



**ACTION LEARNING EVENT**

# UPSCALING MINI GRIDS FOR LOW-COST & TIMELY ACCESS TO ELECTRICITY

Sheraton Hotel | Abuja, Nigeria | December 4 – 8, 2017



## REA MISSION

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The Nigerian Rural Electrification Agency (REA), set up by the Federal Government of Nigeria (FGN) with the primary objective of increasing electricity access to rural and underserved communities has developed the off-grid electrification strategy. Part of this strategy is to fast track some of its development initiatives towards achieving the overall objective of the FGN Economic and Recovery Growth Plan (ERGP) and the Power Sector Recovery Programme (PSRP). The 2017 – 2020 ERGP sets out to increase power generation by optimizing operational capacity and creating an enabling framework for small scale renewable projects, and other distributed power solutions. Mid term, the ERGP aims to optimize the delivery of at least 10,000 MW of operational capacity by 2020 by optimising the existing installed capacity available for generation.

# CONTENTS

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Mini Grids: The Global Context.....	1
Mini Grids: Nigeria .....	2
Agenda .....	4
Program Descriptions .....	12

Notes

## ESMAP MISSION

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The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance program administered by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, the European Commission, Denmark, Finland, France, Germany, Iceland, Italy, Japan, Lithuania, Luxemburg, the Netherlands, Norway, The Rockefeller Foundation, Sweden, Switzerland, and the United Kingdom, as well as the World Bank.

The Participants' List and available presentations will be posted online after the event has concluded at:  
[http://esmap.org/action\\_Learning\\_Minigrids\\_Abuja\\_2017](http://esmap.org/action_Learning_Minigrids_Abuja_2017)

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# MINI GRIDS | THE GLOBAL CONTEXT

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Mini grids are expected to play a critical role in meeting the United Nation's Sustainable Energy for All (SE4ALL) goal of universal energy access by 2030. According to IEA, an estimated 40% of the world's poor live in villages that are typically too remote to be feasibly reached via grid extension in the near term. This is particularly true in Sub-Saharan Africa and developing Asia, where most of the population is expected to be in rural areas for the foreseeable future. For these areas, for a variety of technical and financial reasons, mini grids are a practical alternative.

As a result, mini grids are one of the main High Impact Opportunities within the SE4ALL initiative. They are also a priority in most of the SE4ALL Action Agendas under development in Africa.

In the past, the development of mini grids was constrained by several factors: gaps in policies and regulations, a lack of long-term financing, and a lack of capacity or interest among power producers. Now, technological and institutional innovations and cost reductions have made mini grids an attractive option. Mini grids are emerging as a viable option for meeting the energy demand in Sub-Saharan Africa, and South and East Asia.

However, a lack of knowledge and exposure to global best practices continues to create policy and commercial barriers that hold back the expansion of sustainable mini grids.

In response, several initiatives have been launched to address these challenges. The Climate Investment Fund's (CIF) Clean Technology Fund (CTF) and the Scaling-Up Renewable Energy Program in Low-Income Countries (SREP) are supporting the scaled-up demonstration and deployment of renewable energy in middle- and low-income countries. A series of projects supporting clean energy mini grids—based on renewable energy technologies, including storage in systems with variable renewables or renewable energy-diesel hybrid systems—have been approved and are in startup phases, while others are in the pipeline.

ESMAP at the World Bank—leveraging the core funding from DFID—has initiated a Global Facility for Mini Grids to accelerate the pace of electrification to large groups of people. The facility will mainstream least cost mini grids into World Bank Group operations as well as develop the policy- and business-relevant knowledge and data needed to accelerate mini grid deployment. For more information, see Annex A.

The objective of this event is to bring these initiatives/programs and related stakeholders together to discuss key issues for each of the stakeholder groups and seek solutions/action plans for these to accelerate the uptake of mini grids for low cost and timely access to electricity services in African and Asian countries. Beyond the group specific outcomes, it is envisioned that the overall lessons generated through the event will inform future efforts in the global mini grid sector on how to effectively scale up. A facilitator ensures that a process of action learning is established and continued, following up on earlier similar events in Kenya and Myanmar.

# MINI GRIDS | NIGERIA

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**The Federal Government of Nigeria (FGN) aims to make reliable electricity available to 75% of the population by 2020, and 90% by 2030, with at least a 10% share of renewable energy by 2025.**<sup>1</sup> The FGN intends to take a comprehensive approach to extending access through grid extension and off-grid expansion.

At present, 80 million people lack access to grid electricity, with the national electrification rate at 58% and only 41% in rural areas.<sup>2</sup> Most of the unserved people live in rural areas, and rely on candles and flashlights for lighting. To achieve universal access to electricity by 2030, Nigeria would need to connect more than 1 million households per year and add roughly 25 GW to its power generation capacity.<sup>3</sup>

**Implications for mini grids.** The implication is that for activities in the off-grid areas significantly more emphasis on mini grids and stand-alone off-grid solutions need to be provided. Without this shift, it will be difficult to serve households and commercial customers in a timely manner.

**Rural Electrification Fund.** To support FGN's rural electrification strategy outlined in the Rural Electrification Strategy and Implementation Plan (RESIP), the Rural Electrification Agency (REA) has been authorized to establish a Rural Electrification Fund (REF) to help finance rural electrification expansion in Nigeria. The REF has a legal mandate to promote "fast and cost-effective expansion of electricity access in un-electrified rural areas evenly across the different geopolitical zones in Nigeria" through both off-grid and on-grid electrification solutions.

**Mini grid potential in Nigeria.** To assess the potential for mini grids as a rural electrification solution, the Ministry of Power, Housing and Works, with support from GIZ, collected geo-referenced data on population clusters and load centers. This analysis indicates an estimated 8,000 potential load centers that are suitable for mini grids. At least 8 companies are developing mini grids with a pipeline of over 1,000 projects and large multinational companies have also shown interest in developing mini grids in Nigeria. Local companies that have large power requirements, such as telecom and agricultural service companies, are an additional set of prospective mini grid developers.

**Nigeria has approved a regulatory framework for mini grids.** The Nigerian Electricity Regulation Commission (NERC)<sup>4</sup> completed its public consultations for the draft regulation in December 2016 (the World Bank reviewed the draft and provided comments). NERC then revised the regulations based on the public consultation, and its board approved the final regulation for mini grids in March 2017. The regulation will be published in the FGN's Official Gazette in 2017.

The latest mini grid regulatory framework defines a mini grid as "any electricity supply system with its own power generation capacity, supplying electricity to more than one customer and which can operate in isolation from or be connected to a Distribution Licensee's network" with a generation capacity of between 100kW and 1MW.

The regulatory framework aims to accelerate electrification in areas without existing distribution networks ("unserved areas") and areas with an existing but poorly electrified or non-functional distribution grid ("underserved areas") by attracting participation of private sector, communities, and nongovernmental organizations in achieving nationwide electrification.

The regulations take several important steps towards creating a more favorable environment for private sector investment in mini grids. They enable mini grid developers to set cost-reflective tariffs, and they

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<sup>1</sup> National Electric Power Policy (NEPP) 2001 and Rural Electrification Policy 2005; cited in Rural Electrification Strategy and Implementation Plan (RESIP) 2016 prepared by the FMP and approved by the President.

<sup>2</sup> 2015/16 Living Standards Measurement Study (LSMS) by the Nigerian National Bureau of Statistics and the World Bank Group.

<sup>3</sup> To achieve 30 GW of installed capacity per Nigeria's Vision 2020.

<sup>4</sup> Nerc.gov.ng

set out options for previously isolated mini grids when the main grid arrives, which include selling the distribution assets to the Distribution Company (DisCo) and converting to an Independent Power Distributor. The regulations also streamline a variety of regulatory processes, including when developers need to apply for a license (capacity above 100kW) and options for “regulation by contract” in which developers enter into bilateral or trilateral agreements directly with communities and local governments. These first-generation mini grid regulations may require additional updates as the sector develops and NERC receives feedback from developers.

### Key Issues: Nigeria

**Strong World Bank Support.** The World Bank is working with the Government of Nigeria to develop a new five-year project: Nigeria Electrification Project (NEP). World Bank project approval is expected in April 2018. The NEP will be implemented by the Rural Electrification Agency.

The World Bank’s contribution for NEP is expected to be \$350 million, of which about \$150 million would be allocated to mini grids. Mini grids developed under NEP are expected to serve 200,000 households and 50,000 local enterprises. The project is nationwide in scope, with early activities expected in Niger, Plateau, Kaduna, and River states.

**Development Modalities.** The component will be implemented under a market based approach. Private firms are expected to develop mini grids, with subsidies from REA. It is expected that about 1,200 mini grids will be developed under the project. The subsidies will be provided in two ways:

- 1 | **Kickstart: Bid for subsidies for selected sites.** For a large number—currently set at 200—selected potential sites, REA will invite private firms to bid for minimum subsidies they require to deliver electricity services on a commercial basis. This is intended to kick-start the deployment of mini grid projects by increasing the deal size, aiming to attract some of the international private developers to enter this market in Nigeria.
- 2 | **Expansion: Pre-set performance-based subsidies.** REA will provide performance-based grants to mini grid operators, focusing on installed capacity (\$/kW), new connections (\$/end user), or a combination of both, to bridge the affordability gap for a large portion of potential end users. The performance-based grants will benefit an estimated 1,000 mini grids and 430,000 end users.

**Productive Uses and Collaboration.** The presence of productive loads is important for the commercial operation and long-term sustainability of mini grids. Thus, the proposed project seeks to identify synergies with World Bank-assisted agricultural programs, such as the Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project, and the Fadama III Project, to identify agricultural load centers.

**Technical Specifications.** Solar hybrid systems (i.e., solar generation with battery storage and diesel back-up) will be the focus. Other renewable technologies will be considered on a case-by-case basis. The mini grids will be built to Nigeria’s grid code standard to facilitate future integration with distribution companies (per the approved NERC regulations for mini grids). These hybrid mini grids can be rolled out quickly because the physical generation and distribution infrastructure components, as well as the skills to install them, are already available in Nigeria. Prepaid metering and Pay-As-You-Go (PAYG) systems will be required to mitigate revenue collection risk and enhance the bankability of the mini grid subprojects.

**Regulation and Tariffs.** The Rural Electrification Policy specifies that the tariffs for rural electricity service will be cost reflective. Projects below 100kW must register with NERC, but obtaining a permit is optional and enables the mini grid developer to be compensated for its assets if the main grid arrives, but subjects the developer to the same tariff regulations as larger mini grids. Tariffs are calculated by NERC using a tariff model that is specifically designed for mini grids, taking into account the expected costs of mini grids. If the tariff level exceeds the one set by NERC, an exemption can be provided as long as willingness-to-pay can be demonstrated from the community to be served by the mini grid.

# AGENDA

## Prologue. Mon, Dec 4 | HOMER<sup>®</sup> Pro Training

Room: Ballroom 1

TIME	SESSION	SPEAKERS
9.00-5.00	<b>Demonstration and Training Class (breaks will follow main event)</b>	<b>Peter Lilienthal</b> , CEO, HOMER Energy
	<ul style="list-style-type: none"><li>The <b>Hybrid Optimization Model for Multiple Energy Resources</b> (HOMER Pro) software simulates and optimizes the design of hybrid power systems. It analyzes a wide variety of possible system designs to find the least-cost system that meets the site's load requirements given its local resources and prices.</li></ul>	

## Prologue. Mon, Dec 4 | Green Mini Grid Africa Country Coordination

(Invitation Only)

Room: Bibian A

TIME	SESSION	SPEAKERS
7.30	Registration	
9.00	<b>Welcome &amp; Opening Remarks</b>	<b>Steven Hunt</b> , Sr. Energy Innovation Advisor, DFID-UK <b>Jon Exel</b> , Lead for Global Facility on Mini Grids, World Bank
9.30	<b>Role of Green Mini Grids in Nigeria's National Energy Plan</b>	<b>Damilola Ogunbiyi</b> , Managing Director, Rural Electrification Agency
9.45	<b>GMG Tanzania: Status, Learnings, and Issues</b>	<b>Dr. Richard Hosier</b> , Task Team Leader, Tanzania Energy, World Bank
10.45	COFFEE BREAK	
11.00	<b>GMG Kenya: Status, Learnings, and Issues</b>	<b>Chair: Sabita Thapa</b> , DFID <b>Speakers:</b> <b>Rita Laibuta</b> , AFD GMGs Supervision Consultant <b>Joyce DeMucci</b> , GMGs Kenya Managing Entity Team Leader, IED
12.00	LUNCH	
1.15	<b>Other DFID GMG Support: Tour de Table</b> <ul style="list-style-type: none"><li>How is your program trying to address the barriers to mini grid deployment, what have you learned and what is the status?</li><li>What gaps or opportunities in your project do you think that another GMGs project or facility might help address?</li></ul>	<b>Chair: Steven Hunt</b> , Sr. Energy Innovation Advisor, DFID-UK <b>Speakers:</b> Participating Program Managers
2.15	<b>GMGs Regional Facility: Status, Learnings, and Issues</b> <ul style="list-style-type: none"><li>Country Packages of Support</li><li>Market Development Program</li></ul>	<b>Chair: Mansoor Ahmed</b> , DFID Africa Regional Department Mini Grids Lead <b>Speakers: Jeff Felten</b> , GMG MDP Program Officer, AfDB
3.15	COFFEE BREAK	
3.30	<b>Action Learning, Knowledge, and Exchange: Status, Learnings, and Issues</b> <ul style="list-style-type: none"><li>Mainstreaming Best Practice: Research, Learning, and Public Goods</li></ul>	<b>Chair: Steven Hunt</b> , Sr. Energy Innovation Advisor, DFID-UK <b>Speaker: Jon Exel</b> , Lead for Global Facility on Mini Grids, World Bank
4.30	<b>Joint Session with SREP Attendees</b>	<b>Steven Hunt</b> , DFID-UK <b>Zhihong Zhang</b> , CIF/SREP
5.30	Networking and Partnering Event with Private Sector	Outside Ballrooms



## Prologue. Mon, Dec 4 | Scaling Up Renewable Energy Program Countries

### Roundtable

(Invitation Only)

Room: Tamarind A&B

TIME	SESSION	SPEAKERS
7.30	Registration	
08.30	Welcome	<b>Zhihong Zhang</b> , Sr. Program Coordinator (CTF and SREP), Climate Investment Funds
9.00	<b>Overview of SREP Support to Mini Grids</b>	<b>Rafael Ben</b> , Energy Specialist, CIF
9.20	<b>Status Updates on:</b> <ul style="list-style-type: none"> <li>• Ghana</li> <li>• Haiti</li> <li>• Honduras</li> <li>• Kenya</li> <li>• Liberia</li> <li>• Maldives</li> <li>• Mali</li> <li>• Rwanda</li> <li>• Uganda</li> </ul>	<b>Seth Mahu; Henry Vanderpuye</b> <b>Nicolas Allien</b> <b>Mario Cardona</b> <b>Tom Maruti; Roland Ketter</b> <b>Stephen Potter; Omar Al Sherif</b> <b>Hussain Hameem; Aishath Zuha</b> <b>Aminata Thera; Mamadou Ouattara</b> <b>Peace Kaliisa</b> <b>Henry Semaganda</b>
12.30	<b>LUNCH in ballrooms 3 and 4</b>	
1.30	<b>Deep Dive Discussions:</b> <ul style="list-style-type: none"> <li>• Regulations and Tariffs</li> <li>• Financing</li> <li>• Creating Demand</li> <li>• Technology Costs</li> <li>• Institutional Set Up and Ease of Doing Business</li> <li>• Capacity Building / Training</li> <li>• Role of the Private Sector</li> <li>• Grid Expansion</li> <li>• Procurement and Contract Management</li> <li>• Challenges to Project Implementation</li> </ul>	<b>Facilitators:</b> <b>Rafael Ben, CIF; Sailas Nyareza, CIF</b>
4.00	<b>COFFEE BREAK</b>	
4.30	Joint Session with GMG-Africa Adjourn at 5:30pm	<b>Steven Hunt</b> , DFID-UK <b>Zhihong Zhang</b> , CIF <b>Jon Exel</b> , World Bank

## Prologue. Mon, Dec 4 | Private Sector Forum

Room: Ballroom 2

(Invitation Only)

TIME	SESSION	SPEAKERS
1.00	Registration	
1.30	<b>Welcome: Business Environment and Role of Private Sector Developers in Nigeria</b>	<b>Damilola Ogunbiyi</b> , Managing Director, Rural Electrification Agency
	<b>Facilitated Q&amp;A</b>	
2.00	<b>Mini Grid Industry Organizing for Impact</b>	<b>Sam Slaughter</b> , Powergen <b>Rik Wuts</b> , Powerhive Africa Mini Grid Developers Association (AMDA)
3.15	<b>COFFEE BREAK</b>	
3:45	<b>Mini Grid Private Sector in Nigeria: Challenges and Coordination</b>	<b>Segun Adaju</b> , Renewable Energy Association of Nigeria
	<b>Facilitated Q&amp;A</b>	
5:00	Closing Remarks and Adjourn	Rik Wuts
5:30	Networking and Partnering	Outside Ballrooms

(Open)

TIME	SESSION	SPEAKERS
8.00	REGISTRATION	
9:30	<b>Welcome &amp; Opening Remarks</b>	<b>HE Babatunde Fashola, SAN</b> , Minister for Power, Works & Housing
9.45	<b>Overview of Off-Grid Opportunities and Challenges in Nigeria</b>	<b>Damilola Ogunbiyi</b> , Managing Director, Rural Electrification Agency <b>Rachid Benmessaoud</b> , Nigeria Country Director, World Bank
10.00	<b>PRESS EVENT &amp; COFFEE</b>	
10.30	<b>Creating and Enabling Environment: Regulatory Landscape in Nigeria</b>  <b>Moderator: Adam Kendall</b> , McKinsey	<b>Panelists:</b> <b>Dafe Akpeneye</b> , Nigerian Electricity Regulatory Commission <b>Faruk Yusuf Yabo</b> , Ministry of Power, Works and Housing <b>Olusegun Odunaiya</b> , Havenshill Synergy <b>John Alonge</b> , Ministry of Environment
11.45	<b>Private Sector: Ease of Doing Business</b>  <b>Moderator: Amaka Okechukwu</b> , Private Sector Specialist, World Bank	<b>Panelists:</b> <b>Adeshina Emmanuel</b> , Nigerian Investment Promotion Council <b>Jumoke Oduwale</b> , Presidential Ease of Doing Business Committee, Office of the Vice President <b>Mohammed Mijindadi</b> , GE Gas Power Systems <b>Ifeanyi Orajaka</b> , CEO, GVE
1.00	<b>LUNCH</b>	
2.00	<b>Access to Finance</b>  <b>Moderator: Philip Osafo-Kwaako</b> , McKinsey	<b>Panelists:</b> <b>Andre Hue</b> , Deputy Country Director, French Development Agency (AFD) <b>James Lykos</b> , USAID <b>George Ogbonnaya</b> , First City Monument Bank <b>Wiebe Boer</b> , ALLOn <b>Jon Exel</b> , Task Team Leader, Nigeria Rural Electrification Project, World Bank
3:00	<b>Engaging with States</b>  <b>Moderator: Muhammad Wakil</b> , World Bank	<b>Panelists:</b> <b>Mustapha Lemu</b> , Niger State <b>Rev. James Olugbebi</b> , Ogun State <b>Balaraba 'Barbara' Aliyu</b> , Kaduna State <b>David Jaafaru Wuyep</b> , Plateau State
4.15	<b>COFFEE BREAK</b>	
4.30	<b>DisCos: Opportunities for Collaboration</b>  <b>Moderator: Rahila Thomas</b> , Country Director, Energy Market and Rates Consultants	<b>Panelists:</b> <b>Sanusi Ohiare</b> , Executive Director, Rural Electrification Fund, Rural Electrification Agency <b>Baba Umara Mustapha</b> , Yola Disco <b>Yusuf Usman</b> , eN Africa <b>Umar Hashidu</b> , Kano DISCO  <b>Lawal Lawal</b> , Kaduna Disco <b>Chigoziri Egeruoh</b> , Port Harcourt Disco <b>Bola Odubiyi</b> , Abuja Disco
5:30	<b>Closing Remarks</b>	<b>Sanusi Garba</b> , Vice Chairman, NERC <b>Jon Exel</b> , World Bank
6:00	Reception	Pool Area

## Day 2. Wed, Dec 6 | Global Mini Grid Technical Conference Room: Ballrooms 1&2

(Open)

TIME	SESSION	SPEAKERS
8.00	REGISTRATION	
9.00	<b>Opening Remarks</b>	<b>Louis Edozien</b> , Permanent Secretary to the Ministry of Power, Works and Housing <b>Mac Cosgrove-Davies</b> , Global Lead Energy Access, World Bank
9.15	<b>Frontier Developments in Mini Grids</b>	
	<ul style="list-style-type: none"> <li>Geospatial Planning</li> </ul>	<b>Prof. Ignacio Perez Arriaga</b> , MIT, Geospatial Planning
	<ul style="list-style-type: none"> <li>Scaling Successful Mini Grid Programs</li> </ul>	<b>Farazana Rahman</b> , IDCOL
	<ul style="list-style-type: none"> <li>Cost Reductions - Benchmark Cost Study</li> </ul>	<b>Pol Arranz</b> , Trama TecnoAmbiental
	<ul style="list-style-type: none"> <li>Regulatory Framework</li> </ul>	<b>David Ehrhardt</b> , Castalia
10.30	<b>COFFEE BREAK</b>	
10.45	<b>PARALLEL CLINICS</b>	
	<b>Clinic 1   Demand Creation and Productive Uses (Tamarind A&amp;B)</b>  <b>Moderator: Sam Duby</b> , TFE Consulting <b>Expert: Sam Slaughter</b> , Powergen	<b>Panelists: Emily Moder</b> , SteamaCo; <b>Geoffrey Mburu</b> , Renewable World East Africa; <b>Mwakahesya Lutengano</b> , Husk Power; <b>Millicent Lewis-Ojumu</b> , UNOPS - Sierra Leone
	<b>Clinic 2   Workable Regulations (Ballroom 1)</b>  <b>Moderator: Ashley Brown</b> , Harvard University <b>Expert: Chris Greacen</b> , Mini Grid Consultant	<b>Panelists: Rik Wuts</b> , Powerhive; <b>David Ehrhardt</b> , Castalia Strategic Advisors; <b>Dafe Akpeneye</b> , Commissioner, NERC; <b>Bola Odubiyi</b> , Abuja Distribution Company, <b>Anastas Mbawala</b> , former Tanzanian Regulator
	<b>Clinic 3   Access to Finance (Ballroom 2)</b>  <b>Moderator: Subodh Mathur</b> , WB Consultant <b>Expert: Mac Cosgrove-Davies</b> , World Bank	<b>Panelists: Krishnan Raghunathan</b> , MIT Sloan Business School; <b>Farzana Rahman</b> , IDCOL; <b>Austin Egwuche</b> , Bank of Industry; <b>Okenwa Anayo Nas</b> , Nayo Tropical Technology Ltd.; <b>Josh Bushinsky</b> , Micorgrid Investment Accelerator; <b>Wiebe Boer</b> , AllOn
12.30	<b>LUNCH</b>	
1.30	<b>PARALLEL CLINICS</b>	
	<b>Clinic 4   Technology and Costs (Ballroom 1)</b>  <b>Moderator: Shashi Buluswa</b> , The Institute for Transformative Technologies <b>Expert: Pol Arranz</b> , TTA	<b>Panelists: Mir Islam</b> , EM-ONE; <b>Hasna Khan</b> , The Institute for Transformative Technologies; <b>Stephen Doig</b> , RMI; <b>Carlos Mir</b> , NESP Advisor on Rural Electrification
	<b>Clinic 5   Geospatial Planning (Tamarind A&amp;B)</b>  <b>Moderator: Prof. Ignacio Perez Arriaga</b> , MIT <b>Expert: Dami Sonoiki</b> , eHealth Africa	<b>Panelists: Peter Lilienthal</b> , HOMER; <b>Yann Tanvez</b> , World Bank; <b>Rik Wuts</b> , Powerhive
	<b>Clinic 6   Community Engagement (Ballroom 2)</b>  <b>Moderator: Jechoniah Kitala</b> , Practical Action <b>Expert: Srishti Sehgal</b> , Quick Sand	<b>Panelists: Geoffrey Mburu</b> , Renewable World East Africa; <b>Patrick Tolani</b> , CESEL; <b>Kabir David</b> , Quick Sand
3.15	<b>COFFEE BREAK</b>	

## Day 2. continued

### 3.45 PARALLEL CLINICS

#### Clinic 7 | Taking Mini Grids to Scale Sustainably (Ballroom 1)

**Moderators:** Ekaterina Grigoryeva, World Bank  
**Expert:** Dr. Ibrahim Salau, Environmental Accord

**Panelists:** Patrick Schroeder, Green Transformations, Institute of Development Studies; **Farzana Rahman**, IDCOL; **Lillian Rushaigo**, Renewable Energy Performance Platform (REPP)

#### Clinic 8 | Capacity Building/Training (Ballroom 2)

**Moderator:** Felix Nitz, Winrock  
**Expert:** Bulent Bicer, Arizona State University

**Panelists:** Viviane Mike-Eze, Schneider Electric; **Stephen Awoyele**, AHK Vocational Training Project; **James Lykos**, USAID; **Sharon Kaburuk**, GIZ Nigerian Energy Support Program; **Sunday Ikumonesan**, Arnergy Solar; **Kunle Oyenusi**, National Power Training Institute of Nigeria; **Kashim Abdul Ali**, COREN

#### Clinic 9 | Institutional Set Up (Auctions) (Tamarind A&B)

**Moderator:** Steven Hunt, DFID  
**Expert:** Emily McAteer, Odyssey Energy Solutions

**Panelists:** Nico Peterschmidt, Inensus; **Carlos Mir**, NESP Advisor on Rural Electrification; **Sam Slaughter**, Powergen; **Emma Miller**, Shell Foundation

#### Clinic 10 | Private Sector Joint Ventures (Acacia A&B)

**Moderator:** David Ehrhardt, Castalia Strategic Advisors  
**Expert:** Ifeanyi Orajaka, GVE

**Panelists:** Ifeanyi Odoh, Schneider Electric; **Rik Wuts**, Powerhive; **Mwakahesya Lutengano**, Husk Power

5:30 Wrap Up and Adjourn

**Steven Hunt**, DFID; **Damilola Ogunbiyi**, Managing Director, Rural Electrification Agency

## Day 3. Thurs, Dec 7 | Nigeria Mini Grid & Off-Grid Electrification Clinics

(Invitation Only)

Rooms: Ballroom 1&2

TIME	SESSION	SPEAKERS
9.00	REGISTRATION	
9.30	<b>Opening Remarks &amp; Overview</b>	<b>Damilola Ogunbiyi</b> , Managing Director, Rural Electrification Agency <b>Jon Exel</b> , Task Team Leader, Nigeria Rural Electrification Project, World Bank
10.00	<b>PARALLEL CLINICS</b>	
	<b>Clinic 1   Unlocking Barriers to Large Scale Deployment of Mini Grids (Ballroom 1)</b>	<b>Moderator: Steven Doig</b> , Rocky Mountain Institute (RMI)
	<ul style="list-style-type: none"> <li>What financing mechanisms will allow mini grids to scale?</li> <li>What are the biggest opportunities to reduce cost of power from mini grids?</li> <li>What is required for mini grids to achieve commercial viability?</li> <li>What is the role of demand stimulation in supporting large-scale deployment of mini grids?</li> </ul>	<b>Panelists:</b> <b>Lolade Abiola</b> , Rural Electrification Agency <b>Ashish Shrestha</b> , World Bank
	<b>Clinic 2   Unlocking Barriers to Large-Scale Deployment of Individual Solar Systems (Ballroom 2)</b>	<b>Moderator: Leigh Vial</b> , Consultant, World Bank
	<ul style="list-style-type: none"> <li>What are the significant constraints to rapid scale?</li> <li>What regulatory changes are the most important?</li> <li>What are the best ways to apply financial support to reach more people?</li> <li>What are the best ways to enable solar home system companies to reach challenging areas?</li> </ul>	<b>Speakers:</b> <b>Besnik Hyseni</b> , World Bank <b>Timothy Shekarau</b> , Rural Electrification Agency
12.00	<b>LUNCH</b>	
1.00	<b>Clinic 3   Funding Nigeria's Off Grid Strategies (Ballroom 1)</b>	<b>Moderator: Kelly Carlin</b> , RMI
	<ul style="list-style-type: none"> <li>How can we coordinate different funders and types of financing into more platform-based finance?</li> <li>How can we ensure that investors and financiers are keeping commitments (e.g., local job creation, ethical working conditions), and that donors are consistently acting in the best interest of Nigeria/REA?</li> </ul>	<b>Panelists:</b> <b>Godfrey Osamuyi Ogbemudia</b> , European Union <b>Ebi Clark</b> , Central Bank of Nigeria <b>Heidi Ijomah</b> , IFC
	<b>Clinic 4   Energizing Education (Ballroom 2)</b>	<b>Moderator:</b>
	<ul style="list-style-type: none"> <li>What can we do to promote a successful bidding process?</li> <li>What can we do to ensure sustainable projects, e.g. on-going O&amp;M?</li> <li>How can we apply lessons learned from other solar IPP projects?</li> <li>How to sustainably allocate power and energy within the universities?</li> </ul>	<b>Panelists:</b> <b>James Sherwood</b> , RMI <b>Anita Otubu</b> , Rural Electrification Agency <b>Mac Cosgrove-Davies</b> , World Bank
	<b>Clinic 5   Energizing Economy (Ballroom 3)</b>	<b>Moderator: Eric Wanless</b> , RMI
	<ul style="list-style-type: none"> <li>What needs to be done to make Energizing Economies attractive to developers?</li> <li>What are the barriers to unlocking additional financing for this program? How should they be addressed?</li> <li>Is there regulatory uncertainty or other barriers that would prevent this program from being successful?</li> <li>What are the risks and benefits associated with interconnecting with the adjacent distribution grids?</li> </ul>	<b>Panelists:</b> <b>Ubani Nkaginieme</b> , Total Support Energy <b>Habeeb Alebiosu</b> , Vista Advisory <b>Uche Honah</b> , Rural Electrification Agency <b>Farouk Bello</b> , World Bank Consultant
2.45	Move Back to Ballroom 1&2	
3.15	Report Back from Clinics	
3.45	Closing Remarks and Adjourn at 4:00	<b>Damilola Ogunbiyi</b> , REA; <b>Jon Exel</b> , World Bank
5.00	Networking/Reception	Outside Ballrooms



### Bisanti | Solar Mini-Grid

Bisanti is a landlocked community located in Katcha Local Government Area of Niger State, Nigeria. The Community is approximately one hour away from the heart of Minna (off Maraya junction, Minna/Bida Road) and about 20 minutes away from Bida. Bisanti has agriculture and small commercial activities as its prevailing economic drivers. The community has an estimated population of about 200 houses. The community is serviced by a school, health center, corps members abode, a security post (local vigilantes), and mosques as social amenities, but there is no mobile telephony service to the village. The predominant means of transportation is by foot or motorbikes. A handful of the inhabitants have access to electricity through petrol-powered generators while the rest rely on kerosene lamps, candle lamps, firewood, etc. The major challenge facing economic development is the

lack of electricity access for residential and commercial activities, especially for the processing of agro-products before taking them to the market.

In July 2015, GVE Projects, Ltd., in collaboration with the Bank of Industry Nigeria (BOI)/United Nations Development Program (UNDP) and the Institute of Electrical Electronics Engineers (IEEE), announced the implementation of a 37.8 kWp PV solar-based mini-grid pilot project. Aimed at field-testing the technical and commercial viability of adopting renewable energy for off-grid rural electrification, the project was completed in three months. Sixty direct and indirect jobs were created during the course of implementation and generated an estimated N2.75 million (US\$13,000.00) in wealth in the beneficiary community through construction, survey, labor, and other related expenditures.

The project is estimated to offset about 365.2 metric tons of CO<sub>2</sub> annually in the community, thereby preserving the natural environment while enhancing the living standards of the inhabitants. Additionally, local residents were trained to oversee the daily operation of the site post-implementation, which has led to the sustainability of the project. The project currently serves 200 households (approx. 1,600 people, at 8 persons per house) and utilizes a pay-as-you-go platform.

Other project impacts include:

- 22 street lighting points added along the main street of Bisanti Community
- Enhanced security at night
- Extended business operating hours
- 50% reduction in energy-related expenditures
- Children use street lighting points to study/play at night
- An additional 300 people indirectly benefit from the street lighting component

**Execution Agency:** N/A  
**Development Partner:** United Nations Development Program (UNDP)  
**Technical Consultant:** N/A  
**Project Cost:** \$250,000 - 90% from Bank of Industry Nigeria (equity and debt financing), 10% from IEEE (grant)  
**Location:** 9.19° N, 6.12° E

Kperegi/Swasun is a landlocked community located in Katcha Local Government Area of Niger State, Nigeria. The community is approximately one hour away from the heart of Minna (off Maraya junction, Minna/Bida Road) and about 30 minutes away from Bida. Kperegi has agriculture and small commercial activities as its prevailing economic drivers. The community has an estimated population of about 230 houses. The community is serviced by a school, health center, a security post (local vigilantes), and mosques as social amenities but there is no mobile telephony service to the village. The predominant means of transportation is by foot or motorbikes. Some inhabitants have access to electricity through petrol-powered generators; the remainder rely on kerosene lamps, candle lamps, firewood, etc. The average cost of petrol in Kperegi is N250 while the average cost of kerosene is N350 (72% and 300% higher than open market rate, respectively). The major challenge facing economic development is the lack of electricity access for residential and commercial activities, especially for the processing of agro-products before taking them to the market.



In June 2017, GVE Projects, Ltd., in collaboration with the Bank of Industry Nigeria (BOI)/United Nations Development Program (UNDP) and the Institute of Electrical Electronics Engineers (IEEE), announced the implementation of a 40.95 KWp PV solar-based mini-grid pilot project. The project is aimed at scaling up renewable energy adoption for off-grid rural electrification. Fifty-one direct and indirect jobs were created during the course of implementation and generated an estimated N4.68 million (US\$13,000) in wealth in the beneficiary community through construction, survey, labor, and other related expenditures.

This project will utilize a pay-as-you-go platform and train local community members to oversee the daily operation of the site after commissioning. Upon commissioning in early November 2017, the project will serve 200 households (i.e., 1,600 people at 8 persons per house) and will offset about 365.2 metric tons of CO<sub>2</sub> annually in the community, thereby preserving the natural environment while enhancing the living standards of the inhabitants.

Other project impacts include:

- 24 street lighting points added along the main street of Kperegi Community
- Enhanced security at night
- Extended business operating hours
- 50% reduction in energy-related expenditures
- 80% reduction in malaria cases
- Children use street lighting points to study/play at night
- An additional 260 people indirectly benefit from the street lighting component

**Execution Agency:** N/A  
**Development Partner:** United Nations Development Program (UNDP)  
**Technical Consultant:** N/A  
**Project Cost:** \$250,000 - 68% from Bank of Industry Nigeria (concessional debt financing), 22% from UNDP (grant), 10% from GVE (equity contribution)  
**Location:** N09° 21.311', E006°12.407'

# PROGRAM DESCRIPTIONS

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## Clean Technology Fund & Scaling Up Renewable Energy Program, CIF

Both of the major energy sector Climate Investment Funds (CIFs)—the Clean Technology Fund and the Scaling-Up Renewable Energy in Low Income Countries (SREP) Program—are supporting the scaled-up demonstration and deployment of renewable energy in middle- and low-income countries. Clean energy mini grids (CEMGs)—based on renewable energy technologies (including storage in systems with variable renewables) or renewable energy-diesel hybrid systems—are one potentially promising option for delivering reliable energy in a sustainable manner.

While some initiatives are also ongoing within Clean Technology Fund, mini grids are of particular interest to SREP countries. The SREP has allocated more than \$140 million to mini grid projects identified through country investment plans in 13 countries (out of 27 SREP countries), representing a relevant and strategic part of the SREP portfolio, with strong ownership from countries. An additional \$55 million has been allocated to mini grid projects through the Clean Technology Fund Dedicated Private Sector Program on Renewable Energy Mini Grids and Distributed Power Generation.

## Global Facility on Mini Grids, ESMAP/World Bank

ESMAP at the World Bank—with core funding from DFID and committed funds from Danida—initiated a Global Facility for Mini Grids to accelerate the pace of electrification to large groups of people by mainstreaming least cost mini grids into World Bank Group operations as well as develop the global and local knowledge associated to achieve this. While mini grids have a long history and are widely used around the world, they are now emerging as a viable option for meeting the energy demand in Sub-Saharan Africa, South and East Asia, and Small Island Developing States. Mini grids are the expected least-cost option for more than 120,000 villages and towns in these regions.

The Global Facility for Mini Grids is part of the joint effort of ESMAP and the SE4All High Impact Opportunity on Mini Grids. The Global Facility for Mini Grids, focusing on:

- *Pillar 1:* Accelerating the pace of electrification for large groups of people by working together with operational task teams and clients to mainstream least cost mini grids into World Bank Group operations and national electrification programs. Where possible, these mini grids will be powered by renewable energy.
- *Pillar 2:* Developing the required knowledge to assist in achieving the first objective and contribute to the frontiers of global knowledge development and learning. This development will look at the experience of mini grid projects worldwide.



## Rural Electrification Agency, Nigeria Energizing Economies

This aims to initiate efficient, clean and sustainable power to catchment areas that have high growth impact on the economy.

Using specific industry indicators such as population density, trade, employment sustainability amongst others, REA has identified and selected catchment areas for immediate intervention. These economic clusters have been selected primarily for their high level of commercial activities and propensity to increase local content as it relates to 'Made in Nigeria' goods, as well as heavy reliance on electricity for running their day-to-day business. They include:

- Somolu Printing Community, Lagos State
- Ariaria Market, Abia State
- Muhammadu Abubakar Rimi (Sabon Gari) Market, Kano State
- Sura Shopping Complex, Lagos State

## Energizing Communities

Energizing Communities is a programme developed with the support of the World Bank that aims to develop solar home system and mini grid projects, making them more attractive to potential investors: REA plans to provide support to investors on:

- Data Collection
- Pre-Feasibility Studies
- Project Grants
- Regulatory Advice Support

## Energizing Education

This aims to support generation and provision of adequate power supply to 37 federal universities and 7 university teaching hospitals across the Federal Republic of Nigeria, starting with an initial 9 universities and one teaching hospital, in order to improve educational outcomes all over the country. The pilot phase includes:

- Abubakar Tafawa Balewa University, Bauchi
- Bayero University, Kano
- Usumanu Danfodiyo University, Sokoto
- Federal University of Agriculture, Makurdi
- Federal University, Ndufu Alike
- Nnamdi Azikwe University, Anambra
- University of Lagos
- Obafemi Awolowo University and Teaching Hospital
- Federal University of Petroleum, Delta

# NOTES

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## NOTES

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# SCHEDULE AT-A-GLANCE

<b>Prologue</b> <b>Mon</b> <b>4 Dec</b>	9.00-5.00	<b>HOMER® PRO TRAINING  </b>	<b>Ballroom 1</b>
	7.30 – 5.30	<b>GREEN MINI GRID AFRICA COUNTRY COORDINATION (Invitation Only)</b>	<b>Room Bibian A</b>
	7.30 – 5.30	<b>SCALING UP RENEWABLE ENERGY PROGRAM (SREP) COUNTRIES ROUNDTABLE (Invitation only)</b>	<b>Room Tamarind A&amp;B</b>
	1.00 – 5.00	<b>PRIVATE SECTOR FORUM (Invitation Only)</b>	<b>Ballroom 2</b>
<b>Day 1</b> <b>Tues</b> <b>6 Feb</b>	9.30	<b>NIGERIA MINI GRIDS ROUNDTABLE   Welcome &amp; Opening Remarks  </b>	<b>Ballrooms 1 and 2</b>
	9:45	Overview of off-Grid Opportunities and Challenges in Nigeria	
	10:30	Creating an Enabling Environment: Regulatory Landscape in Nigeria	
	11:45	Private Sector: Ease of Doing Business	
	2:00	Access to Finance	
	3.00	Engaging with States	
	4.30	DisCos: Opportunities for Collaboration	
	5.30	Closing Remarks	
	6.00	Reception in Pool Area	
<b>Day 2</b> <b>Wed</b> <b>6 Dec</b>	9.00	<b>GLOBAL MINI-GRIDS TECHNICAL CONFERENCE   Opening Remarks  </b>	<b>Ballrooms 1 and 2</b>
	9.15	Frontier Developments in Mini Grids	
	10.45	PARALLEL CLINICS 1  Demand Creation and Productive Uses 2  Workable Regulations 3  Access to Finance	
	1.30	PARALLEL CLINICS 4  Technology and Costs 5  Geospatial Planning 6  Community Engagement 7  Taking Mini Grids to Scale Sustainably	
	3.45	PARALLEL CLINICS 8  Capacity Building / Training 9  Institutional Set Up (Auctions) 10  Private Sector Ventures	
	5.30	Wrap Up	
<b>Day 3</b> <b>Thur</b> <b>7 Dec</b>	9.30	<b>NIGERIA MINI GRID &amp; OFF-GRID ELECTRIFICATION CLINICS   Opening Remarks &amp; Overview (Invitation only)</b>	<b>Ballrooms 1 &amp; 2</b>
	10.00	PARALLEL CLINICS 1  Unlocking Barriers to large-Scale Deployment of Mini Grids 2  Unlocking Barriers to Large-Scale Deployment of Individual Solar Systems	
	1.00	PARALLEL CLINICS 3  Funding Nigeria's Off-Grid Strategies 4  Energizing Education 5  Energizing Economy	
	3.15	Report Back from Clinics	
	3.45	Closing Remarks	
	5.00	Networking Reception outside ballroom area	
<b>Day 4</b> <b>Fri</b> <b>8 Dec</b>	6.00	<b>FIELD TRIP (Limit: 100 participants; Distance: 3.5 hrs)</b> • Bisanti • Kperegi/Swasun	

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