go briefly through the work that we've been doing that follows three broad goals which is essentially promote the problems that you have been hearing about and apply scientific R&D projects and human capital formation in clean energy in Mexico. We do this by providing funds for Mexican research institutions, universities, students and researchers, promoting the collaboration between our academic institutions and the private sector and all stakeholders on these topics.

One broad goal is to develop strong international collaboration projects and partnerships with the top academic and research institutions. I will give you a brief overview of the type of projects that we have been launching. So the lectures series the future of energy that Nelson mentioned. We proposed this four years ago to Sener to the essentially the idea behind it was to bring to Mexico the top thinkers in energy, the experts in energy to discuss the trends, the latest in knowledge and energy and more importantly to build or develop collaboration projects with their institutions, with their groups' labs as well as to inspire our students in Mexico to go into these topics. So on the screen you see a few of the leaders that we have brought Mexico to discuss and to present their work.

And very importantly these meetings have led to specific R&D collaboration projects with these institutions that these experts represent. We have a few samples on the screen. So we developed and launched a project that is ongoing right now to develop organic solar cells between our national university and Harvard University specifically the chemistry department and Dr. Alan Aspuru-Guzik that you see on the screen is our first guest with, visited Mexico in February 2014 with Professor Daniel Nocera both from Harvard University. A similar example we launched and are funding a project to develop low cost solar panels and testing procedures with the photovoltaic research lab of MIT led by Professor Tonio Buonassisi and our institute of

renewable energy in Mexico, that was mentioned before linked to the energy hub at UNAM.

So other examples you see there. We have an open call for energy efficiency and demonstration projects. We have projects with Canada and specifically CIFAR Canadian Institute for Advanced Research and other projects with our energy hubs. So it's important to mention. Here we are innovating not only or promoting innovation and R&D by also innovating the mechanisms to do so. So here on the screen you have a picture. This is a recent launch of the energy efficiency, the _____ proposal for energy efficiency and demonstration projects launched with the Center for Energy and President Janet Napolitano of the University of California.

We are promoting new ways or following best practices testing international practices to build this human capital in Mexico and promote these type of programs. We have post doc programs. Just to give an example over the last two years we doubled the number of Mexican post docs at the Lawrence Berkley National Lab from a very small base from we only had three Mexican post docs there. Now we have seven and we continue to promote this type of programs. We are developing master's programs together with universities in Mexico and US universities, promoting research exchanges and most importantly as was mentioned before, Mexico joined Mission Innovation. And we are leading the clean energy materials challenge that my colleague Carlos and I will discuss further in a moment.

But I want to emphasize that we will be holding the first international expert workshop in materials discovery, materials innovation in Mexico City September 11th to the 14th. You see the website on the screen and we will discuss it further with Carlos in a second. Here's my contact information and without further ado I will pass it over to Carlos Ortiz to continue the discussion on Mission Innovation and the initiatives that we're leading with Mexico. Thank you very much.

Carlos

Thank you, Hermann. We'll just take a couple of seconds while we switch presentations. I will also set up my stop watch. So I will briefly explain what Mission Innovation is. I ignore how our audience is set up. Probably a lot of you already know a lot about Mission Innovation. But we felt that it would be necessary to set up like an introduction to explain what we are doing and why it's important to us. So please, sorry for those who are highly experts on Mission Innovation for putting you through an introduction on what Mission Innovation is. And to those of you that don't know anything about Mission Innovation I hope this is useful information.

So Mission Innovation is an initiative where at the moment 22 countries plus the European union decided to cooperate by doubling our investors in clean tech R&D. Initially, the initiative was set up by invitation of then President Barack Obama to its peer countries. And in Mexico we analyzed the initiative. We presented it to both our fiscal authorities as well as the office of the president for the country. It went, underwent a series of analysis and eventually we were authorized to participate which we are very excited for.

Mission Innovation sits together with Clean Energy Ministerial as one of the international cooperation agreements towards achieving the COP objectives with the differentiator that whereas Clean Energy Ministerial is focused on the deployment of technology, Mission Innovation is set for accelerating the pace of innovation for developing new technologies. There's an overlap amongst the two in technology demonstrations. But the spirit of Mission Innovation is accelerating the base of innovation by promoting international cooperation and increase investment in mainly pre-commercial stages of technology development. For Mexico, we analyzed this initiative. We had a series of investments that were coming our way even before joining Mission Innovation. So once we presented our financial planning to our authorities that we were authorized to join Mission Innovation.

Our baseline previous to Mission Innovation was set around \$20 million a year in investments and clean tech R&D, specifically energy clean tech. And after that we increased our investment to around \$60 million per year. A lot of the investments that we've discussed like CEMIEs and so on are part of these portfolio that helped us reach our commitments as we join Mission Innovation. So when you're looking in this graph both in darker green and lighter green are investments that are already approved, the resource is there and the expenditure on these projects is a multiyear project that will happen as we progress. So everything that is in green is already committed investment. It's not something that we need to go back and find the resources. It's there and what we see in lighter blue is additional investments as we progress with the initiative.

Mission Innovation defines seven key innovation challenges to promote cooperation amongst the countries. In regards to Mexico we're looking for participation in four of these challenges. We're setting up our participation in four of these and as Hermann mentioned we're leading one of these challenges. On the smart grid innovation challenge, as Edgar explained a little while ago that we are in the process of setting up a smart grid center for energy innovation. So we're looking at that as our vehicle for participation in these innovation challenges. And for the carbon capture something similar happens. We are currently working on a second round of our carbon capture center. And I say second round because we launched a bid for the carbon capture center last year. Unfortunately, we didn't receive the proposal that we were expecting so we're launching a second round. But that should be up and operational. As soon as it is, it would be participating actively in the carbon capture innovation challenge.

For the sustainable biofuels, we have these five clusters that come cover _____ and we're setting up their participation with this challenge and the same thing with sunlight innovation challenge through our CEMIE Sol. For the clean energy materials innovation challenge, we will be leading that jointly with the US and hoping to gain more and more countries participating in this initiative that we believe has the potential of transforming how we innovate in the clean energy technology sector. And to explain briefly what this innovation challenge is, this challenge would require a full webinar to explain comprehensively. But the goal is to accelerate the process through

which we discover new materials for energy applications so be it solar energy cell or an electrolyte for a flow battery or any other material that is required to make more efficient energy technology, we aim to accelerate it.

The discovery from first _____ and how do we aim to do this? By setting up this international consortia that integrates a series of steps that are already proven in the state of the art but have never worked jointly. I'm speaking specifically about simulation machine learning and big data processes that are widely known. So being able to model more and more alternative materials to predict properties, accelerate and connect those simulations with accelerated synthesis through robotic means using technologies that are widely deployed in the pharmaceutical industry. Also connecting this to the characterization to accelerate the characterization and looking into reaching to these materials much faster.

One of the key topics here is that we aim to have a full connection between the product engineer and the theoretical candidate that is modeling the first molecule. So if we have these working teams completely integrated we would aim to have this production line of materials that would accelerate the discovery of new materials and open the door to a set of new technologies across the board. I would hand out the rest of the time to Hermann. We have set up a website for the workshop and maybe, Hermann, you can explain a little bit on that front.

Hermann

Before we got there on the slide we have, on the slide you have on the screen just quickly as you pointed out we're moving from—can you expand? Yeah. So the figure on the top left shows the three stages that Carlos mentioned. And so, the modeling, the theoretical work and the synthesis and the characterization working in steps, that's the traditional way of doing it. We're changing now to develop a fully integrated platform that is moves from this step by step process into a loop that you see on the bottom left meaning each of the three main stages work with each other. You see machine learning throughout the process. And very importantly as Carlos mentioned, the goal of accelerating this whole process goes through applications of robotics tools into—so that we can automate some of the stages that are currently manually done especially in the synthesis and characterization of new materials to do it with robots and faster so that we meet the challenge of discovering new materials. And by an order of magnitude meaning ten times faster than it's currently done.

So with that with in Mexico if you can pull up the website of the event please so that we can show the audience. So this is again for the event. As part of this challenge we are organizing and expert workshop in Mexico City in September as I mentioned before. And this will follow the model that the US through the Department of Energy and the National Science Foundation have been promoting when they go into a new field. Carlos, I don't know if you have the website there. If not, Stephanie if you can give me control I can pull it up on the screen please.

Carlos

Hermann, we have ten seconds left for this presentation so perhaps we should move to the next presentation and maybe share the website later.

Hermann

That's fine. So ok. So that's—that makes sense. So we'll address it in the Q&A. Thank you very much.

Carlos

Thank you, Hermann.

Araceli

Thank you, Carlos. I'm delighted to talk about the PRODETES Award, the clean energy technology's prize. I would like to—I would like to start by saying that PRODETES Award is the most important clean energy prize worldwide in the terms of the amount of money awarded. In the second edition PRODETES Award offers a money back of several million dollars. First of all, let's talk about its background. So the PRODETES Award is the second component of the sustainable energy technology development project which we call PRODETES. This project is implemented with a \$16.8 million donation. This donation was negotiated by the Mexican government with the World Bank and with resources of the Global Environment Fund.

The objectives of the project are to improve institutional capacity of advanced clean technology organisms both public and private in Mexico and to foster the conversation of advanced clean energy technology by providing financial incentives to the private sectors which considered are expected to be [Break in Audio] greenhouse gases emission reduction in the future. The prize is to boost innovation and entrepreneurship in clean energy technology by supporting the best proposals in the field of renewable energy, energy efficiency, clean energy generation, storage, transmission, distribution and construction.

PRODETES project has three components. The first component is dedicated to make regional need assessments in Mexico. These regional need assessments are met with the process of how the necessities, capacities of _____ and processes for clean energy technologies in each state of Mexico. The product of these components will be useful to construct clean energy regional development plans for the country. The second component is precisely the PRODETES prize. And the third component is dedicated to the administration of the project.

This award promotes the development of clean energy technology businesses through the granting of economic incentives to innovative proposals from private sector companies, higher education institutions, research centers, researchers and multidisciplinary teams or by any of them. It is expected that the projects that compete will be viable to enter the market with successful application in the clean energy sector. The expected innovation capacity makes mechanisms for inter partnership and investment in project base in the use of clean energy technology. There are two schemes in which any can enter a proposal in the PRODETES prize. The first one is the proof of concept and prototype scheme and the second one is collaborative commercialization scheme.

The prize has three categories, gold with \$2 million, silver with \$500.00 and bronze with \$100.00. The presentation of the prize which was available last year offer one gold prize, two silver prizes and five bronze prizes. It means a total amount of \$3.5 million. In this slide, we can see the winner projects for

the first edition of their work. In the first edition of their work we have three winner projects, one gold, two silver and two bronzes. These five projects will be developed in the next two years. Now as I said the prize has to schemes, proof of concept and collaborative commercialization. The proposals that compete under the proof of concept theme can either compete alone and with partners and can go for the silver and the bronze categories. The proposals under the collaborative conversation scheme must be a group or by at least two members that can contest for the bronze, silver and the gold category. It means the three categories.

Contestants may include institutions in their proposals in order to promote international participation. The condition is that the letters of development or the work corresponds to the Mexican site. Now let's move to the second edition of the prize, the PRODETES Award 2017. The call for the prize was opened on the last day of February and we close on the last day of June. In the second edition, the stock of resources available in the prize doubled. This year we have two gold prizes, four silver prizes and ten bronze prizes which in total we have an amount of \$7 million in prizes. Each one with the same amount of money offered in the first edition of the prize as we can see on the screen.

We evaluate six main criteria in the proposals, capacity for project management, co-financing, innovation, market potential, technical feasibility and economic viability. The _____ in the first edition of the prize last year as a support to the contestant. In this edition, we have made available a business development workshop that prepares them in terms of construction of their business plan. This workshop is free for all applicants who enroll in it. The expectations that we have for the second edition of the PRODETES Prize is to obtain more proposals than in the first edition and of higher quality of course. For more information about PRODETES Prize please enter the web page premioprodetes.mx and we can see in the screen. Thank you.

Carlos

Thank you.

Stephanie

Yes. Go ahead. Thank you everyone so much for those presentations. They're wonderful. Before we jump into the question and answer portion, Hermann if you would like to talk a little bit more about the website and registration page we can. We have some time for that.

Hermann

Thank you so much, Stephanie. I think we can—let me give you just a one minute version. So you have the website on the screen. This is again this international expert workshop for the clean energy and materials challenge of Mission Innovation. And I think we should just go to Q&A Stephanie. Carlos, you wanted to say something about this or should we just answer questions now?

Carlos

No. Just wanted to thank everyone. Also thank our colleagues in Conacyt. It's very important to say that everything we do we do jointly with Conacyt. Conacyt is the national council for science and technology here in Mexico. I mentioned them throughout the presentation as the largest granter of scholarships in the country but that's not all they do. They also have a series

of different mechanisms to promote science technology development in the country including entrepreneurial funds, different sector funds so we're talking right now about the energy sector funds. They also have a series of sectorial funds for 24 actually sectorial funds like marine, army, economy, cell, agriculture. So it's a great agency to be partnered with in this. And also, today with us is the Theresa _____ from Conacyt. I don't know if you'd like to mention something.

Theresa

Well nothing except that of course we support our 24 sectorial funds and we look very much into helping, opening doors and collaborating with international organizations in terms of developing and other any type of programs that really enhances the innovation at the system. We very much care about as Carlos mentioned specific ministries, specific challenges, societal challenges, global and Mexico's challenge and nothing except supporting the activities that these particular funds carry out. And congratulations for these efforts of course.

Carlos

Thank you Theresa. And with that, we would wrap up our set of presentations. We understand that this was a lot of topics to cover so we covered all of them on a very high-level basis. But of course, right now we have the Q&A. But if there's any follow up we would also be very pleased to be approached by anyone within the audience. If you want to learn more about any or all of these initiatives we would very much enjoy that. So from our friends, Stephanie, that would be it. Thank you.

Stephanie

Wonderful. Thank you all so much for the presentations. As we shift to the question and answer session I would like to remind the attendees to please submit questions using the questions pane on the Go to Webinar toolbar at any time. We'll also keep several links up on the screen throughout for quick reference to point where to find information on other upcoming webinars and the Ask an Expert program. The first question is related to the workshop registration. We had a couple of people click the links on the website that was sent and it says registration is by invitation only. And there's also information to fields to fill out your information. Is that how to receive an invitation or is there another method to receive an invitation to the workshop?

Hermann

Yes, this is Herman. Thank you for that question. So there are two ways. So it is definitely by invitation only for those experts that will be actively participating in the discussions and panels. However, we have the option of having observers. So if you're interested in attending as an observer or in any other capacity please go ahead and register and note in your registration your, again your profile or your intention and we will get back to you. Thank you very much. So again, open for observers and students as well. Thank you.

Stephanie

Excellent. Thank you. On the most recent presentation on the PRODETES Prize winners is there—Araceli is there any information on previous winners and how they're progressing at the moment?

Araceli

At the moment, the first five projects that just won the prize the last year—in fact they were prizes in December last year. They just started the projects. They have like a month with the projects. So all we have right now is their—

let's say their administrations advance of the projects. And they have two years to finish the projects maximum.

Carlos And, I also think that the website. Does the website have the information of the leaders of the project as well as their email addresses?

Araceli No. The website doesn't have the detail of each leader or the project but does have the email which anyone can ask for information for the specific leaders for each project.

Carlos So, I think if anyone in the audience would be interested in reaching out to any of the project winners we could facilitate that. We do have some regulations here in Mexico regarding personal information and most of the participants are not public officers so they're not necessarily obligated to share their personal information. But if there's any interest we can probe with them and facilitate the contacts. We would be glad to do that.

Stephanie Wonderful. And thank you. Most of the panelists on today's webinar did have their contact information on their presentations. And as a reminder all of the presentations will be posted to the Solutions Center's training page and you'll be able to get that information there. For our next question, are there any programs that are designed to foster entrepreneurship and tech commercialization that have come out of recent activities?

Carlos I'm sorry. Can you say that again?

Stephanie Oh, of course. Are there any programs that are designed to foster entrepreneurship or tech commercialization as—

Carlos Well, our main program on that front is the PRODETES Award. We also work extensively with the CEMIEs and other initiatives through different mechanisms just at the roadmap and different courses and training sessions that we do to help them facility technology commercialization. Recently the science and technology law was also revamped. So we have a recent new addition of the science and technology law that considers a very wide array of mechanisms that facilitate technology commercialization, intellectual property for PIs and so on. And I don't know, Araceli, if you'd like to mention something on that front.

Araceli Yeah, we do. We're running right now a program for exactly that, clean energy and technology commercialization and this is a joint activity that we carry along with the national science foundation. If you are familiar by any chance with the I4 program, that is exactly what we're trying to replicate here in terms of pushing out technologies from universities and research centers and really training researchers to with the technology commercialization activities. So we ran a year ago and right now we identified five nodes, innovation nodes that include the best universities in Mexico which add 24 institutions. And we're running those five nodes right now trying to graduate if that is the word, different cohorts. Each node is running 23 teams per year, at least 23 teams.

So by coming just like a nature way those nodes we identify sectorial characteristics. We don't have one dedicated to energy but we could focus some efforts to try to address mostly energy related projects. We do have _____ industry and food industry. We have health and among the five many of the projects are related to energy. But we didn't as I said specify any particular effort for energy but we could do that if that makes sense for the fund. We just know we can do that. So we're very excited and very much looking forward to graduate at least 100 projects or entrepreneurial teams per year through this.

Stephanie

Excellent. Thank you. And on the research and development side Carlos, you had mentioned that Clean Cities is one of the priorities especially regarding air quality. Are there any actions in that area that involved waste energy programs?

Carlos

So, at the moment we're taking the first steps on that front. Last year we published the strategy. It's a very long name but it's an official documented mandated by law that is called strategies for the use of cleaner technologies and cleaner fuels, something like that. Within that strategies one of the key areas that we promoted, one of the action items that was already approved was setting up this cities' work that I mentioned. So the workshop will be the first step. We underwent the [Break in Audio] workshop. We received an array of proposals. Eventually we decided for a proposal that was presented by one of our research centers here in Mexico in collaboration with very several different research centers in Mexico, the _____ Center. There is participation from the Public Health School of Harvard University. Participation from—I can't recall but there's several organizations, MIT program on negotiation, several organizations around the world that will lead this workshop trying to understand from a very multidisciplinary point of view, meaning from a political front, economical front, technology front, social mobility, urban landscape, architecture, etcetera, where are these opportunities and research areas that we need to work?

So very likely there will be something associated to waste as you mentioned. But we will be holding the workshop in around October, November. There's still no set date. They just initiated work. And the proceedings from that workshop would be the guide that we would be using for investing in any and all of our programs so from scholarships, what type of scholarships do we want to allocate to be able to train the people that will be able to lead these efforts to capacity building within institutions to research to any of the mechanisms that we have. So we should be having this workshop later this year and learning about the outcomes later, beginning of the next year.

Stephanie

Wonderful. Thank you. The next question is about the partnerships with universities. Which criteria are used to make these partnerships and what steps are taken to ensure that the partnership with the universities is providing students with skills?

Carlos

So that's I would say like a multi-criteria analysis. I will say something first and then hand over to Hermann and Nelson to see if they want to compliment. But basically, when we partner with universities we're looking at those

universities that have the capabilities that intersect with some of our challenges. So it's not necessarily based on a ranking because a ranking wouldn't tell us anything about how a university addresses or what are the capabilities of a specific university around the specific issue. So we try to identify knowing our challenges, receiving feedback from our different agencies, industry and so on, understanding what our challenges are and learning which universities are the ones that have these capabilities.

But that is just from a technical point of view. When you negotiate interpersonal relationships for multiyear programs, there are many other factors that are at hand and one of them of course is the interest and willingness on the other side to participate. It's not enough for us to identify a university and learning that we could learn a lot from them and we can leverage their capabilities. We also need to understand how this university is going to be interested to come into the table and negotiate with us and find that mutual gains mechanisms that will help us develop the capabilities that we need but that will also help the university advance their agenda in any front.

Usually universities find a lot of interest in participating with us through attracting students. We have a very large demographic bond and we have a very generous scholarship program so we can be an asset for universities looking to diversify and increase their curriculum for Mexican students which by the way we constantly receive excellent feedback on the quality of our students. Any university that has our students constantly gives us the feedback that our students are amongst the top of their classes. But also, in regards of attracting funds and increasing the research portfolio because a lot of the research that we do with these universities involves challenges that they already have faced in the past but with very new and unique context. So this is a very enriching scenario for the research community to engage on. So again, this is a series of criteria we take into account. I don't know if Hermann and Nelson you would like to compliment that with something in particular.

Hermann

Yes. Thank you very much, Carlos. So this is Hermann Tribukait again. I just to compliment on two points you make Carlos that are really important. One is obviously matching to the higher priorities of Mexico. And you already heard what those are. And so, we try to match to the institutions around the world or in this case mainly in the US, Canada and Europe. But we're open to any institution that has, that offers the again the leading skills, the leading researchers in the world to partner with that show the interest as Carlos mentioned to negotiate and come to Mexico. So just to give an example energy efficiency is one of the top priorities that Carlos mentioned at the beginning. We just launched this energy efficiency call for proposals to work with the University of California. The reason why that is first the concept of energy efficiency was invented at the Lawrence Berkley National Lab which is part of the University of California and Barkley lab as well as Berkley UC Davis and some of the other campuses in the UC system are the leaders in a lot of these topics in the world.

So that's one criteria. The other thing is President Janet Napolitano has been to Mexico a couple of times over the last few years again promoting and showing this interest to work with Mexico. So those are just two of the key topics and the other one that is very important to mention is the quality of our students is really, really high. Mexico today graduates as many engineers as the US with one third of the population. So three times as much per capita engineering students are graduating from Mexico and we're eager to give them opportunities, the best opportunities to go into the energy sector, especially clean energy and innovation. And so, these efforts are geared to that, again, bringing those experts to Mexico to inspire them, to inform them and to give them opportunities to develop again in this area. So we welcome all questions on this and interest to partner with us. Thank you. Nelson, you want to add anything?

Nelson

Yeah. Well, thank you Hermann and Carlos and I would just reemphasize what Carlos mentioned which is the first one would be matching Mexico's interest and priorities but adding to what's been said I would like to also point out that the partnership [Break in Audio] some would be on research, other would be on training and obviously different universities have capabilities on research and training and some of them would be very specialized. For example, in the case of our partnership where working with the Oxford Institute for _____, it's research based institution and it does not do a lot of training. So we would look into that.

Also, to point out that we have engaged with most of the universities or top universities in Europe and the US for a long time. So it's not a one-off discussion. We have been inviting them over. But also, we have a large number of universities and institutions from Mexico have visited their institutions and in the case of the UK last year we held and jointly organized with UK institutions a visit with 25 different universities across the UK. So before even considering the partnership there has been a long engaging process both for Mexican institutions and in our case with the UK. So we would then carefully identify the areas and the modality of opportunities in order to discuss further. Thank you.

Stephanie

Great. Thank you so much. The next question is someone is asking for some more details on the role expected from ENEL in the clean energy innovation strategy. Could you elaborate on ENEL's role?

Carlos

Absolutely. So ENEL for those of you that don't know is the National Institute for Clean Energy and Electricity or perhaps I would say electricity and clean energy. It's an institute affiliated to the secretary of energy and is a national institute. We didn't include ENEL in this presentation given time constraints. We could set up a webinar to showcase their work but ENEL is as I said the national institute that would assist both the secretary of energy as well as industry as the general transition through these energy reforms and the new goals that we have. We didn't speak a lot about the energy reform but as a lot of you know Mexico just currently underwent the largest energy reform in its history. Pretty much the largest reform that we've seen in the past 70 plus years where mainly the result of this energy reform is that both the

hydrocarbons as well as the electricity value chains were open completely to market participation from scheme where previously they were managed exclusively by two state owned companies so Pemex on the oil and has front and CFE on the electricity front.

So now they have implementation of the energy reform, the entire electric sector except for transmission and some parts of distribution is open for investment on private participation. And ENEL is expected to facilitate the energy transition towards use of cleaner technologies. As a country, we have a goal of 35 percent of our electric energy generated by 2040—'50. I'll get back to you on that specific year, should come from clean technologies and ENEL is spearheading a lot of that work.

So they work a lot in electricity. They work a lot in different clean technologies. Perhaps not necessarily so much on the technology front as the deployment side so systems 35 by 2020—systems, etcetera and recently they are leading the efforts that we are undergoing on the storage front. They will be leading the storage workshop. They are developing an advanced storage program that just initiated recently beginning with a flow battery program, non-barium based flow battery program and many other initiatives. So I guess if possible we could host another workshop or put anyone interested in touch with ENEL for further discussions on this front.

Stephanie

Great. Thank you so much. That is the last question that we'll have time for today. If we did not get to your questions please don't worry. We'll be sending them to the panelists after we conclude. If there's anything else that you'd like to ask please type it into the question pane now. Thank you everyone so much for your participation. On behalf of the Clean Energy Solutions Center I'd like to extend a thank you to our panelists and our attendees. We very much appreciate your time and hope in return that there were some valuable insights that you can take back with you. We also invite you to inform your colleagues and those in your networks about the Solutions Center's resources, services including no cost expert policy assistance.

I invite you to check the Solutions Center website if you would like to view the slides from today and listen to a recording of today's presentations as well as any previously held webinar. Additionally, you will find information on upcoming webinars and other training events. We are also posting webinar recording to the [Solutions Center's YouTube channel](#) and allow about a week for that to be posted. Finally, I would like to kindly ask you to take a moment to complete a short survey that will appear when we conclude the webinar. And please enjoy the rest of your day and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar.