Alliance for Rural Electrification
Shining a Light for Progress

Source: Phaesun

Global Conference: Rural Energy Access –
Session 4: Enabling factors for providing modern energy services to rural areas

Thursday, 5 December 2013, Addis Ababa

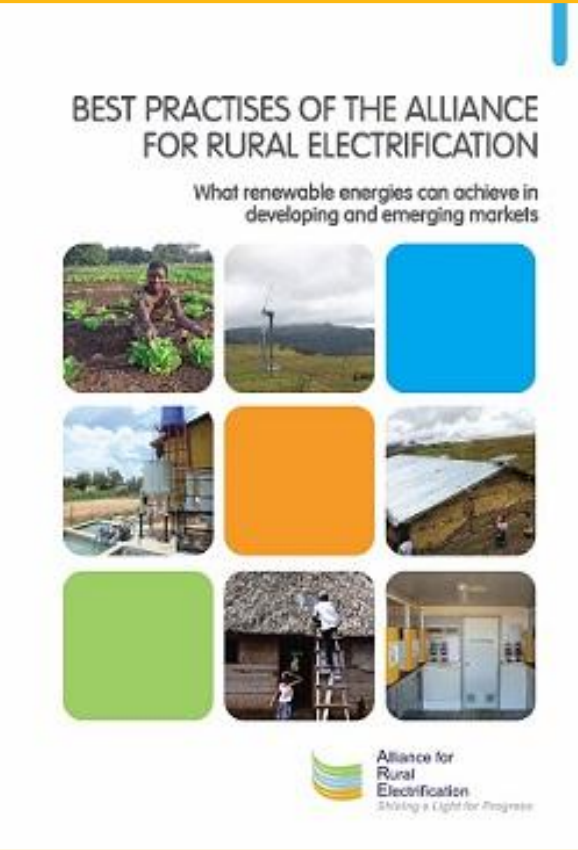
Ernesto Macías, President of ARE

Agenda

1. **Alliance for Rural Electrification**
2. Rural energy markets
3. Hybrid mini-grids
4. Towards upscaling and replication
5. Challenges and proposed solutions

1. Who we are, what we do

- International business association promoting **off-grid RET** solutions to electrify rural areas in developing and emerging countries
- Enabling business and market development through **advocacy** as well as the **facilitation of information.**
- Global **knowledge sharing platform** (e.g. showcase best practices as well as develop technical, financial & policy recommendations).



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1. Diversified & global membership structure

ARE has about 80 members from industry, academia and public sector.
7% from Africa, more than 10 new members in 2013.

1. Strong partners

We partner with **international and national organisations**, **projects and initiatives, the media** and **other industry platforms.**

Selected international partners

European Commission

UNEP

euei pdf
energy for development

IRENA
International Renewable Energy Agency

Africa-EU Energy Partnership

UNITED NATIONS FOUNDATION

1. How we work

2013 (Focus on Africa & Latin America)		2014 (Focus on Latin America & Asia)		2015 (Focus on Asia & Africa)	
1st Semester	2nd Semester	1st Semester	2nd Semester	1st Semester	2nd Semester
Small Wind	Energy Storage	Small Hydropower	Hybridisation & Power Components	Biomass	Minigrids

Main services:

Business & Intelligence

Business creation and development: Representation at conferences, organisation of ARE events (e.g. business delegations, workshops, webinars); facilitation of market, finance and procurement info; as well as project support and management

Public Affairs

Awareness creation for nascent rural markets through advocacy, communications & marketing services: campaigns, newsletters, brochures, position papers, tool-kits, market studies.

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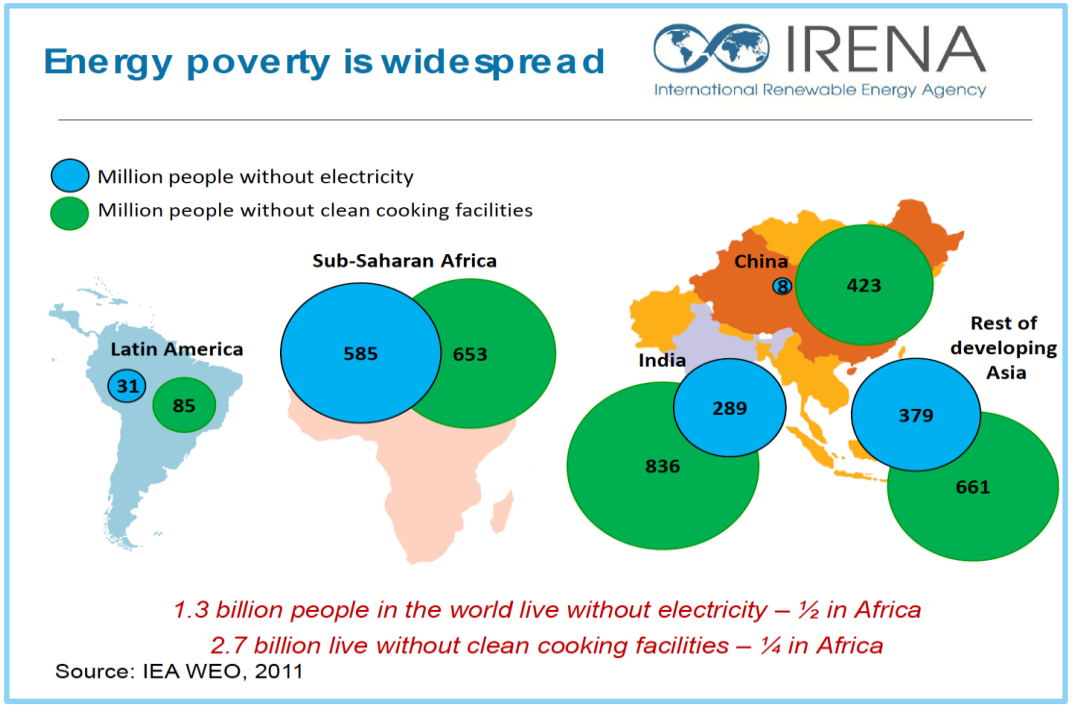
2. Rural energy market big potential but challenging

- **Niche:**
  - 1.1 bn rural people un-electrified
  - SSA, Asia and Oceania
- **Demand:**
  - Unaware of opports
  - Remote and scattered
  - Low and irregular income
  - Low demand needs
- **Supply:**
  - Low local content
  - Lack of feasibility info
  - Poor access to finance
  - High risks



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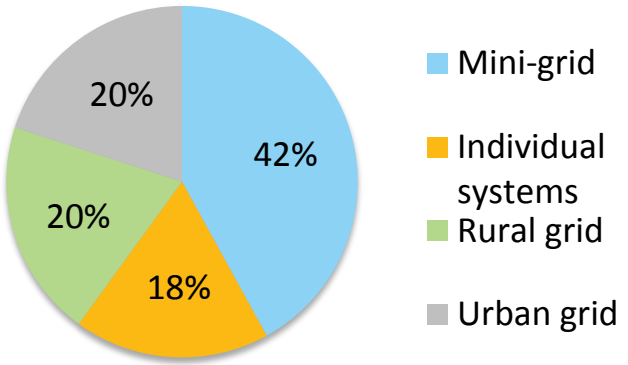
2. Off-grid RETs essential to tackle energy poverty

- **Grid extension:**
  - Fin. and technically unviable
- **Off-grid diesel:**
  - Higher LCOEs due to high OPEX
  - Important for backup
- **Off grid RETs:**
  - Cheapest over system's lifetime
  - Solutions ready to be deployed
- **Off-grid RET applications:**
  - Mini-grids: advanced serv. x isol. comms
  - Ind. sys: basic serv. x isol. households

952 TWh needed to achieve universal electricity access by 2030



Source: UNF, EAPN, June 2012

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2. Two different kinds of systems

Technology	Advantages	Shortcomings
Individual plants Pico (W) Domestic (up to kW) Residential (several kW)	• High flexibility. • Easy to move and share. • Systems relatively cheap (cash sales model/micro credits)	• Limited to their specific use. • High electricity prices
Mini-grid fed by RE/ Hybrid systems Generally up to 1 MW	• Power for economic activities. • Efficient maintenance • Easily expandable • Stable power supply • Numerous opportunities for hybridization • Relatively cheap electricity prices	• If no backup: Battery storage needed. Power shortages in cases of unfavourable weather conditions. • If diesel backup: functioning depends on availability of fuel. Emissions and noise • High investment costs

2. The case of the global off-grid PV market

(initial estimate)

Off-Grid Applications	Market potentials		
	People	Residential	Total*
Small PV (ave 30 Wp/user)	~ 470 mio.	2 GW	6 GW
Small PV (ave 100 Wp/user)	~ 470 mio.	6 GW	18 GW
PV based mini-grids (300 kWh/user/a)	~ 470 mio.	16 GW	48 GW

* residential fraction of overall energy demand is typically about 1/3 of total demand

- 2/3 of not electrified people to be linked with small PV applications.
- 2/3 of new off-grid capacity to be installed through mini-grid applications.
- Isolated diesel-grids could be upgraded by PV in the order of ~ 20 – 40 GWp .

Source: Breyer Ch., Werner C., et al., 2011. Off-Grid Photovoltaic Applications in Regions of Low Electrification: High Demand, Fast Financial Amortization and Large Market Potential, 26th EU PVSEC, Poster 5BV.1.45

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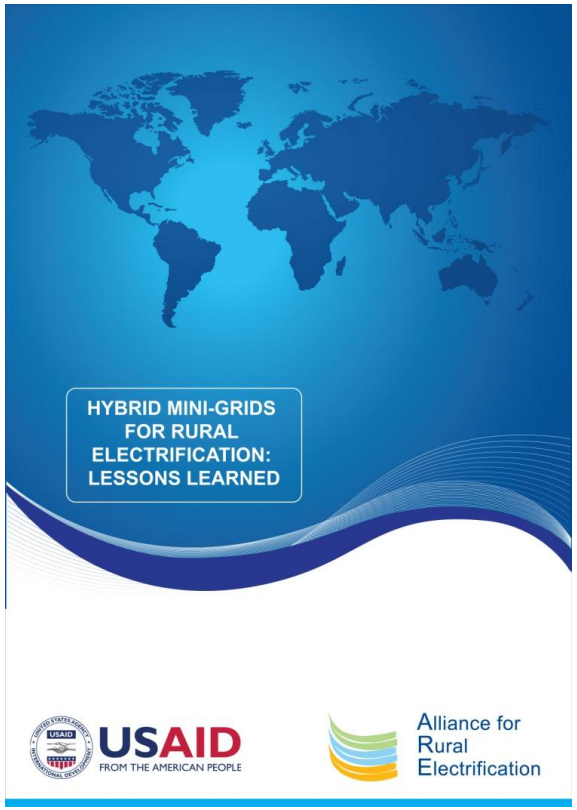

3. Concept of Mini-grid

- **Main sections of mini-grid**:
  - **Production:** RETs + genset, storage, converters and management + bus bar.
  - **Distribution:** Low voltage line (AC/DC, single-phase/three-phase).
  - **Demand (end-user) subsystem:** meter, internal wiring, grounding, devices.

- **Generation:** RET generation in hybrid systems represents 75%-99% of total supply
  - **SHP** cheapest technology and most mature (with high efficiency levels), but the most site dependent.
  - **Solar** suitable for almost any location, easy to install, maintain and scale-up. Initial investments costs higher, but prices have dropped sharply over the last decade.
  - **Small wind** site specific, cheaper than solar, but difficult to predict.
  - **Batteries** core part, help ensure reliability in elec. services and reduce costs.
  - **Diesel**: system back-up

3. Business models

- **Community model**
  - Need for strong involvement from end-users from the beginning
  - Community will become owner and operator
  - Model needs long preparation period and important capacity building

- **Private model**
  - Needs output-based aid and based on long term concession
  - Shorter preparation period if priv. sector handles M&O&M
  - Needs incentives, but can result more easily to replication

- **Public model**
  - Utilities have expertise and financial resources
  - Can take advantage of economies of scale and access to financing
  - But their action often lacks efficiency and commitment in rural areas

- **Hybrid model**
  - Utility model: Unbundling between generation and distribution (PPA)
  - Comm. and private model often need subsidies
  - Any model requires some kind of involvement from comm.

3. Mini – grid policy toolkit

- **Purpose of policy and regulatory frameworks**
  - Set up the “rules of the road” for mini-grid implementation
  - Ensure the public good
  - Develop confidence among investors
  - Provide incentives and support instruments for project development

- **Regulatory context**
  - Wide array of players, i.e. Government ministries, rural electrification agencies, energy regulators, other stakeholders
  - Need to create a durable and stable regulatory environment to attract investment

- **Toolbox for a successful regulatory framework**
  - Manage the mini-grid development process: process efficiency, accessibility and minimum regulation to further deployment and ensure safety of mini - grids
  - Promote innovative business models (esp. given the scarcity of funds)
  - Importance of the economic and financial aspects, e.g. tariff-setting, incentives such as subsidies, creating long-term stability of cash flows for business models

3. Mini – grid policy toolkit (2)

- **Policy requirements for the (significant) development of mini-grids**
  - Three "mandatory" policies
    - Clear private sector development policy
    - Clear rural electrification policies
    - Clear policy support for desired MG business model
  - Supporting policies
    - Rural electrification master plan and agency
    - Tariff guidelines
    - Simple (licensing) procedures
    - Capacity building
  - Helpful policies
    - Technical assistance
    - Non-essential incentives such as short-term tax breaks

3. Need for strong involvement from public sector

- **Political momentum:**
  - Energy as target for SGD post-2015
  - Donors and countries mini-grid programmes
- **Role of public sector goes beyond financing**
  - Project sponsoring
  - Project development
  - Feasibility and market studies
  - Training and awareness creation
  - Simplification and standardisation of regulation
  - Low import duties, tax exemptions etc…

Countries with MG programmes:
Senegal, India, Brasil, Ghana, China, Bolivia, Mali, Sri Lanka, Peru, Kenya, Nepal, Honduras, Rwanda, Bangladesh, Colombia, Namibia, Indonesia, South Africa, Cambodia, Uganda, Philippines, Tanzania.

Donors working on mini-grids:
- AusAID, USAID
- EC & EUMS (GIZ, ADA, Danida, DFID) + NORAD,
- Regional banks (ADB, AfDB, EIB, IDB),
- WBG (IFC, ESMAP, GEF),
- UN (UNIDO, UNEP, UNDP, UNGC).

Source: IED

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4. Towards upscaling & replication

- Solid Public-Private Partnerships
- Smart regulatory framework (e.g. specifically tailored **subsidies**)
- **Risk mitigation mechanisms and credit lines**
- Need for training and awareness creation schemes
- Need for market and feasibility studies

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5. Challenges and proposed solutions

Challenges	Solutions
Lack of political will	Stability, long-term master plan and commitment towards RE and access to energy .
Complex institutional framework	Clear distribution of responsibilities among institutions involved + creation of specialised bodies on RE & RETs
Inadequate legal and regulatory framework	Simplification, standardisation (licensing, PPAs, authorisation, access to market etc.)
Public support schemes	One-off for capital investment and/or on-going. Cross-subsidy/ REFiTs / Phase out fuel subsidies.
Access to finance	Credit schemes, guarantees for the banking sectors
Lack of information and need for capacity-building on technical, business, financing.	From simple end-user education to building entrepreneurial skills and technical trainings.
No links to other sectors	Need for an integrated approach: Creation of synergies water, food, telecom sectors

Thank you for your attention

Future ARE activities on mini-grids:

- Mini-grid publication focusing on finance (GIZ)
- Mini-grid policy toolkit (EUEI PDF & REN21)
- Mini-grids (UNEP)
- Conf. in 2014 together with OTTI
- Technology-focus 2nd semester 2015

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Alliance for Rural Electrification (Brussels) – are@ruralelec.org - www.ruralelec.org
www.facebook.com/AllianceforRuralElectrification - @RuralElec