CLEAN ENERGY LEADERS ATTEND THE 2017 ASIA CLEAN ENERGY FORUM AND DEEP DIVE WORKSHOPS
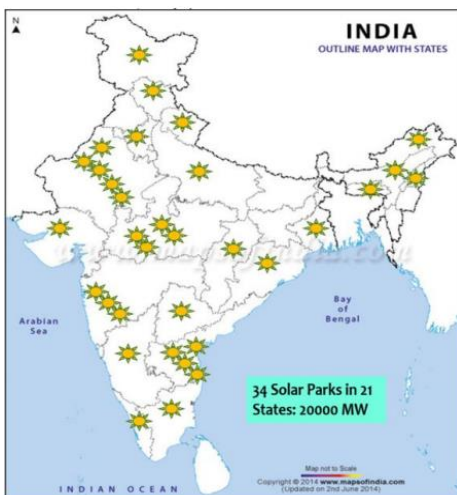
USEA/USAID SUPPORTS THE PARTICIPATION OF DELEGATES FROM UZBEKISTAN, PAKISTAN, INDIA, BANGLADESH, THAILAND, INDONESIA, VIETNAM, LAOS, AND CAMBODIA TO ATTEND THE 2017 ASIA CLEAN ENERGY FORUM AND THE PRE-FORUM DEEP DIVE WORKSHOPS

MANILA, PHILIPPINES – This year the theme of the 2017 Asia Clean Energy Forum (ACEF) was "The Future is Here: Achieving Universal Access and Climate Targets" and thousands of clean energy professionals and government officials throughout Asia gathered to present new ideas on policy, technology, and sustainability in order to achieve a future where everyone has access to clean energy. At the conference, the United States Agency for International Development (USAID) sponsored three Deep Dive pre-forum activities that focused on renewable energy grid integration, geospatial analysis of renewable energy deployment and transmission planning, and reverse power auctions to scale up renewable energy development. The Deep Dive Workshops were organized in collaboration with the National Renewable Energy Laboratory (NREL) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Around 30 clean energy stakeholders were sponsored by USAID, USEA, and Clean Power Asia (CPA) to attend these Deep Dive pre-forum activities at ACEF. The countries that were represented include Pakistan, India, Uzbekistan, Vietnam, India, Thailand, Laos, Indonesia, Bangladesh, and Cambodia.

Opening Plenary of the 2017 Asia Clean Energy Forum

PRE-FORUM DEEP DIVE WORKSHOPS

INTEGRATING GENERATION AND TRANSMISSION PLANNING TO ENABLE RENEWABLE ENERGY DEPLOYMENT

The first pre-forum activity was jointly coordinated by USAID and NREL in order to introduce an innovative way for countries to integrate large-scale renewable energy projects into the grid system through geospatial analysis of renewable energy zones (REZ). A renewable energy zones (REZ) is a geographic area characterized by high-quality, abundant renewable energy resources, suitable topography, and a strong developer interest. The REZ approach helps to speed the deployment and utilization of renewable energy while minimizing the impacts of variable renewable energy on the stability of the power system.

The deep dive began with a case study perspective from India by Kashish Bhambhani of Power Grid Corporation of India Ltd. Mr. Bhambhani explained how India has an abundance of solar and wind energy resources with over 1000 Gigawatts (GW) potential combined. The Government of India has set a target of 175 GW renewable energy installed capacity by 2022 which would account for 32% of India's generation mix. However, there are challenges to integrating such as large amount of renewable energy generation, such as the variability and intermittency affecting the load balance and voltage management. This variability affects the net load curve creating a high ramp rate at night when traditional sources of energy are needed to quickly ramp up to meet this increased energy demand in the evening. Another prevailing issue is the imbalance between the rate of renewable energy development and transmission line access. To address these challenges, India has developed their own version of renewable energy zones called "Green Energy Corridors" which align the development of renewable energy projects with the development of transmission lines, all of which are then managed by Renewable Energy Management Centers (REMCs) to forecast, schedule, and monitor renewable energy generation. So far, India has 20GW of solar energy installed in 34 different "Solar Parks" as Phase 1 of the Green Energy Corridor plan.

Nathan Lee of NREL was the second speaker who spoke on the renewable energy zones transmission process and provided a case study on Texas' Competitive Renewable Energy Zones (CREZ). According to Mr. Lee, the traditional ways approaching transmission expansion is first forecasting future demand, then developing a plan for expansion, then obtaining permits from the regulator, and finally begin constructing the transmission lines all of which can take up to 10 to 20 years to complete. Unfortunately, there is a large disparity between the time it takes to develop a renewable energy project (2-3 years) and the time it takes to construct a grid system (10+ years), which is causing a circular dilemma whereby renewable energy projects are sited in sub-optimal locations and curtailed while transmission lines face congestion. The solution is that renewable energy development should follow transmission development, and transmission development should be planned near the best renewable energy resources. Therefore, renewable energy zones provide an outline for where developers and regulators should site future transmission lines.

So what is the best way to identify these renewable energy zones? Ilya Chernyakhovskiy of NREL went through a step-by-step process of using the Renewable Energy Data Explorer (RED-E) tool in a hands-on simulation exercise where the participants used their laptops to access the RED-E tool online and identify the best renewable energy zones in Cambodia. You can check out the online tool at https://www.re-explorer.org/.

Participants practice geospatial analysis using the Renewable Energy Data Explorer (RED-E)

THE POWER SYSTEM OF TOMORROW:
PATHWAYS TOWARDS LARGE-SCALE INTEGRATION OF VARIABLE RENEWABLE ENERGY

Jacqueline Cochran of NREL

The second pre-forum activity was coordinated by USAID, NREL, and GIZ. This workshop focused on early actions that can be taken to facilitate integration of variable renewable energy into power systems. The session kicked off with an interactive game of "Who Wants to Be a Millionaire" where Jennifer Leisch of USAID posed renewable energy and grid integration questions that kept audience members engaged and on their toes. Following the game, Frank Seidel of GIZ and Niels Ehlers of 50Hertz presented on the German experience of integrating renewable energy into the grid system called "Energiewende". In Germany, wind and solar have increased dramatically due to the massive cost reduction in the price of renewable technologies that have made it highly competitive with traditional energy sources like nuclear, natural gas, and coal. Germany has a target of reaching 80% of total electricity consumption from renewables and an 80% reduction in greenhouse gas emissions by 2050. These goals are completely feasible, in fact, on April 30th 2017, 85% of the electricity load in Germany was covered by renewables and the grid system did not fail.

Jacqueline Cochran of NREL was the next speaker and she began by defining the term "flexibility" which is the ability of a power system to respond to change in demand and supply. This flexibility is needed in order to successfully integrate variable renewables into the grid system. This can be achieved by scheduling dispatch decisions closer to real-time to reduce uncertainty and ancillary services as well as improving overall forecasting of the system operation. Likewise, adding storage to the system, such as pumped hydro or thermal storage, can stabilize the net load balance and prevent load shedding. Cochran emphasized that large, agile systems are more cost-effective when integrating high quantities of variable wind and solar; this is because aggregation and geographic diversity essentially reduces variability and balance the net load.

The last speaker was Kashish Bhambhani of Power Grid Corporation of India who briefly spoke about Renewable Energy Management Centers (REMC) under the Green Energy Corridors program in India. These REMCs are equipped to manage renewable energy forecasting, scheduling, and monitoring systems on a state, regional, and national level.

Deep Dive Panelists (from left to right): Christoph Menke, Niels Ehlers, Jacqueline Cochran, Kamani Jayasekera, Kashish Bhambhani, Peerapat Vithayasrichareon, Jose Layug

REVERSE AUCTIONS TO SCALE RENEWABLE ENERGY

The third Deep Dive Workshop hosted by USAID, in collaboration with USEA, was on reverse power auctions for renewable energy development. Kristen Madler of USAID explained how renewable energy auctions have become an increasingly popular tool to incentivize renewable energy development because it creates a competitive market that can allow countries to meet their energy sector goals affordably and efficiently. Improvements in the energy sector legal and regulatory framework in addition to the commercial viability of off-takers (utilities) in developing countries is typically a core component of USAID's energy sector programming. The private sector consistently lists these factors as top barriers to investment in emerging markets. Private developers also typically favor transparent competitive procurement processes (such as auctions) over non-competitive negotiated contracts to reduce corruption in such settings. USAID has supported the development of auctions in El Salvador, Mexico, Afghanistan, and Zambia, with many more countries expressing interest and beginning the process to design their own auctions.

As the first presenter, Diala Hawila of the International Renewable Energy Agency (IRENA), provided an overview of the various methods countries have used to boost renewable energy deployment, namely Feed-in Tariffs (FITs), Feed-in Premiums (FIPs), and Reverse Auctions. Nearly 90% of the world has implemented one of these methods to reach their renewable energy targets. However, each method has its drawbacks: feed-in tariffs are costly with high deployment rates; feed-in premiums are risky to investors if an appropriate floor is not set; and, auctions have high transaction costs with risk of underbidding and delays. Of all these options, auctions have the most flexibility and can

be tailored to each country's needs. That being said, there are four factors that impact the auction price: 1) country-specific conditions, such as access to finance and resource availability, 2) investor confidence, such as credibility of off-taker, Power Purchase Agreements, past auction experiences, 3) domestic policies and incentives, and 4) auction design. All of these factors are important and must be considered when creating pre-qualification requirements, selecting the winner, and managing liabilities and risk -- as is evident from the first case study in South Africa.

Nelisiwe Magubane of Matleng Energy Solutions and former Director-General of South Africa's Department of Energy explained that the top priority for governments creating an auctions process is determining risk allocation. There must be someone who is adept at dealing with a specific risk and that a process is in place so that person is in charge of managing that risk. In South Africa, there was an energy shortage in 2008 and so the various Ministries decided to identify the gaps and blockages that were preventing energy generation. They found that there was 1) no independent buyer and procurement system in place to add on new generation, 2) a lack of equitable access to the transmission network, 3) gaps in the regulatory environment and energy legislation, 4) a lack of standard project documentation, and 5) an overall lack of government support. As

Nelisiwe Magubane of Matleng Energy Solutions presenting the South African auction experience

such, the South African government established an Integrated Resource Plan that would deploy 6GW of renewables in 3 years by using auctions as the mechanism to incentivize development. The lessons learnt from the South African experience is that the bidding process can be expensive, the documentation can be extensive, the risks can be mismanaged, and the program can be harmful to local energy businesses if not managed properly.

Alexandre Viana of Câmara de Comercialização de Energia Elétrica (CCEE) - Brazil's electric market operator – provided a reverse auction case study from the Brazilian perspective. According to Viana, the three key aspects to developing a power auction is the: 1) market design, 2) auction process, and 3) auction design. If there is not a good regulatory foundation for all three, then the auction will fail. Brazil's electricity mix consists primarily of hydropower, but in 2001 there was a severe drought that lowered all of South America's hydroelectric capacity and in 2014 there was a serious economic crisis. Thus, Brazil began the

Alexandre Viana of Câmara de Comercialização de Energia Elétrica (CCEE) presenting the Brazilian Reverse Auctions

process of integrating more renewables into the grid system. The first wind power auction was held in 2012 and the first solar PV auction in 2015. Some of the pitfalls CCEE ran across were cancelling auctions on short notice because of inadequate planning, construction delays and incomplete projects, and generation and transmission timescale mismatch. Viana concluded that there is no "one size fits all" template when it comes to creating an auction, and that countries should seek to develop its auction system based on its market design.

The last speaker, Gu Yoon Chung of Enel Green Power, presented from a developer perspective. Since 2015, Enel has won bid awards in Mexico, Brazil, Peru, Morocco, Zambia, India, Indonesia, USA, and Australia. According to Chung, auctions are preferred by developers because it creates a deadline where they have to move fast, and it provides a preview of the project and price through an offtake draft contract. From a perspective of an independent power producer (IPP), the key elements needed in auction design are 1) consistent long-term regulation that supports investment, 2) bankable contracts and clear power purchase agreement (PPA) terms, 3) defined risk allocation process, and 4) predetermined grid access and transmission planning. All four of these elements were present in the two auction case studies that Chung described in India – one for a 750MW solar PV park and the other for 250MW wind project.

The session concluded with each speaker providing the top recommendation they would suggest to any country wishing to develop an auction system.

- Ms. Hawila recommended that there needs to be a clear regulatory policy and that the auction must be designed based on the country context.

- Ms. Magubane stated that regulators and governments need to plan properly with a long-term view and clear policy directive; moreover, regulators should play a significant role in the contract management.

- Mr. Viana emphasized that the Power Purchase Agreements and contracts must be clear and bankable. He recommends that countries don't attempt to solve all problems with a single auction – take baby steps to eventually create a regular process.

- Mr. Chung suggested that governments need to engage the private sector more and not focus so much on the tariff amount. He stated that each market is different and it is important to focus on the non-price aspects of an auction because those are the factors that can significantly hinder development.

Reverse Auctions Deep Dive Panelists (from left to right): Kristen Madler, Diala Hawila, Nelisiwe Magubane, Alexandre Viana, Gu Yoon Chung

RESULTS

Based on the survey results of all three deep dives, the majority of participants were from the private sector and various government agencies. All of the surveys showed that the participants had primarily a beginner or basic knowledge of integrating variable renewable energy to the grid, while less than a third of the participants had advanced knowledge of the topics in all three deep dives. That being said, 68% of the participants in the reverse auctions deep dive stated that they are planning an auction in their respective country and would like to have more trainings or workshops on the techniques on best practices for competitive procurement and reverse auctions. 40% of the participants found that the "Setting the Scene Presentations: common grid integration myths; experiences from Germany, India, and the U.S." were the most useful, and 32% found the presentation on "Improved variable renewable energy forecasting" very useful. Furthermore, nearly 60% of the participants plan to use the information they learned from the presentations to devise or revise policies and regulations within their country. Overall, 96% of the participants found each deep dive session "useful" and "very useful".