

# Grid Integration Of Variable Renewable Energy: Innovative Solutions at the Transmission and Distribution Levels

Deep Dive Workshop, Asia Clean Energy Forum (ACEF)  
5 June 2018, 09:00-17:30  
Asian Development Bank Headquarters, Manila, Philippines

## Gain knowledge and tools to enable a clean, modern, flexible, and affordable power system

With the costs for solar and wind energy technologies continuing to fall, an increasing number of countries have shifted from planning for the integration of variable renewable energy to actually implementing changes. This Deep Dive Workshop, organized by USAID, GIZ and NREL, will draw from these experiences to provide the most up-to-date information on emerging solutions for efficiently integrating variable renewable energy to both the transmission and distribution systems. Expert speakers from diverse power systems around the world will highlight case studies and provide participants with insights on solar and wind grid integration strategies that can be adapted to power systems of any size and market structure.

## Learn how decision makers in the Asia region (and beyond!) are addressing common grid integration questions

- Which **decision support tools** are available to enable power system flexibility?
- What strategies are effective in creating an enabling environment for **thermal plant flexibility** to support solar and wind integration?
- What considerations and approaches can help policy makers understand the type, size, and location of **energy storage** to best benefit their power systems?
- How can innovative approaches to interconnection processes, compensation mechanisms, and planning address the technical challenges that arise as large amounts of **rooftop solar PV** are interconnected to the distribution system?
- What will the role of **emerging technologies** be in systems with high levels of variable RE?



## Participation is free for ACEF attendees

Registration for ACEF is a prerequisite for participation in the Deep Dive Workshop. Apart from the ACEF fee, there are no additional costs to attend this workshop. **Please indicate your participation in this Deep Dive Workshop when registering online for ACEF at**

<http://www.asiacleanenergyforum.org/registration-2018/>.

## Contact us

For the latest agenda and information, please visit the Deep Dive Workshop section of [ACEF website](#). For any other questions, please contact the organizers:

- Jaquelin Cochran ([jaquelin.cochran@nrel.gov](mailto:jaquelin.cochran@nrel.gov))
- Jennifer Leisch ([jleisch@usaid.gov](mailto:jleisch@usaid.gov))
- Kerstin Linden ([kerstin.linden@giz.de](mailto:kerstin.linden@giz.de))



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## Agenda

Time	Activity
9:00-9:20 am	<b>Opening: Welcome remarks</b> <ul style="list-style-type: none"> <li>Mr. Helmut Fischer, Executive Director for Austria, Germany, Luxembourg, Turkey and the United Kingdom, Asian Development Bank</li> <li>Ms. Carrie Thompson, Deputy Assistant Administrator, USAID Bureau for Economic Growth, Education and Environment</li> </ul>
9:20-9:45am	<b>Morning Keynote - Grid Integration and Power System Flexibility: Challenges and Trends</b> <ul style="list-style-type: none"> <li>Dr. Jaquelin Cochran, NREL</li> </ul>
9:45-10:30am	<b>Decision Support Tools to Enable Power System Flexibility</b> <i>Identify methods and tools that can help planners understand the power system-specific issues that might arise as the penetration of solar and wind on the power system grows, as well as the flexibility strategies that are most likely be cost-effective.</i>  <b>Speakers:</b> <ul style="list-style-type: none"> <li>Overview: "Grid Integration Studies and Identifying Flexibility Solutions," Ms. Jessica Katz, NREL</li> <li>Thailand case study: Dr. Peerapat Vithayasrichareon, International Energy Agency (IEA)</li> <li>Sri Lanka case study: Dr. H. M. Wijekoon and Mr. Randika Wijekoon, Ceylon Electricity Board</li> </ul>
10:30-11:00am	<b>Break</b>
11:00-11:50am	<b>Overcoming Barriers to Flexibility in the Generation Fleet</b> <i>Communicate the range of issues that policymakers will likely confront when addressing how to create an enabling policy, regulatory, and market environment for thermal plant flexibility.</i>  <b>Speakers:</b> <ul style="list-style-type: none"> <li>Overview: "Creating an Enabling Environment for Conventional Power Plant Flexibility," Dr. Peerapat Vithayasrichareon, IEA</li> <li>Germany case study: Ms. Claudia Weise, VGB PowerTech e.V</li> <li>India case study: Mr. Anjan Kumar Sinha, NTPC</li> </ul>
11:50am-12:30pm	<b>Utility-Scale Storage: If, When, What Type, How Much, and Where?</b> <i>Provide an overview of the considerations and tools that will support policymakers in making cost-effective decisions about the deployment of storage as the penetration of variable RE grows.</i>  <b>Speakers:</b> <ul style="list-style-type: none"> <li>Overview "Storage services in a high-RE power system, and the state of the industry," Ms. Jessica Katz, NREL</li> <li>Hawai'i case study: Mr. Leon Roose, Hawai'i Natural Energy Institute (HNEI)</li> </ul>
12:30-2:00pm	<b>Lunch</b>
2:00-2:30pm	<b>Afternoon Keynote - Grid Integration at The Distribution Level: Challenges and Trends</b> <ul style="list-style-type: none"> <li>Dr. Thomas Ackermann, CEO, Energynautics</li> </ul>
2:30-3:30pm	<b>Solutions to Facilitate Successful RE Integration on the Distribution System</b> <i>Support policy makers in identifying and navigating the range of institutional strategies (including policy, regulations, compensation mechanisms, and planning) that will help mitigate technical challenges (e.g., 2-way power flow, voltage control) that arise as large amounts of rooftop PV are interconnected to the distribution system.</i>  <b>Speakers:</b> <ul style="list-style-type: none"> <li>Overview: "Institutional mechanisms to enable efficient integration of rooftop PV," Dr. Jaquelin Cochran, NREL</li> <li>India case study: Mr. Jörg Gäbler, Indo-German Energy Programme, GIZ</li> <li>Hawai'i case study: Mr. Marc Matsuura, HNEI</li> </ul>
3:30-4:00pm	<b>Break</b>
4:00-5:15pm	<b>Panel: Where Do We Go from Here?</b>
5:15-5:30pm	<b>Summary, Additional Resources, and Closing</b>

## Speakers

### **Dr. Thomas Ackermann, CEO, Energynautics**

Dr. Ackermann is the founder and CEO of Energynautics, a German based consulting company active world-wide in the area of grid integration of renewables. He has over 21 years of professional experience in the field of renewable generation, and 16 years in the field of grid integration of renewables into power systems. He is active in the area of investigation and research into innovative energy solutions and dissemination of knowledge about the integration of renewable energies into existing systems around the world. In addition, he is lecturer at the Royal Institute of Technology (KTH) in Stockholm, Sweden, and frequently provides lectures on renewable grid integration at various universities around the world.



### **Dr. Jaquelin Cochran, Senior Energy Analyst, NREL**

Dr. Cochran is a Senior Energy Analyst with NREL. Dr. Cochran analyzes policies and market designs that create an enabling framework for emerging energy technologies (renewable energy, demand response, and distributed generation), with a focus on best practices for grid integration of renewable electricity. Prior to NREL, Dr. Cochran was an Assistant Professor of Natural Resource Management with KIMEP University in Almaty, Kazakhstan. She also served as a Peace Corps Volunteer for two years with the Polish Foundation for Energy Efficiency (FEWE) in Krakow. She holds a Ph.D. and M.A. from the Energy & Resources Group at the University of California at Berkeley.



### **Helmut Fischer, Executive Director for Austria, Germany, Luxembourg, Turkey and the United Kingdom, ADB**

ED Fischer joined ADB in July 2017. He has more than two decades of professional experience as a civil servant working with the German Ministry for Economic Cooperation and Development (BMZ). Prior to his assignment to ADB, he was head of BMZ's division for sustainability standards. Furthermore, he gained comprehensive expertise in development cooperation both with the private sector and with a number of ADB's regional member countries. He spent more than three years in Afghanistan as Counsellor for Development Cooperation.



### **Jörg Gäbler, Principal Advisor of the Indo-German Energy Programme, GIZ**

Mr. Gäbler is a German-American citizen with many years of experience in the Indo-German-American business culture. He has served as Principal Advisor of the Indo-German Energy Programme since March 2016. He is heading projects related to distributed solar rooftop and grid integration of variable renewable energy, distributed storage, and electric vehicle charging. Prior, Mr. Gäbler was the Managing Director of Wagner Solar, Inc., (the U.S. division of Wagner & Co, the German pioneer of solar energy system manufacturing) from 2009 through 2015. Mr. Gäbler holds a B.A. in Business Administration from Northeastern University and an M.Sc. from the TU Vienna in renewable energy technologies. His Master's thesis covered the solar thermal market of North America and involved 3 years of research and market entry preparation for Wagner Solar.



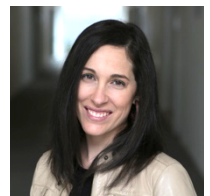
### **Jessica Katz, Decision Support Analyst, NREL**

Ms. Katz is a member of the Markets & Policy Analysis Group in the Strategic Energy Analysis Center at NREL. She coordinates and implements projects that provide technical assistance to developing countries as they transition to cleaner, more advanced energy systems. In this role, she has developed tools and trainings related to clean energy topics such as renewable energy resource assessment and the integration of significant levels of variable renewable energy to the grid. She currently leads NREL's support to the United States Agency for International Development's Clean Power Asia program and Greening the Grid initiative. She holds a B.S.E. in Civil and Environmental Engineering from Arizona State University.



### **Dr. Jennifer Leisch, USAID-NREL Partnership Manager, USAID Office Of Global Climate Change**

Dr. Leisch manages the USAID-NREL Partnership, overseeing a portfolio of clean energy integration projects. Dr. Leisch leads the USAID Greening the Grid initiative and directs agency work to account for greenhouse gas emissions reductions as a result of USAID Clean Energy programs. She holds a Ph.D. focused on renewable energy science, and she has previously worked in the research and development of advanced solar energy and fuel cell technologies.





**Marc Matsuura, Senior Smart Grid Program Manager, HNEI**

Mr. Matsuura joined HNEI in the School of Ocean & Earth Science & Technology and the University of Hawaii at Manoa in 2013 as the Senior Smart Grid Program Manager and is a founding member of GridSTART (Grid System Technologies Advanced Research Team). Prior to joining HNEI, he was with the Hawaiian Electric Company for 21 years. His career at Hawaiian Electric included positions in the areas of Transmission & Distribution (T&D) Engineering, T&D Standards and Technical Services, System Operations, Transmission Planning, Smart Grid Planning, and System Integration. Marc is a licensed professional electrical engineer in Hawaii. He holds a B.S. in Electrical Engineering and an M.B.A. from the University of Hawaii.



**Leon Roose, Chief Technologist, HNEI**

Mr. Roose is a tenured faculty member of HNEI, University of Hawaii (HNEI), where he formed and leads GridSTART (Grid System Technologies Advanced Research Team), a team of professionals focused on the integration and analysis of energy technologies and power systems, including smart grid and micro-grid applications. He served in numerous leadership roles at the Hawaiian Electric Company for 19 years prior including management of renewable energy planning and integration, smart grid planning and projects, system protection, distribution and transmission planning, generation resource planning and procurement, fuel purchase and supply to utility generating plants, and the negotiation of power purchase contracts for the utility. Mr. Roose is a licensed attorney, worked in private law practice in Hawaii, and was formerly Associate General Counsel at Hawaiian Electric. He holds a B.S. in Electrical Engineering and a J.D. from the University of Hawaii.



**Anjan Kumar Sinha, Additional General Manager, NTPC Ltd, India**

Shri A.K. Sinha is a power professional with 29 years' experience in the power business and is presently associated with Strategic Initiatives and Information Systems. He provides strategic inputs for managing NTPC's power business, technology scanning, and implementation of new initiatives. As a member of various committees set up by the Ministry of Power, he is instrumental in providing inputs for formulation of policies for facilitating renewable integration. With his in-depth technical knowledge, efficient communication, and excellent team orientation, he is facilitating the preparedness of NTPC's thermal units for flexibilization, with international cooperation. He has been an active member of the Indo-German Energy Forum (IGEF) and the USAID initiatives under "Greening the Grid". Shri Sinha has presented papers on strategies for renewable integration in international conferences. He was a speaker at COP23, Bonn, where the key issues of flexibilization of coal-based units in India was highlighted. He has worked on operations and maintenance of thermal power plants of all sizes, consultancy, and operation services. Shri Sinha has excellent academic records with bachelor's degree in Mechanical Engineering, Masters in Operations Research, and PG Diploma in Finance and Strategy.



**Carrie Thompson, Deputy Assistant Administrator, USAID Bureau for Economic Growth, Education and Environment (E3)**

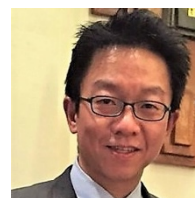
Ms. Thompson joined USAID/E3 in September 2015. She oversees the work of the Global Climate Change, Forestry and Biodiversity, Land and Urban and Energy and Infrastructure Offices, as well as the Multilateral Development Bank Team for Social /Environment Safeguards. Before returning to Washington she served as Deputy Director of USAID's Regional Development Mission for Asia based in Bangkok, Thailand, where she provided oversight on regional programs that address trans-boundary challenges such as infectious diseases, human and wildlife trafficking, economic integration and shared use of natural resources, and on bilateral programs in China, Thailand, and Laos. Ms. Thompson is a career member of the U.S. Senior Foreign Service. Additional prior assignments include Director of Program Analysis, Implementation, Communication and Outreach for E3 (2009-2011), Director for East African Affairs (2007-2009), and Program Office Director for Guatemala and Central America Programs (2001-2006). She also served in USAID missions in Peru (1997 – 2001) and El Salvador (1993 – 1997). Prior to joining USAID, she worked for the Overseas Private Investment Corporation in Washington and various international trade and finance firms.



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**Dr. Peerapat Vithayasrichareon, Energy Analyst, IEA**

Dr. Vithayasrichareon is an Energy Analyst at the System Integration of Renewables Unit at the IEA. He is leading the analysis of the challenges, opportunities and best practices for integration of variable renewable energy into the power system, covering technical, economic and institutional aspects. Prior to the IEA, he was a Senior Consultant at Intelligent Energy Systems (IES), an Australian-based energy consulting firm. Notable projects include modelling high renewables and the integration of power markets in the ASEAN region. His previous roles include a Research Fellow at the Centre for Energy and Environmental Markets (CEEM) at UNSW Australia and an engineer at the National Load Dispatch Centre in Thailand. He has led the delivery of an Australian Government funded research project which examined the impact of high renewable penetration in the Australian electricity sector. He also has experience in real-time operation of power grids and power system planning in Thailand. He holds a PhD in Electrical Engineering from the UNSW Australia, M.Eng. in Energy Economics and Planning from the Asian Institute of Technology, Thailand, and B.Eng. (Electrical) from University of Melbourne, Australia.

**Dr. Claudia Weise, Project Manager, VGB PowerTech e.V.**

Dr. Weise works as a project manager at VGB PowerTech e.V., an international technical association for heat and power generation and storage based in Germany. She is responsible for international projects ranging from technical consultancy to bilateral energy cooperation projects. The flexibility of power systems – in particular flexible power generation – has become the key topic of Dr. Weise's activities. In 1999 she started her professional career at Siemens AG as a project engineer in the field of modernization of coal-fired power plants. Since then Dr. Weise has been working in the energy sector. She holds a diploma and a doctorate in process engineering.

**Eng. Dr. H.M Wijekoon Banda, Chief Engineer (Transmission Planning), Ceylon Electricity Board**

Dr. H. M. Wijekoon received a B.Sc.Eng. degree in 1993 with first class honors from the University of Peradeniya, Sri Lanka, a M.Eng. Degree in 1998 from Asian Institute of Technology, Thailand, with outstanding academic performance, and a Doctor of Philosophy (Ph.D.) in 2005 from Nanyang Technological University, Singapore. He has more than 25 years of industrial experience in local as well as in international electricity transmission and distribution network planning, stability, and power quality studies on intermittent resource-based generation, load forecasting, protection development, and power plant interconnection design. He has published many technical papers in IEEE, IEE, and other journals and conference proceeding on voltage restoration systems, dynamic voltage restorer (DVR), renewable energy integration, and power distribution system analysis and improvements. He is presently working as the Chief Engineer (Transmission Planning) at the Ceylon Electricity Board in Sri Lanka.

**Eng. Randika Wijekoon, Electrical Engineer (Generation Planning), Ceylon Electricity Board**

Eng. Wijekoon is an Electrical Engineer in the Transmission and Generation Planning branch of the Ceylon Electricity Board, Sri Lanka. He is working on generation expansion planning, renewable energy grid integration, power sector master planning, and feasibility studies for the national utility. He obtained his bachelor's degree in Electrical and Electronic Engineering from the University of Peradeniya, Sri Lanka, and he is completing his master's degree in Power and Energy Systems, High Voltage. His areas of research include power system reliability planning, energy policy analysis, variable renewable energy, and operating reserves and renewable Energy grid integration.

**Markus Wypior, Indo-German Energy Programme (IGEN), GIZ India**

Mr. Wypior holds a degree as an economist from the University of Bonn, Germany. He has been working in various industrial and development cooperation projects in Eastern Europe, Central Asia, South Asia, and Southeast Asia. Mr. Wypior joined GIZ in 2003 as a regional manager in the Asia-Pacific department responsible for energy and environment projects. From 2005 - 2010 he was seconded to India for the implementation of the National CFC Consumption Phase-out Plan and the National CTC Phase-out Plan under the Montreal Protocol on Substances that Deplete the Ozone Layer. From 2012 – 2015 he headed the support office of the Indo-German Energy Forum in New Delhi. At present he is the Deputy Cluster Coordinator of IGEN and heads the IGEN Green Energy Corridor Project on large scale grid integration of renewable energy.



## Preparation / Additional Information for Participants

For more information and advance reading about variable RE grid integration issues, please see the resources at <http://greeningthegrid.org>.

## About the Organizers

The **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)** provides services worldwide in the field of international cooperation for sustainable development. GIZ has over 50 years of experience in a wide variety of areas, including energy and the environment, economic development and employment, and peace and security. The diverse expertise of this federal enterprise is in demand around the globe, with the German Government, European Union institutions, the United Nations and governments of other countries all benefiting from our services. The German Federal Ministry for Economic Cooperation and Development (BMZ) is the main commissioning party, but GIZ also works with the private sector, fostering successful interaction between development policy and foreign trade.

The **United States Agency for International Development (USAID)** is the lead U.S. Government agency that works to end extreme global poverty and enable resilient, democratic societies to realize their potential. USAID's work safeguards this mission and puts countries on a path to pursue clean energy growth and resilient, low-carbon development. Countries around the world are feeling the effects of climate change, from more intense heat waves, droughts, floods and storms to slower-moving changes like ocean acidification. USAID is sharing world-class knowledge, data and tools to ensure countries can predict, prepare for and adapt to change. USAID also helps countries lay the foundations for sustainable growth powered by clean energy and healthy landscapes.

The U.S. Department of Energy's **National Renewable Energy Laboratory (NREL)** focuses on creative answers to today's energy challenges. From breakthroughs in fundamental science to new clean technologies to integrated energy systems that power our lives, NREL researchers are transforming the way the world uses energy. NREL analysis informs policy and investment decisions as energy-efficient and renewable energy technologies advance from concept to commercial application to market penetration. With objective, technology-neutral analysis, NREL aims to increase the understanding of energy policies, markets, resources, technologies, and infrastructure and connections between these and economic, environmental, and security priorities.

## For any questions, please contact:

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