

# Private Sector Mini-Grid Business Models: *Lessons learnt from South-East Asia*

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Alliance for  
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*Shining a Light for Progress*



10th Edition

**MICROGRID**

**GLOBAL INNOVATION FORUM**

EMEA • Asia-PAC • Latin America

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*Credits: ASEP Philippines*

# About ARE



**The Alliance for Rural Electrification ([ARE](#))** is an international business association with the aim to promote a sustainable decentralised renewable energy industry for the 21<sup>st</sup> century, activating markets for affordable energy services, and creating local jobs and inclusive economies.

ARE had more than **130 Members** at the end of 2018.

**More information:** [ruralelec.org/matchmaking-platform](http://ruralelec.org/matchmaking-platform)

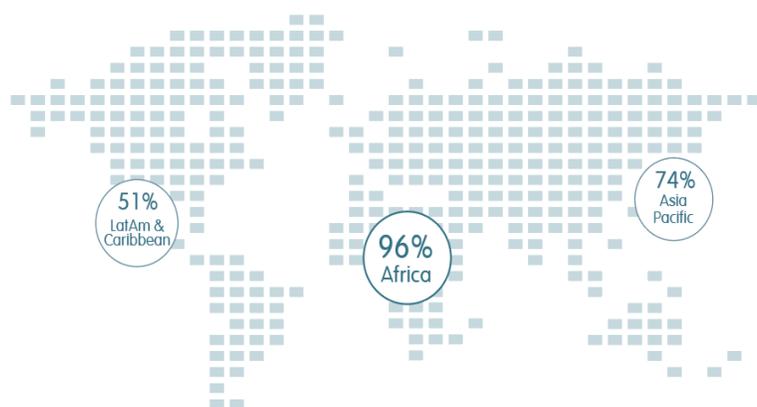
# ARE Members



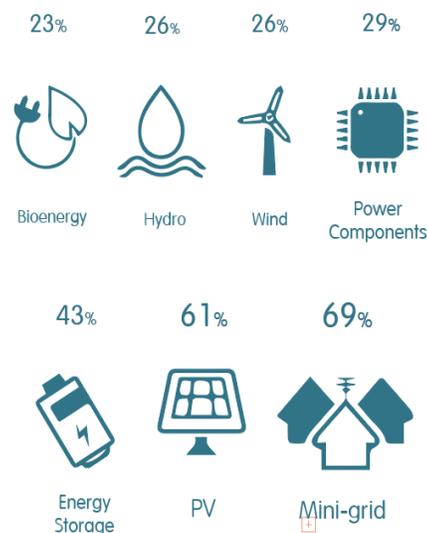
# ARE Members and Services

## ARE MEMBERS

### ARE MEMBERS REGIONAL FOCUS



### ARE MEMBERS BY TECHNOLOGY



ARE helps on **sector coordination and development** by:

**Service Line 1:** Market Intelligence & Business Services

**Service Line 2:** Policy & Advocacy

**Service Line 3:** Individual Support

# ARE Partnerships

## Commercial Partners

2013:  Africa-EU Energy Partnership  euei pdf energy for development  btc | European Business & Technology Centre  
Enabling Europe India Collaboration

2014:  RECP Africa-EU Renewable Energy Cooperation Programme  giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH  IFID THE ONE FUND FOR INTERNATIONAL DEVELOPMENT  
Uniting against Poverty

2015:  European Commission  The ROCKEFELLER FOUNDATION  Agence de Régulation du Secteur de l'Electricité ARSEL Electricity Sector Regulatory Agency

2016:  Interreg North-West Europe LOGIC  inter solar connecting solar business | EUROPE  IRENA International Renewable Energy Agency

2017:  IDB Inter-American Development Bank  RES4MEDI RENEWABLE ENERGY SOLUTIONS FOR THE MEDITERRANEAN  RES4AFRICA RENEWABLE ENERGY SOLUTIONS FOR AFRICA 

2018:  AFRICAN DEVELOPMENT BANK GROUP  UNIDO UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION  aidex  ADB  EGREE RENEWABLE ENERGY ENERGY-4-ALL  iea  POWER FOR ALL

## Knowledge & Support Partners

 RAEL  CLUB-ER 

 IEC  ICC BELGIUM INTERNATIONAL CHAMBER OF COMMERCE  SMART VILLAGES New thinking for off-grid communities worldwide

 PROUD PARTNER OF SUSTAINABLE ENERGY FOR ALL  GOGLA The Voice of the Off-Grid Solar Energy Industry  ALER Associação Lusófona de Energias Renováveis

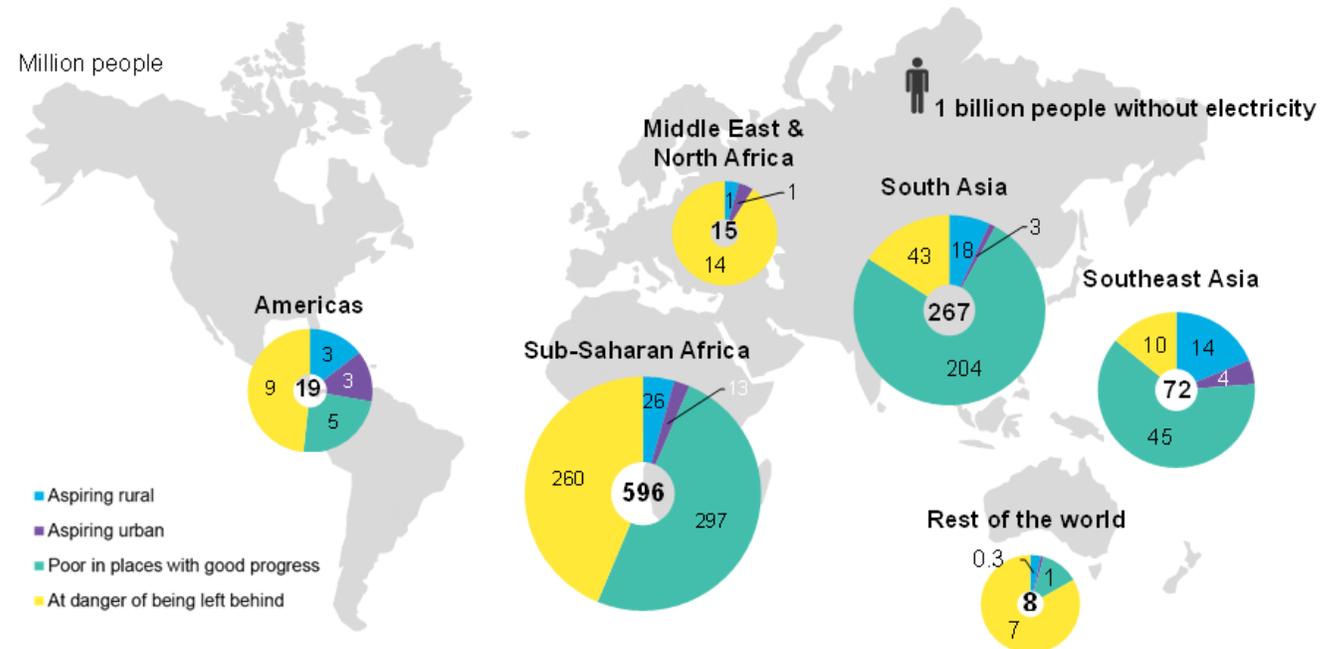
 Bloomberg NEW ENERGY FINANCE  REN21 Renewable Energy Policy Network for the 21st Century  VLERICK BUSINESS SCHOOL  UNITED NATIONS FOUNDATION

 MESIA  RURAL ELECTRIFICATION AUTHORITY  olade  ada25

 ADB  EGREE RENEWABLE ENERGY ENERGY-4-ALL  iea  POWER FOR ALL

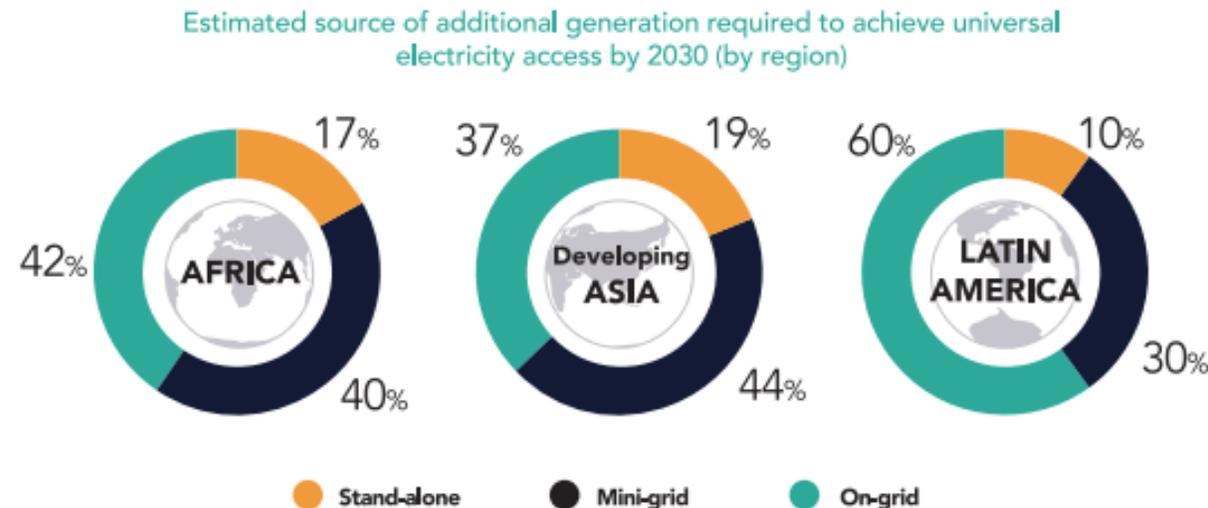
- **339 million people** are without access in South and South-East Asia.
- To achieve energy access for all by 2030, **52 billion USD per year is needed**
- Current investment of **30.2 billion USD per year is not enough.**

## Estimated addressable market for electricity access solutions (2019)



Source: [BloombergrNEF](#) estimates based on World Bank data for income distribution.

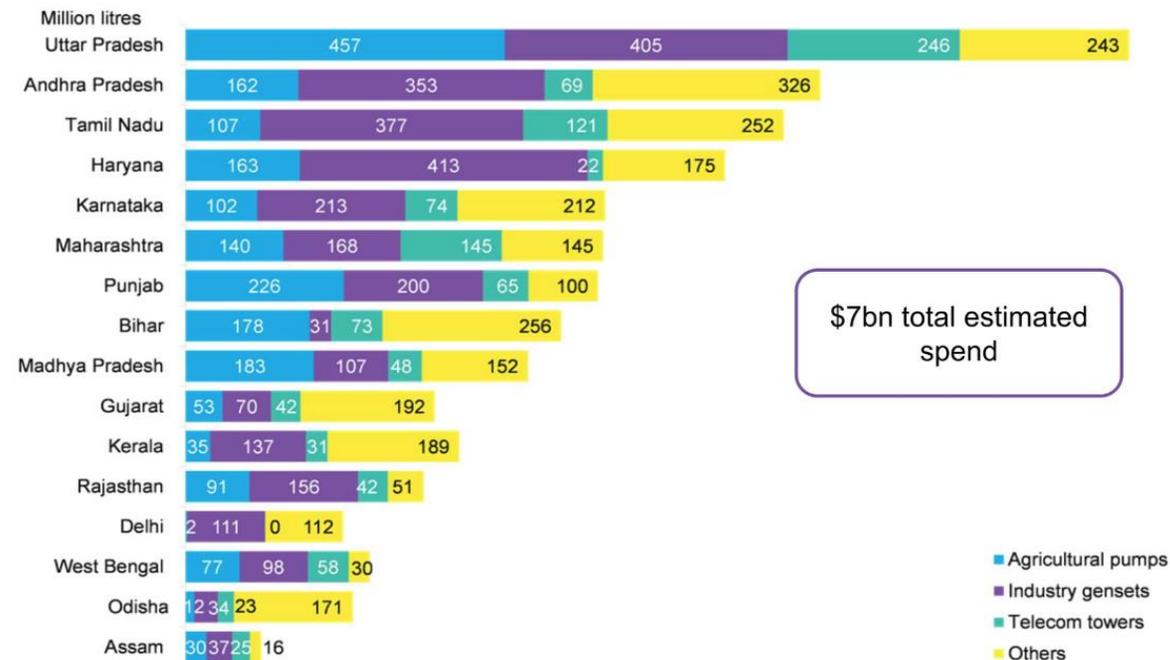
- To achieve full **electricity access South and South-East Asia by 2030**:
  - **44 % of additional generation** will have to come from **mini-grids** (MiA, 2017)
  - **2,200 mini-grids** planned for installation in South and South-East Asia by 2030 (ESMAP, 2019)
  - **Net profit** potential across all mini grid component and service suppliers in 2030 alone of **USD 4.7 billion (globally)** (ESMAP, 2019)



Note: Figures are rounded. Total generation requirements: 468 TWh in Developing Asia, 463 TWh in Africa, and 10 TWh in Latin America.  
Source: Based on IEA, UNDP, and UNIDO, 2010

- South and South-East Asia has an **enormous potential to replace or hybridise existing diesel gensets with hybrid mini-grids** especially for productive uses such as rural industry and agriculture.
- Example: An estimated **USD 7 billion** is spent annually on **diesel consumption for productive uses in India.** (BNEF 2017)

## Diesel consumption for power use in FY2014



Mini-grids Internal Rate of Return (IRR) is usually 10 to 15% - significantly lower than the 20% a typical investor would expect from on-grid projects.

To resolve this challenge, **two main options are available** for private mini-grid developers:

**Option 1:** Improve the IRR to compensate for the higher risk (**by increasing tariffs for end users**)

**Option 2:** Reduce the risks of the project (**by reducing risks along the whole value chain of the mini-grid project**)

## **Difficulties with option 1:**

- Tariffs are often regulated on a national level
- Moral dilemma of charging high tariffs to very poor populations in rural settings
- Increased risk of non-payment from end users and social acceptance might be lower

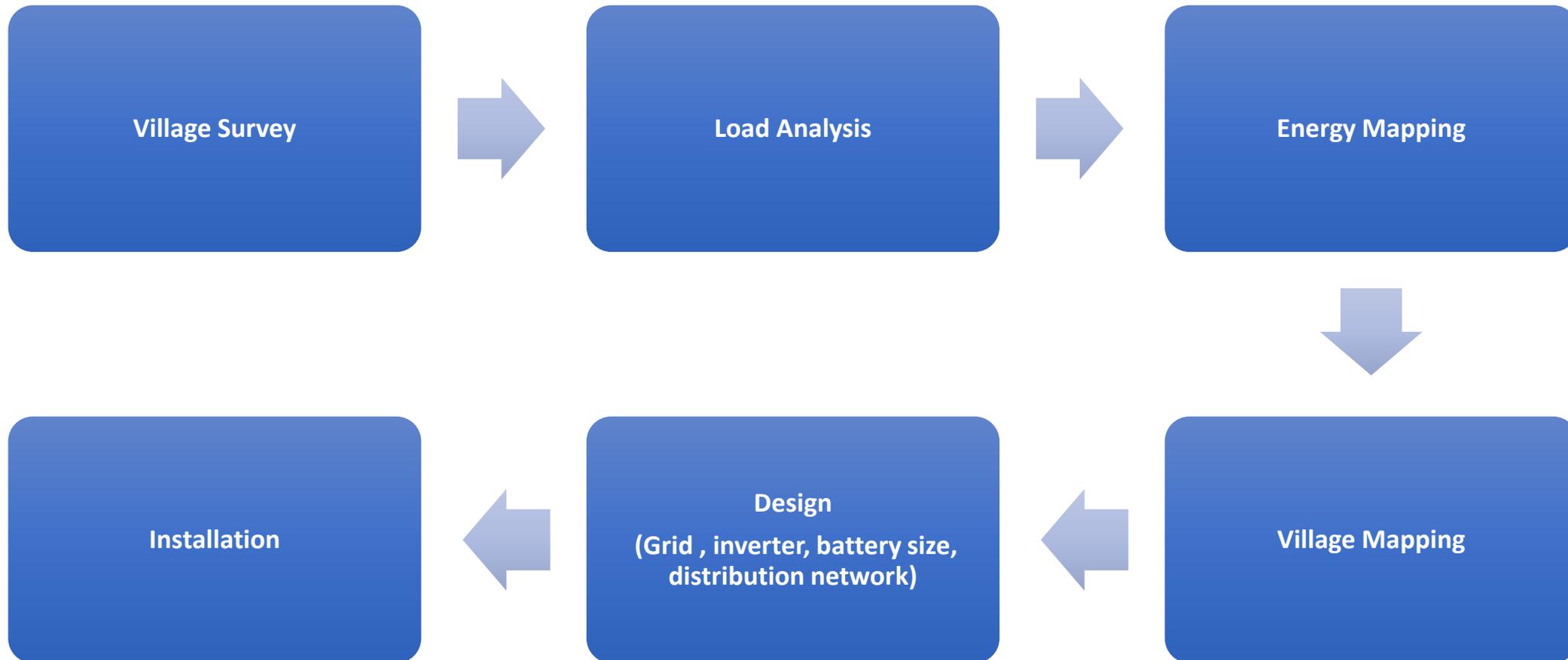
## **Difficulties with option 2:**

- Reducing risks over many parameters across the mini-grid project value chain (see next slides)

# Risk Mitigation for Mini-Grids (2/2)

Project phase	Key risks	Innovations to mitigate risks
1. Site selection	Payment risks	GIS Mapping, AI village mapping, modular or easily redeployed mini-grids, appliance audits
	Political risks	
	Social acceptance risk	
	Demand risk	
	Environmental/force majeure risks	
2. Technical design	Resource price variability risk	Battery innovations (e.g. lithium-ion), standardised designs, increased PV module efficiency
	Construction competition risk	
	Technology risk	
3. O&M	Operational risks	Remote monitoring and control systems, smart meters, diversification of incomes and offerings (e.g internet, appliances)
	Payment risks	
4. Revenue & Financing	Payment risks	Digital payments, smart meters, blockchain
	Social acceptance risk	
5. Billing and Metering	Payment risks	

# Typical Design Process for Mini-Grids



**Source:** ARE & Mlinda Foundation, 2019

Ownership	Revenue model for private sector company	Example from South-East Asia
Private operator	Micro-utility (USD per kWh)	Mlinda, Rahimafrooz
	Service packages (price for services)	Okra Solar
Public (utility)	Power purchase agreement (USD per kWh)	Clean Power Indonesia
Community	Power purchase agreement (USD per kWh)	Blue Solar
Hybrid (e.g. Special purpose vehicle)	Micro-utility (USD per kWh)	Gham Power
	Service packages (price for services)	

# ARE-OFID: Call for Proposals for hybrid mini-grids

- **USD 990,000** for launching a **Call for Proposals** funding in the form of grants for installation of **hybrid mini-grids**.
- **Three success stories** from **Bangladesh, India and Mali**.
- The projects brought great **improvements in the quality of life** of people.
- The possibility of using clean power **productively** is **bringing local economic development**.



*Blendio, Mali*



*Muradpur Island, Bangladesh*



*Naratoli - Jharkhand, India*

**Project Description:** Implementation of solar-powered hybrid mini-grid in Muradpur Island, Bangladesh as part of ARE-OFID grant cooperation agreement.



## Project Results:

- 100 households connected (24/7 provision of electricity), 45 productive uses connected
- 1 health clinic, 3 primary and 1 secondary school connected



**Revenue model:** micro-utility (privately owned and operated)

**Innovations:** smart card payment (pre-payment) from vending kiosks



# ARE Case Study (2/3): Mlinda Foundation, India

**Project Description:** Installation of three new hybrid mini-grids in three rural villages in India (Narotoli, Sahitoli, Pasanga) as part of ARE-OFID grant cooperation agreement.

## Project Results:

- 358 households (24/7 provision of electricity), 61 commercial outlets (poultry units), 57 productive users connected
- 65 direct and indirect jobs created within local communities
- Income increase of 10.6% in the project villages, as a result of electricity connection

**Revenue model:** micro-utility (privately owned and operated)

**Innovations:** O&M clustering, loans to farmers, productive uses



# ARE Case Study (3/3): Clean Power Indonesia & Ankur Scientific (Indonesia)

**Project Description:** Bamboo-powered biomass mini-grids for remote communities Mentawai Island in Indonesia.

## Project Results:

- 1,250 households (24/7 provision of electricity)
- Productive uses such as sago processing facility, agroforestry products and tourism are powered
- 450 jobs created

**Revenue model:** 20-year PPA with national utility (PLN)

**Innovations:** clean biogas source, ubiquitous and fast-growing biomass feedstock



# ARE Key Recommendations (from EAIF 2019)

Challenges	Recommendations
Lack of off-grid market information, data and transparency	<ul style="list-style-type: none"><li>- Aggregation of data from mini-grids -&gt; benchmark for the sector</li><li>- Industry initiative(s) analyse financing models for the productive use of energy</li></ul>
Unsupportive or non-existing policy frameworks	<ul style="list-style-type: none"><li>- Regulation toolkit 2.0</li><li>- Trainings for policy makers on mini-grids tariffs</li></ul>
Lack of interaction between market players inside & outside of local markets	<ul style="list-style-type: none"><li>- Support local and international developers in setting up partnerships (via local help desks)</li></ul>
Lack of debt finance (both in terms of volume and design)	<ul style="list-style-type: none"><li>- Develop schemes that reward strong results and track records (RBF, climate finance)</li></ul>
Lack of capacity among market players (local associations, project developers and entrepreneurs)	<ul style="list-style-type: none"><li>- facilitate the exchange of knowledge and experience (via twinning programmes between international and local business associations)</li><li>- Youth and women entrepreneurship programmes</li><li>- Training programmes for developers and entrepreneurs</li></ul>

- **ECOWAS Sustainable Energy Forum** (Accra, 22-24 October 2019)
- **ARE Micro-Grid Workshop & Exhibition** (Bangalore, 27-29 November 2019)
- **6<sup>th</sup> ARE Energy Access Investment Forum** (Lusaka, 18-19 March 2020)



Looking forward to see you again you at:  
**ECOWAS Sustainable Energy Forum**  
Accra 22-24 October 2019

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