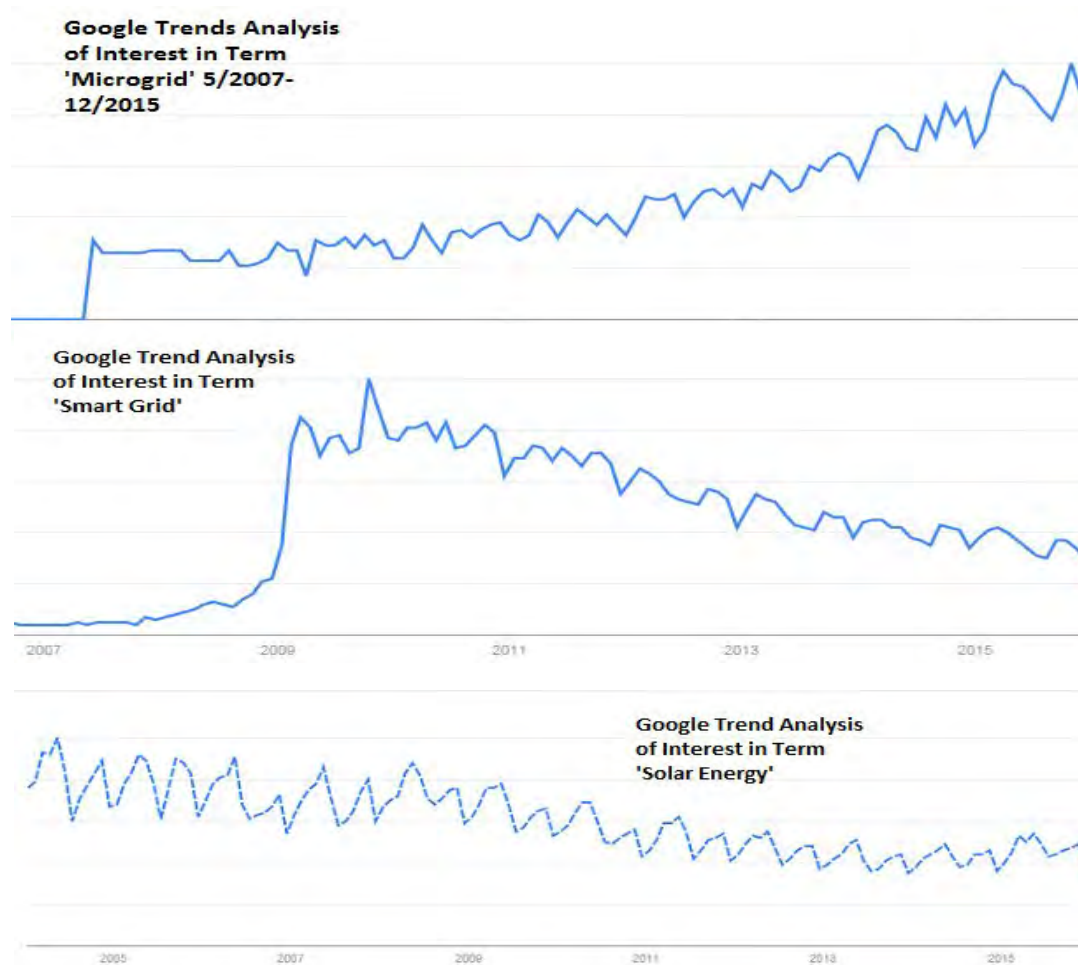


Global Facility on Mini Grid

Operationalization

Jon Exel
Energy & Extractives Global Practice

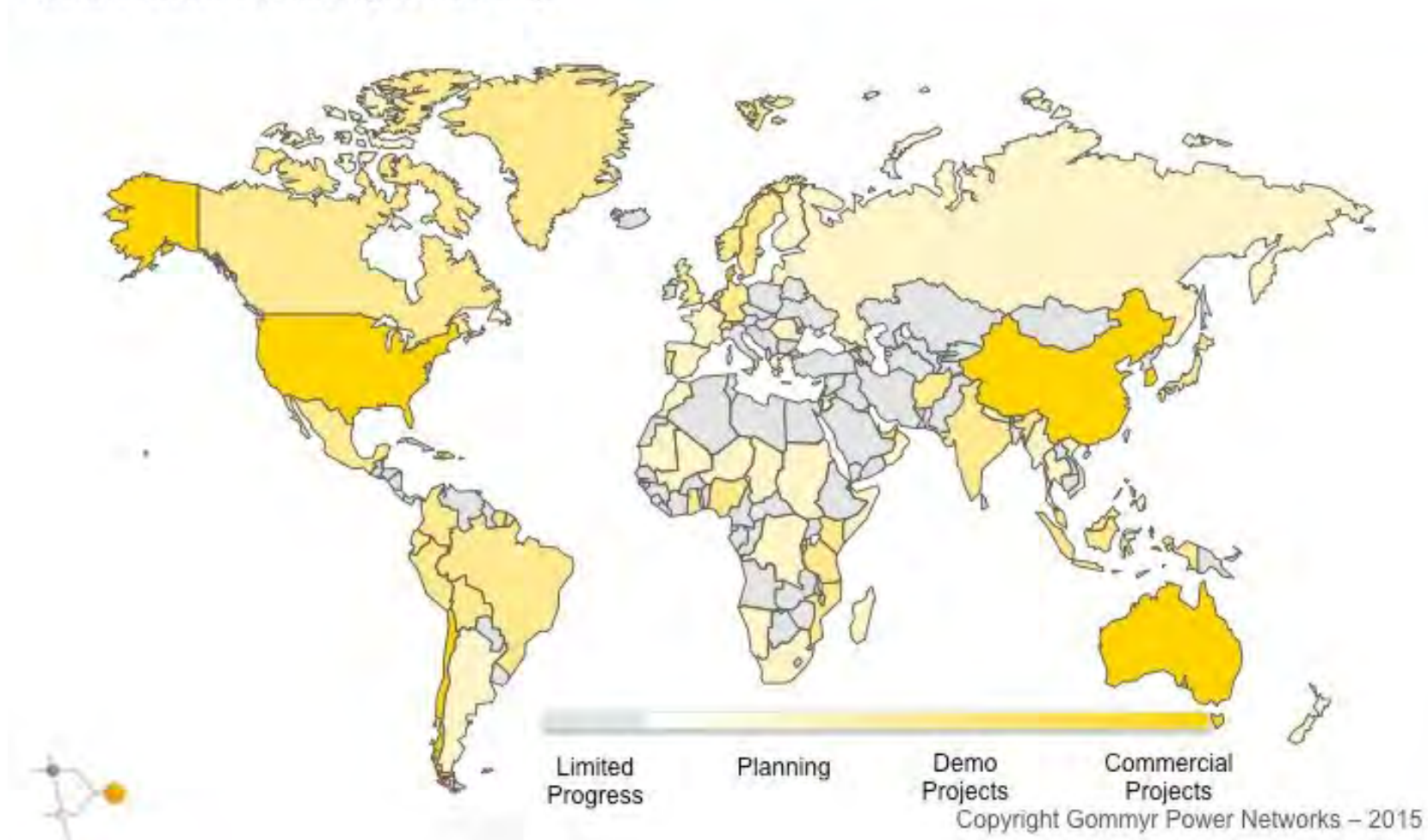
Google Trends Analysis



Source: What Will Keep Microgrid Development Trending Upward in 2016? - Microgrid Knowledge, January 2016

Renewable microgrid momentum is growing around the world

Global Renewable Microgrid Heat Map



Conceptually



WORD OF THE MONTH:
Operationalization

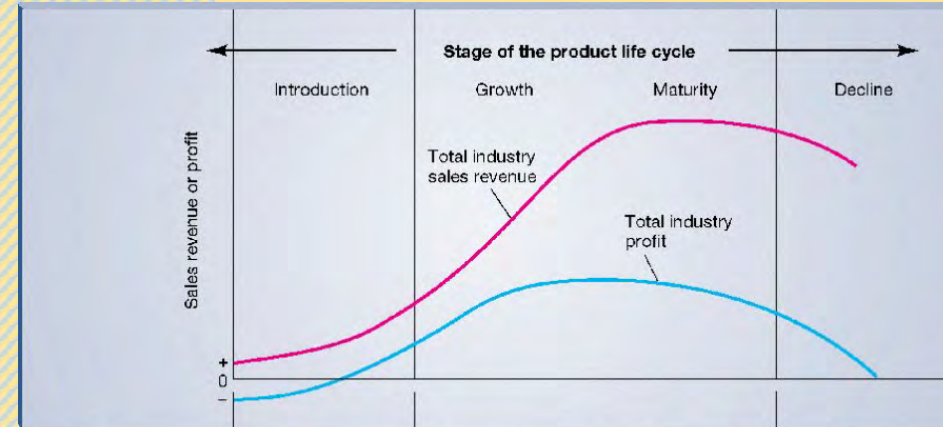
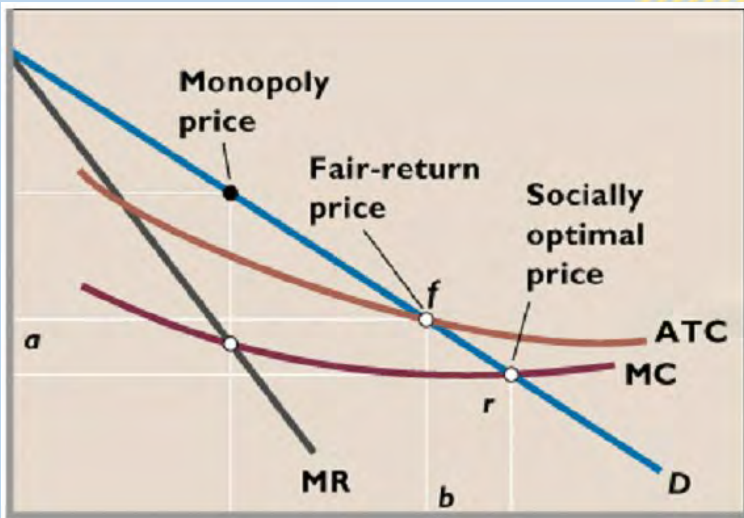
Main Grid

Natural Monopoly

Mini Grids

Isolated Home Systems

Product Lifecycle



MARKETING OBJECTIVE	GAIN AWARENESS	STRESS DIFFERENTIATION	MAINTAIN BRAND LOYALTY	HARVESTING, DELETION
Competition	Few	More	Many	Reduced
Product	One	More versions	Full product line	Best sellers
Price	Skimming or penetration	Gain market share, deal	Defend market share, profit	Stay profitable
Promotion	Inform, educate	Stress competitive differences	Reminder oriented	Minimal promotion
Place (distribution)	Limited	More outlets	Maximum outlets	Fewer outlets

Elements for take off

1. Anchor demand and productive uses
2. Workable regulations
3. Access to financing and smart grants
4. Adaptation of latest, proven technologies
5. Integrated as solution in geo-spatial planning
6. Community participating and engagement
7. Ease of doing business & decentralization
8. Building of operational skills
9. Collaborative institutional framework
10. Local initiatives and global microgrid industry

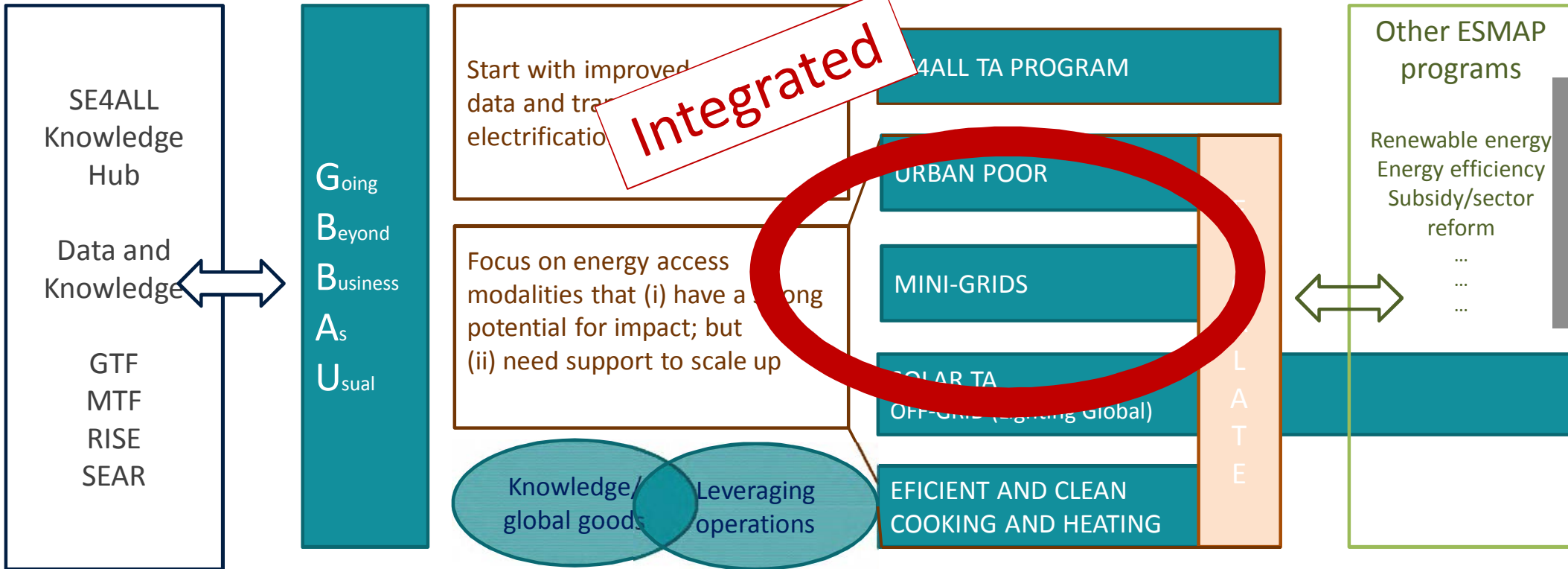
Asia experiences

*Many touched on
this morning*

ESMAP Business Plan for 4 years

SDG 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services

ESMAP energy access programs



Specific country and regional needs: ABGs, AFREA, ASTEA

Global Facility on Mini Grids

SUMMARY

6

Problem Statement

Mini-grids are expected to play a critical role in meeting the Sustainable Energy for All goal of universal energy access by 2030. In the past, proliferation or acceptance of mini grids as a credible energy access option was constrained by a number of factors: gaps in policies and regulations, a lack of long-term financing, and a lack of capacity or interest among power producers. More recently, technological and institutional innovations, and cost reductions have made them an attractive alternative. 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.

Proposed Response

In response, ESMAP initiated a Global Facility for Mini Grids to accelerate the pace of electrification to large groups of people by upscaling least-cost mini grids into World Bank Group operations as well as develop the 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 and South and East Asia. Mini-grids are the expected least-cost option for more than 120,000 villages and towns in these regions. The initiative is part of the joint effort on the SE4All High Impact Opportunity on Mini Grids.

New Team

Universal Access to Electricity

May 2015

Global Facility on Mini Grids

Upscaling Mini Grids for Least Cost and Timely Access to Electricity Services



PILLAR 1

OPERATIONAL UPSCALING – LEARNING BY DOING

Accelerate the pace of electrification for large groups of people by upscaling least-cost mini grids into World Bank Group operations and national electrification programs.

Client countries and operational task teams

PILLAR 2

GLOBAL KNOWLEDGE DEVELOPMENT & LEARNING

Develop the required knowledge to assist in achieving the first objective as well as contribute to the frontiers of global learning.

Client countries, task teams and partners

Pillar 1: “Learning by doing” – operational upscaling



Haiti

Liberia
Ghana
Mali
Gabon
Zambia

Kenya
Tanzania
Nigeria

DRC

Nepal
Myanmar
India
Bangladesh

Pillar 1: “Learning by doing” – operational upscaling

Ghana

Objective of the ESMAP TA support:

The objective of this activity is to assist the Government of Ghana to consider, through various approaches to business model development and the plausible associated policy and regulation necessary for the deployment of mini/micro grid electrification systems in rural communities in the vicinity of the Volta Lake.

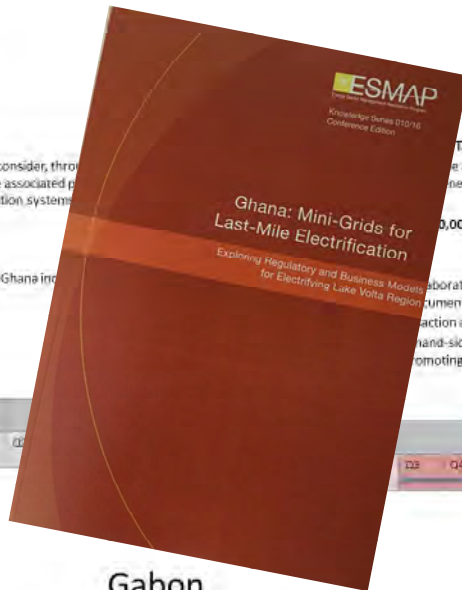
Key Activities:

- Report and Recommendations on Mini-Grid Business Models for Ghana in order to inform the choice of the business model(s).

Support amount: \$170,000

Timeline:

FY16				FY17				FY18			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4



Liberia

Objective of the ESMAP TA support:

The objective of this activity is to support the sustainability and greening of the Mini-grid in Lofa County as part of the Renewable Energy Access Project.

Support amount: \$100,000

Key Activities:

- Review and validation of the Business Plan of the Mini-grid Operator including tariff setting and documentation;
- Provide technical and financial advice to select the Mini-grid Operator;
- Support the Mini-grid Operator in the implementation of demand-side management (DSM) of the Mini-grid through energy efficiency measures, deferring investments, and promoting productive uses;

FY17				FY18			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Gabon

Objective of the ESMAP TA support:

The development objective of this activity is to assist the Government of Gabon in the operationalization of a sustainable delivery model for basic electricity services in rural areas.

Key Activities:

- Development of appropriate costing and cost-recovery models to determine the size of investments required as well as the likely cost of O&M, in turn informing the pricing that will be applied to customers;
- Preparation of a business plan and definition of the level of subsidy for the operator

Support Amount: \$100,000 (TBC)

Timeline:

FY16				FY17				FY18			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Mali

Objective of the ESMAP TA support:

Strengthening the capacity of the Malian authorities and increasing the availability of technical resources to scale-up energy access and use of renewable energy through the provision of targeted expertise.

Key Activities:

- Analyze different tariff/subsidies scenarios that would help reach overall sector financial equilibrium
- Advice to the Rural Electrification Agency (AMADER) on optimization of tariffs and operationalizing cross-subsidies for rural access
- Analyze opportunities to promote productive uses in rural areas with the goal to extend the mini grid service to dedicated areas where commercial usage is heavier
- Strengthen capacity of rural electrification stakeholders, in particular mini grid private operators, the regulator (CREEE) and the national rural electrification agency (AMADER)

Support Amount: \$165,000

Timeline:

FY16				FY17				FY18			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Zambia

Objective of the ESMAP TA support:

Prepare pipeline of mini-grid projects having micro and mini hydro power plants as generation sources for rural growth center (RGC) electrification.

Key Activities:

- Identify suitable project locations matching key conditions for sustainability. The financial model should assist in keying out conditions for sustainability.
- Find out suitable scale of projects, tariffs, and subsidy for the financially feasible and sustainable micro/mini hydro mini-grid rural electrification projects through sensitivity analysis in the financial model.
- Collect cost information including capital and operating costs for micro/mini hydro mini-grids in the Zambian context.

Support Amount: \$350,000 (TBC)

Timeline:

FY16				FY17				FY18			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Pillar 1: “Learning by doing” – operational upscaling

Successful upscaling in two countries

An initial WB pipeline

COUNTRY	PROJECT NAME	IMPLEMENTING AGENCY	SREP FUNDING US\$ MILLION	SYSTEMS AND TECHNOLOGY CHOICES
Kenya	Hybrid Mini-Grid Systems	World Bank Group	10.0	Hybrid Mini-Grid (solar and wind)
Mali	Rural Electrification Hybrid Systems	World Bank Group	15.4	Hybrid Mini-Grid
Tanzania	Renewable Energy for Rural Electrification	World Bank Group	15.0	Hybrid Mini-Grid/Micro-Grids, options include hydro, solar, biomass, biogas, and wind
Liberia	Renewable Energy for Electrification	World Bank Group and African Development Bank	41.7	Hybrid Mini-Grid
Nepal	ABC Business Model	World Bank Group	8.0	Hybrid Mini-Grid

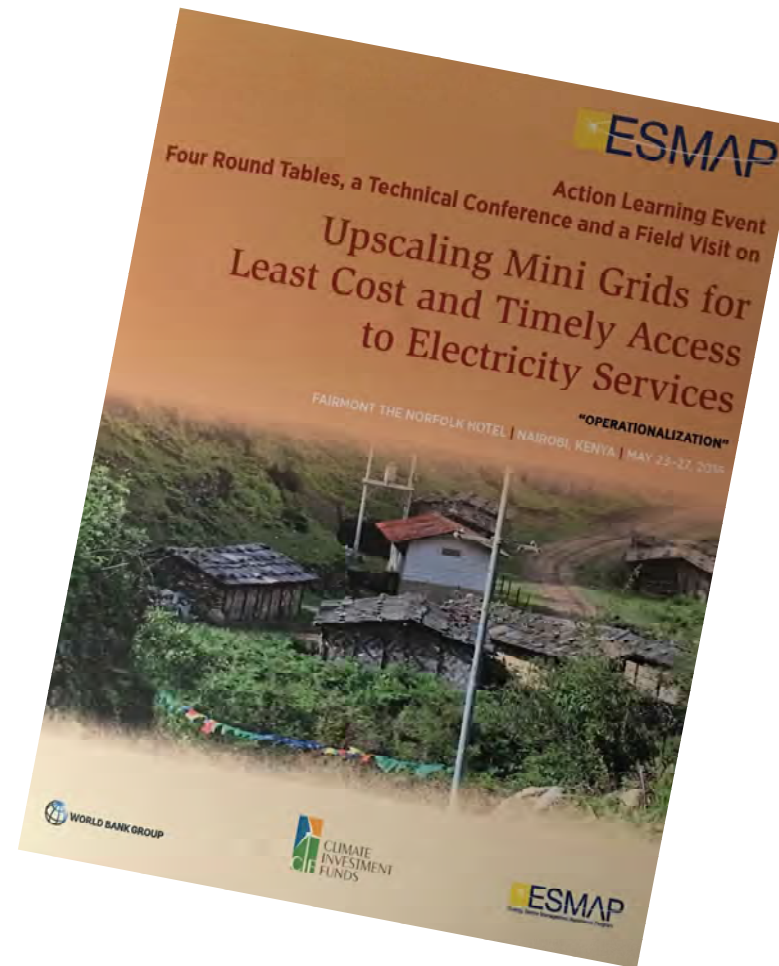
SREP Countries

Country	Project Name	MDB	SREP Funding US\$ Million
Kenya	Electricity modernization project	World Bank	7.5
Mali	Rural Electrification Hybrid Systems	World Bank	15.4
Tanzania	Mini-grids project	IFC	4.95
Liberia	Renewable Energy for Electrification in North and Center Liberia Project-Mini Grids	World Bank	25
Liberia	Renewable energy for Electrification in Eastern and South Eastern Liberia	AfDB	25
Nepal	South Asia Sub-regional Economic Cooperation Power System Expansion Project: Rural Electrification Through Renewable Energy	ADB	11.78
Maldives	Preparing Outer Island Sustainable Electricity Development Project (including TA)	ADB	13.1
Mali	Development of Micro/Mini Hydroelectricity for Rural Electrification in Mali (PDM-Hydro)	AfDB	10.90
Vanuatu	Rural Electrification Project	World Bank	6.75
Solomon Islands	Renewable Energy Access Project	World Bank	6.9
Ghana	RE Mini-Grids and Stand Alone Solar PV Systems	AfDB	17.5
Bangladesh	Off-grid solar PV: Mini-grid	ADB	5.0
Rwanda	REF Mini-grids subprogram	WB	12.1
Uganda	Decentralized Renewables Development Program	AfDB	4.5
			141.38

Pillar 2: Global Knowledge Development and Learning

Confirmed participation	
Overall	202
1. GMG Africa roundtable (closed)	50
2. SREP/CIF roundtable (closed)	32
3. Kenya Mini Grid sector (open)	134
4. Private sector roundtable (open)	101
Technical conference (open)	140
Field trip (open)	78
Club-ER	7
HOMER Training Monday	28
HOMER Training Tue + Fri	25
Number of countries represented	29
Number of African countries	19

* Out of 400 invitations



- Processes on upscaling – round tables
- Issues based technical conference
- Linking just in-time solutions

Pillar 2: Global Knowledge Development and Learning

Name	Date Modified	Size	Kind
2015 - 11 - USDOE - Global LEAP - Off-Grid Appliance Market_Research_Summary.pdf	Dec 18, 2015, 22:17 PM	1.6 MB	PDF Document
2015 - 11 - Global - SunConnect - Off-Grid is booming! But which off-grid industry exactly.pdf	Nov 11, 2015, 20:56 PM	399 KB	PDF Document
2015 - 11 - Global - Rocky M Instit - Island Operations Case Studies OECD - 5_53784_IslandsRenewableMicrogrids.pdf	Nov 11, 2015, 12:41 PM	3 MB	PDF Document
2015 - 11 - Caribbean - NRG - Necker Microgrid - Sir Richard Branson.pdf	Nov 11, 2015, 21:30 PM	75 KB	PDF Document
2015 - 10 - USA - GE - Forms New Company in \$1B Play for Disruptive Energy Market - Microgrid Knowledge.pdf	Nov 11, 2015, 21:52 PM	440 KB	PDF Document
2015 - 10 - Myanmar - Foreign Affairs - KWR Intern - Out of Darkness.pdf	Nov 10, 2015, 23:43 PM	147 KB	PDF Document
2015 - 10 - Global - GVEP - Productive use - webpage.pdf	Jul 1, 2015, 16:21 PM	323 KB	PDF Document
2015 - 10 - Global - GVEP - Mini-grids - webpage.pdf	Jul 1, 2015, 16:20 PM	211 KB	PDF Document
2015 - 10 - Global - art - Financing the DESCO S-Curve.pdf	Dec 4, 2015, 9:23 AM	656 KB	PDF Document
2015 - 10 - Africa - ADB - Interesting Access Map.pdf	Dec 3, 2015, 0:04 AM	598 KB	PDF Document
2015 - 10 - Africa - ADB - Map Share of population without access and population without.pdf	Nov 11, 2015, 5:50 AM	427 KB	PDF Document
2015 - 09 - USA - PECO - microgrid approval - \$50 to \$100M .pdf	Oct 27, 2015, 23:22 PM	133 KB	PDF Document
2015 - 08 - Myanmar - P152936 - Myanmar000Nat0rification0Project0.pdf	Nov 9, 2015, 8:09 AM	2.4 MB	PDF Document
2015 - 08 - Global - McKinsey&Company - Greening_the_future - new technologies.pdf	Nov 9, 2015, 2:53 AM	8.1 MB	PDF Document
2015 - 08 - Global - ARE - Risk M			
2015 - 08 - Global - ARE - Risk M			
2015 - 06 - USA - Siemens - Micr			
2015 - 06 - SE4All - Clean-Energ			
2015 - 06 - Cambodia - USAID - I			
2015 - 06 - Africa - USAID - Pow			
2015 - 06 - Africa - ARE - Best Pr			
2015 - 05 - SE4All - HIO - Mappir			
2015 - 05 - Africa - Deloitte & Tou			
2015 - 03 - Denmark - Nicholas K			
2015 - 00 - USA - NREL - New Sc			
2015 - 00 - USA - Microgrid Know			
2015 - 00 - Cambodia - EAC - Re			

Getting ready to be shared

box

2012 - 00 - Myanmar

2012 - 00 - Global

2011 - 09 - Global

2011 - 09 - Global

2011 - 09 - Global

2010 - 00 - Africa

2008 - 11 - Global

2008 - 04 - Global

2008 - 10 - Global

2008 - 10 - Global

2008 - 10 - Vietna

2008 - 10 - Vietna

2000 - 00 - Mining

2009 - 09 - Mini-Grid Design Manual - TR_mngriddesignmanual21564-2.pdf

Uploaded Dec 4, 2015 by Jon Exel 10.3 MB

2009 - 10 - Vietnam - WB - REAP - community component (2) PDF.pdf

Uploaded Dec 4, 2015 by Jon Exel 203.6 KB

2009 - 10 - Vietnam - WB - REAP - community component (2) PPT.ppt

Uploaded Dec 4, 2015 by Jon Exel 122.0 KB

2009 - 10 - Global - WB PPIAF - Map.pdf

Uploaded Dec 4, 2015 by Jon Exel 1.5 MB

2009 - 10 - Global - WB PPIAF - Small-Scale Private Service Providers of Water Supply and Electricity.pdf

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Jon Exel

New Note in News & Knowledge

New Chat

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All Notes

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JANUARY 2016

US DOE Channels over \$10M to Micro...

1/19/16 US DOE Channels over \$10M to Microgrids f...

In Rural India, Solar Microgrids Show Mi...

1/19/16 In Rural India, Solar Microgrids Show Mixed S...

How microgrids are bringing power to ru...

1/11/16 How microgrids are bringing power to rural Ke...

Microgrid Market to Expand at an Extrao...

1/8/16 Microgrid Market to Expand at an Extraordinary 20.70 % CAGR owing to Development of Renewable Energy The global microgrid market stood at US\$9.8 bn in 2013 and is expected t...

6 Grid Edge Stats to Kick Off 2016 | Gree...

1/8/16 6 Grid Edge Stats to Kick Off 2016 Photo Cred...

Microgrids For 100 Kenya Villages | Cle...

1/7/16 Microgrids For 100 Kenya Villages January 71...

Factiva Alerts

1/6/16 Factiva Alerts CleanSpark, Renova Power Networks Partner to Facilitate Advanced Microgrid Deployment PR Newswire (U.S.) 5 January 2016 13:23 455 words En...

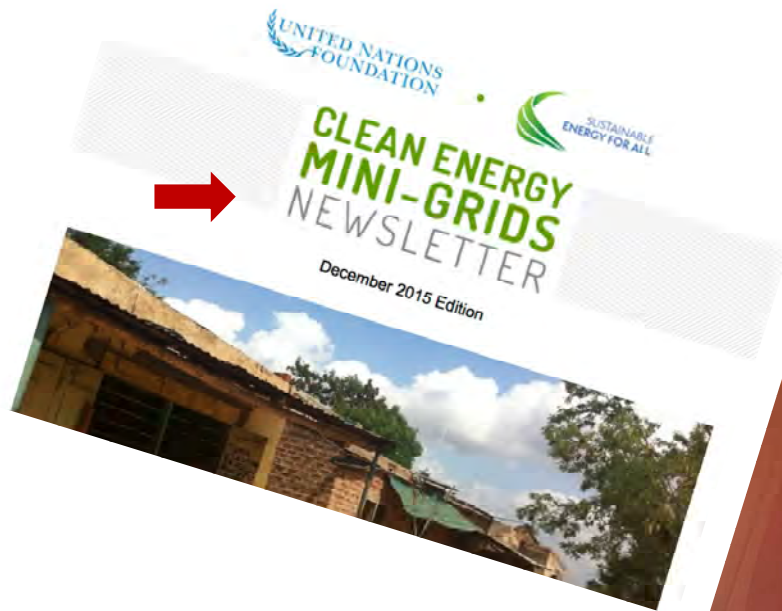
China's first gov't-funded new energy...

1/6/16 China's first gov' t-funded new energy micro...



Pilot – interested?
sign up

Pillar 2: Global Knowledge Development and Learning



Newsletter



Case studies



Just in time reports

Pillar 2: Global Knowledge Development and Learning

➔ Video Exchange Hub

digitalGREEN ABOUT US DISCOVER CONNECT TOOLS WORK

Who we are
A not-for-profit which brings together technology and social organisations to improve agriculture, health and nutrition
[READ OUR STORY](#)

What we do
We build innovative platforms to enable rural communities to create and share videos for wider adoption of locally relevant practices
[KNOW OUR WORK](#)

Who we work with
A network of development organisations in SE Asia and Sub-Saharan Africa use our approach to amplify their impact
[MEET OUR PARTNERS](#)

➔ South-South Exchanges

digitalGREEN ABOUT US DISCOVER CONNECT TOOLS WORK

Community Videos

★ FEATURED MOST LIKED MOST VIEWED MOST ADOPTED

7 Videos | 50:38
Maternal, Child Health ...
Madhya Pradesh | Neemadi
By: RMNT
1,590 | 10,58 | 934

5 Videos | 37:02
Plant and Soil Nutrient ...
Telangana | Telugu
By: SERP
5,244 | 9,296 | 1,125

3 Videos | 01:02:20
Paddy Cultivation Prac...
Odisha | Odia
By: GIMMYT
4 | 1,974 | 26

13 Videos | 01:40:26
Ethnoveterinary Practi...
Karnataka | Kannada
By: GREEN Foundation
550 | 8,444 | 162

EXPLORE VIDEO LIBRARY

Blog

When Settipalli Farmers...
Jan. 12, 2015
Andhra Pradesh Rural Inclusive Growth Project (APRIGIP) mobilizes farmers as producer groups to share knowledge on be ...read more

Resources

Annual Report 2014-15
A comprehensive description of Digital Green activities throughout the financial year 2014-2015.

Pillar 2: Global Knowledge Development and Learning

- **Global RFPs**

- Comparative analysis of regulations in 6 countries plus 2 + 2 TA
 - Based on feedback during ALE
- Mini grid operator mapping
 - What countries?
- Add-on geospatial planning

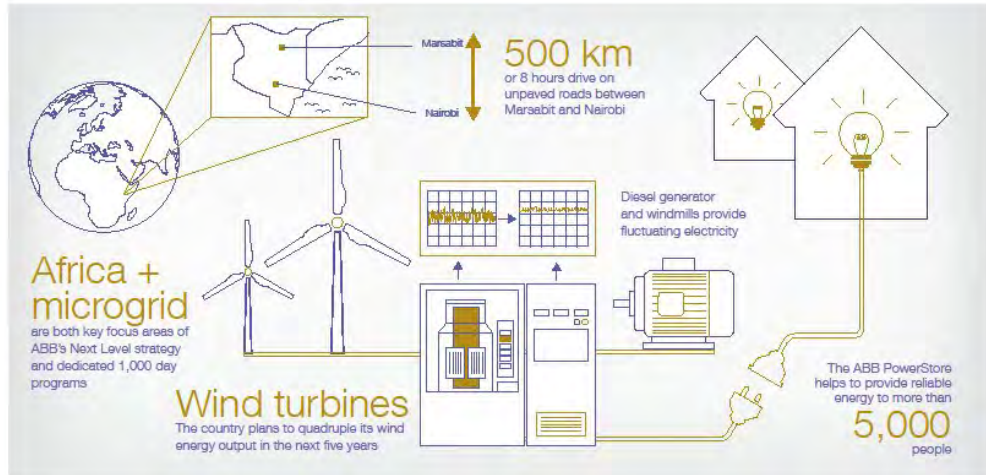
Also discussed this morning

- **Center of excellence**

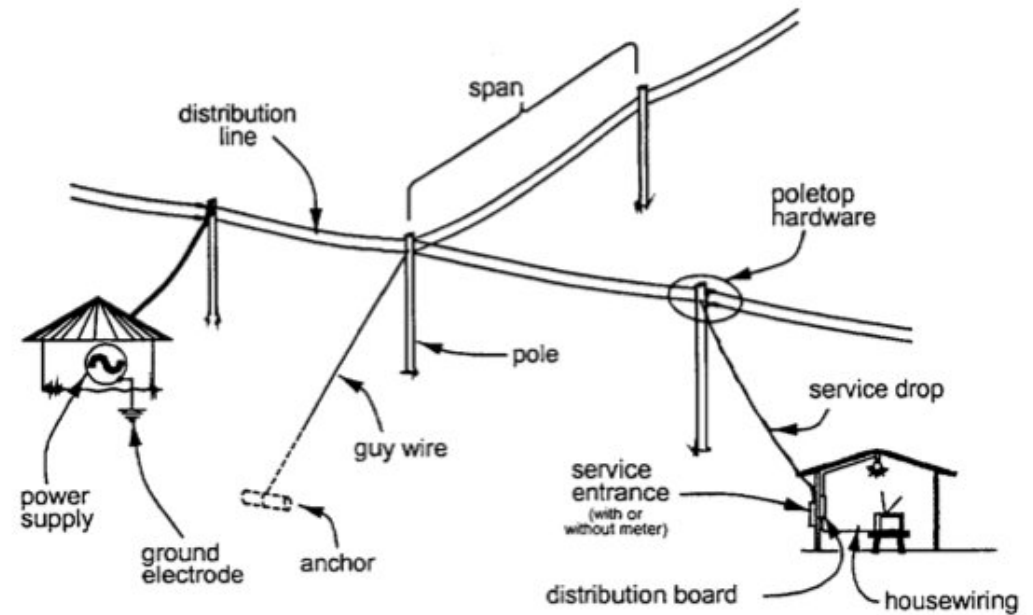
- **Roster of experts** to help you as much as possible in a timely matter

What is a mini-grid?

ABB microgrid solution to boost renewable energy use in remote community in Kenya



Power and productivity for a better world™ **ABB**

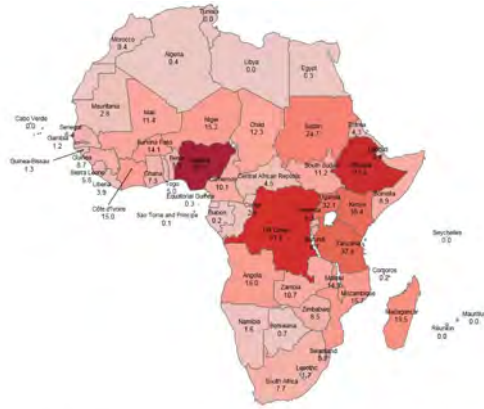


Global

Local

Strong Demand and Need for Timely Solutions

Population without electricity



Source: IEA World Energy Outlook 2015. Data from 2013 for all countries

Population without electricity: millions 635 | 2015. Data from 2013 for all countries

National Electrification Rate



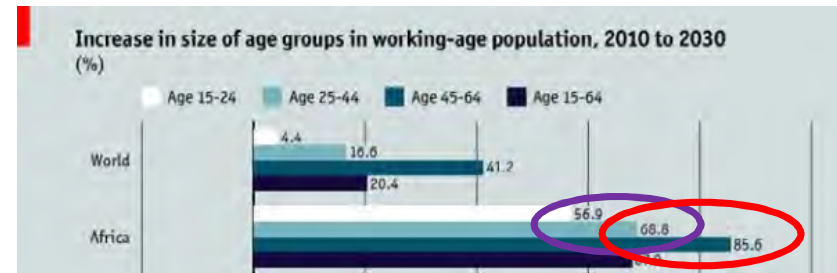
National nr | 1% Source: World Development Indicators (2015)

Avg. GDP Growth '04-'14



Avg. GDP Growth 2004-2014 (Best Available Data) | 2.6% | 11.0%

	People w/o access [million]	National electrification rate [%]	Avg GDP Growth '04-'14 [%]
	>30	<50	>5
Nigeria	96	45	8.6
Ethiopia	71	24	11.0
DR Congo	61	9	6.6
Tanzania	37	24	6.7
Kenya	35	20	5.3
Uganda	32	15	6.9
Total	332		



Source: World Population Prospects; The 2012 Revision, Medium Variant

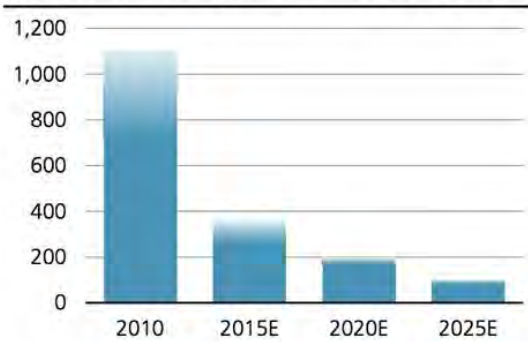
Need for Solutions Tomorrow
Need for Solutions Today

Why now?

PV Module Price Per Watt



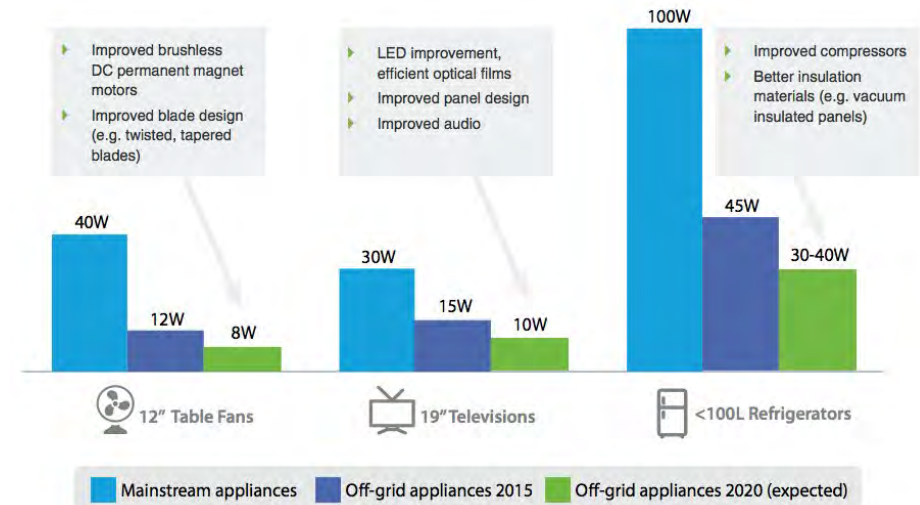
Figure 2: Lithium battery cost to decline >50% by 2020



Source: Tesla, Umicore, UBS. Cost estimates are for the battery pack (€/kWh).



Figure 1. Estimated power rating (W) of off-grid appliances, 2015 and 2020



A Global Agenda



- SE4ALL HIO Clean Energy Mini Grids (Jun '15)
 - 1) Support the integration of CEMG in national and international policy
 - 2) Increase interaction and co-ordination between relevant stakeholders
 - 3) Agreement and knowledge of key concepts, techniques, technologies and approaches
 - 4) Develop and test business models, with effective monitoring and evaluation of outcomes
 - 5) Increase visibility and recognition amongst financiers



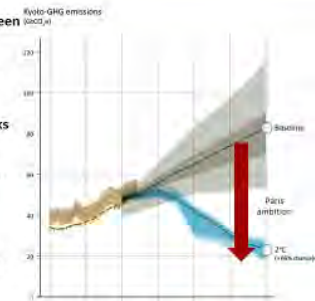
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Global Facility on Mini Grids



The Paris Agreement sets ambitious mitigation goals and creates framework for action by all countries

- Global goal of keeping warming between **1.5-2° C** (Article 2)
- Global peaking “as soon as possible” (Art. 4.1)
- Achieve balance of emissions and sinks by second half of century (Art. 4.1)
- All countries participate in mitigation through **Nationally Determined Contributions (NDCs)**
- Paris agreement sets framework for emission accounting and NDC review



© McKinsey & Company/IEA

Source: UNEP, 2015, 'Ambitious Paris'



WBG ENERGY SECTOR OBJECTIVES



Support client countries in securing the **affordable, reliable, and sustainable** energy supply needed to end poverty and build shared prosperity

➤ Closely aligned with SE4ALL initiative



KEY PRINCIPLES

- From projects to **sector-wide** policy and planning
- Unambiguous position on **coal** projects
- Scale-up of engagement in **natural gas**
- Firm commitment to **hydro** (at various scales)
- Scale up work on **renewable energy**
- Clear priority to **access** in low access countries

