IEF15 INTERNATIONAL ENERGY FORUM ALGIERS

27 September 2016 | Algiers

Sustainable Energy Access: A Critical Factor for Human Development

Parallel Roundtable 1

BCG ENERGY | IEF INTERNATIONAL ENERGY FORUM

Introduction and roundtable themes

Context

- 1.2 billion people globally live without grid access, ~95% of them live in Sub-Saharan Africa and South and East Asia
- Energy scarcity/poverty impacts human development across many axes, from economic to social to health and education
- Sustainable energy access is critical for both developing and developed nations as population grows
- Technology will play a vital role in ensuring the success of sustainable energy access

Session objectives

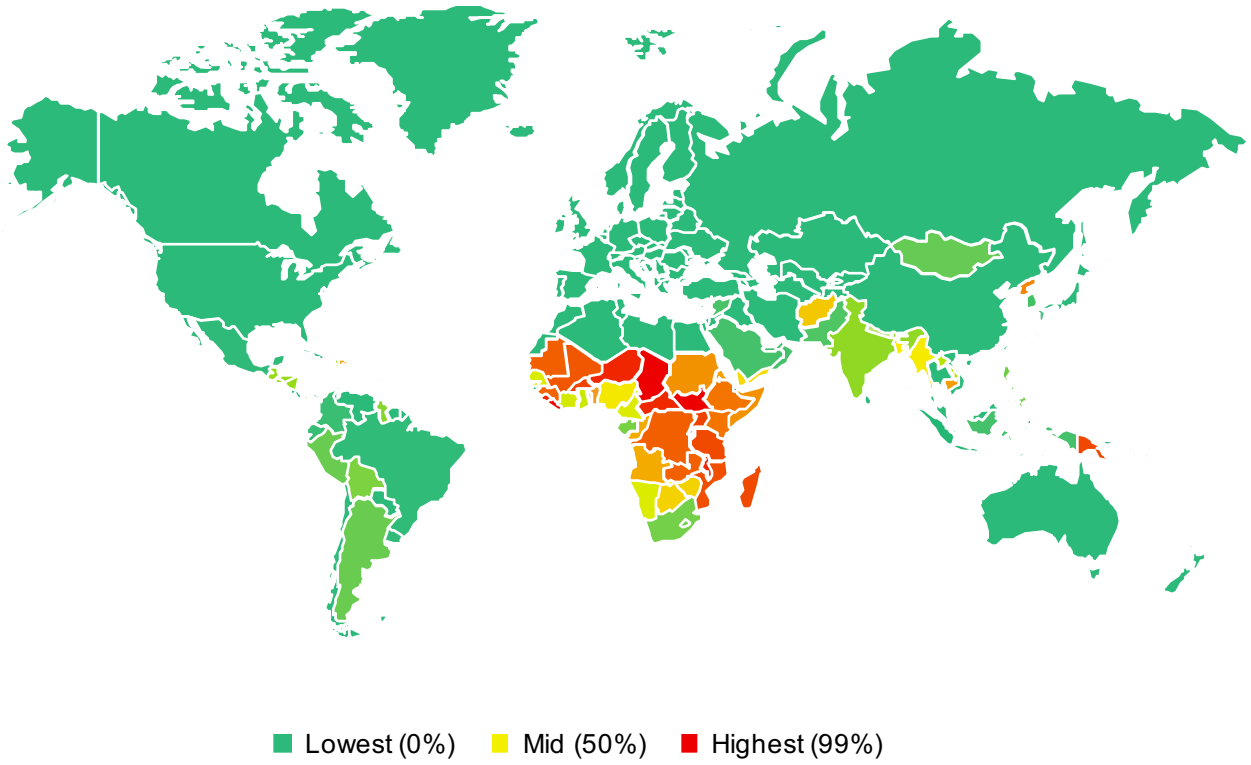
- To exchange perspectives on the drivers for ensuring sustainable energy access
- To understand what is the outlook
- To discuss how the industry will adapt its investment strategy and what government policies are required to support it

Key Question:
What needs to be done to ensure sustainable energy access for all?

1.1 billion people globally live without grid access

Energy access is crucial for social and economic wellbeing

Share of population without grid access



1.1 Billion people globally live without grid access

- 95% live in Sub-Saharan Africa; South & East Asia
- 84% live in rural areas

1 Billion more only have access to an unreliable electricity source

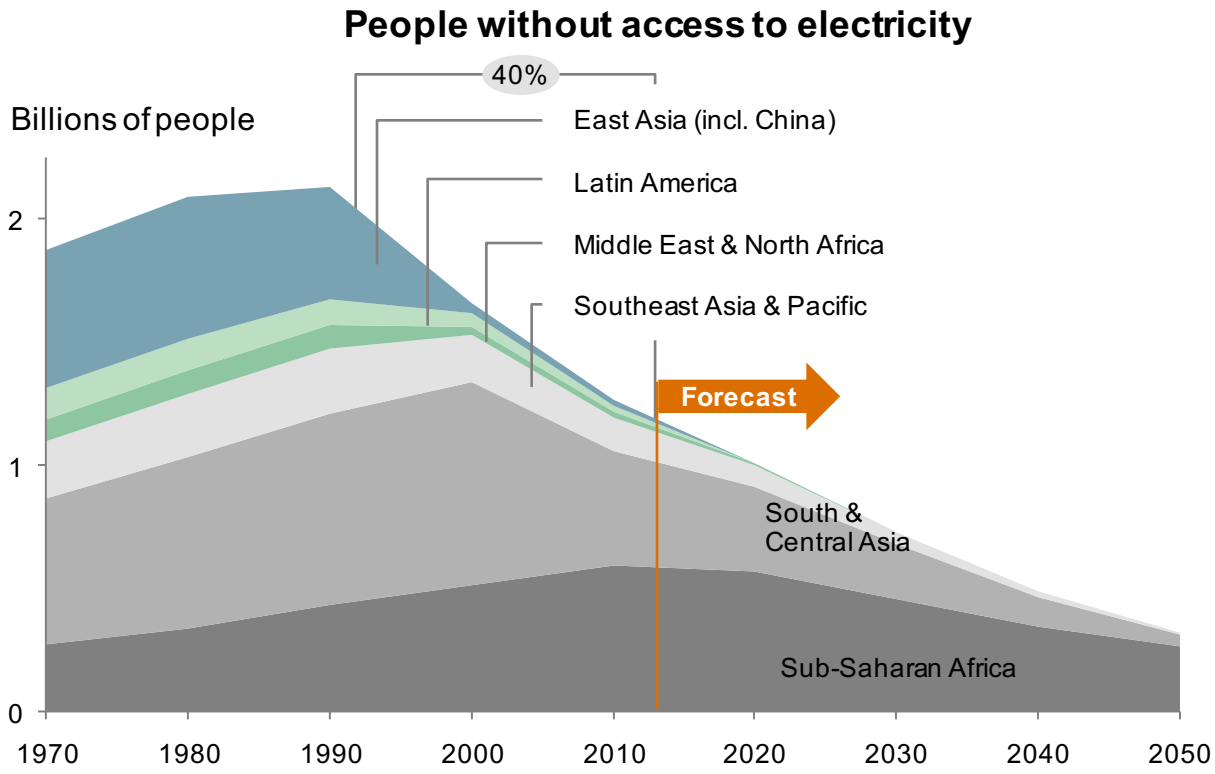
2.9 Billion rely on basic fuels or biomass for cooking/ heating

- 4.3 million people died prematurely due to related indoor air pollution in 2012

Source: World Bank, Bloomberg New Energy Finance. UN, World Health Organisation, G20. The number of people without access to electricity globally has diminished only slightly according to the SE4All Global Tracking Framework 2015.

Energy access has improved by 40% in the last 20 years

Sub-Saharan Africa and South & Central Asia are next focus areas



Key drivers in improved energy access

- Significant rural investment due to East Asia's economic growth
- China encouraged rural power stations to develop supply areas

Key challenges :

- Access to financing and investment
- Poor regulatory environment
- Lack of knowledge and capacity
- Poor quality existing infrastructure
- Mainly dispersed rural populations

Note: A scenario with high GDP growth but lower increase in population
Source: World Energy Council

Sustainable energy access creates significant benefits

Benefits align along 4 dimensions

Economic

- Improved productivity
- Extended operation hours of small businesses
- More mobile connectivity
- Time savings for fuel purchases incl. fuel savings
- Job creation in supply chain

Environment

- Reduced greenhouse gas emissions (CO_2 and black carbon)
- Less landfill from disposable kerosene lanterns

Health

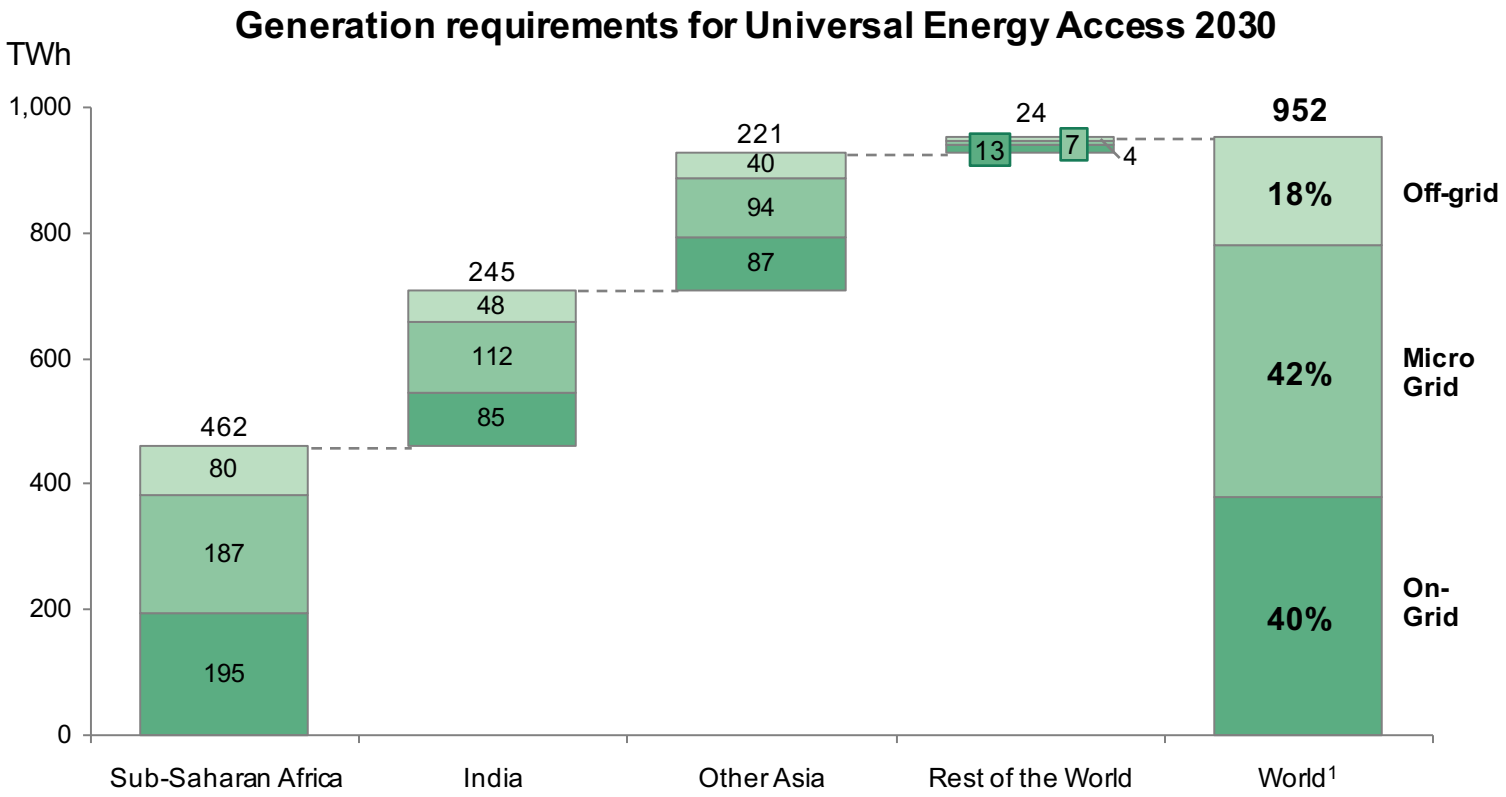
- Reduction of fire hazards
- Reduced exposure to particulate matter
- Reduced risk of accidental ingestion of kerosene
- Reduced risk of compromised visual health

Social

- Longer hours of better illumination
- Improved education
- Improved safety
- Improved social cohesion and leisure quality

Improved access demands both on and off-grid solutions

60% of the new generation need to be connected to micro-grids or off grids



1. Includes OECD and transition economies
Source: IEA

3 Technologies are improving energy access in rural areas

Rural villages are able to leapfrog traditional grid access for distributed renewable energy

Solar Home Systems (SHS)

- Electricity is generated via a PV panel distributed locally at a single property
- Can be used for domestic or small businesses (e.g. mobile phone charging)
- Technical challenges include maintenance, battery life, power consumption
- High impact future technology improvements include low power appliances, LiOn batteries, smart metering, repair analytics and smart-grids

Kiosks

- Electricity is supplied to the consumer via a battery charged by a renewable energy source (PV, Hydro, Wind) or diesel generator
- Typically used for lighting, mobile phone charging, small appliances
- Technical challenges include maintenance, system location tracking
- High impact future technology improvements include low power appliances, LiOn batteries, smart metering, repair analytics and smart-grids

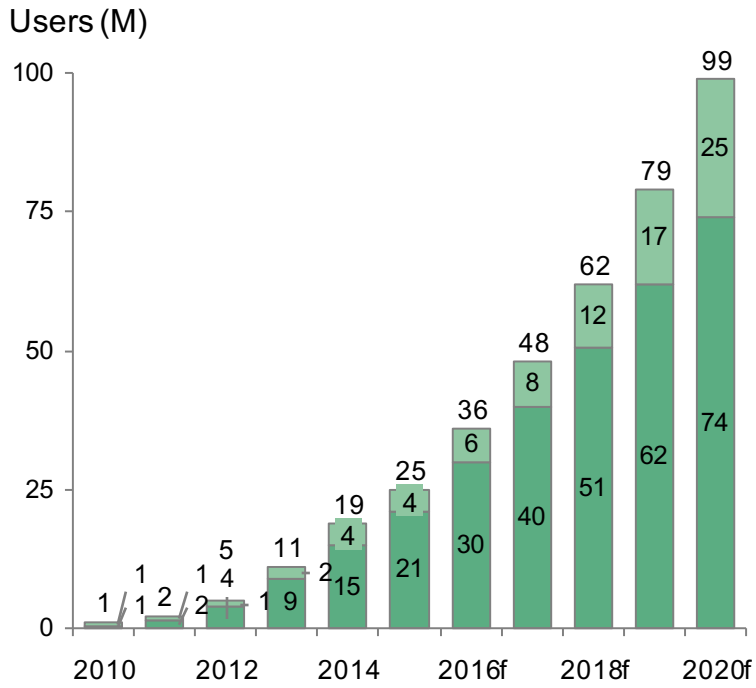
Micro/Mini Grids

- Local electricity generation supplying local demand
- Power supplied through diesel generators, small wind, small hydro or PV
- Technical challenges include implementation cost, load management , communication and monitoring, maintenance
- High impact technology improvements include energy management systems, storage systems/battery technologies, efficiency improvements

Solar home systems are forecast to continue rapid growth

Future growth likely to be driven in part by improving energy access

Users of solar home systems worldwide



Large solar home systems

Portable solar lanterns & Small home systems

or

- Solar home systems experiencing growth in rural areas of Africa, India, Bangladesh
- Many providers are moving to a pay as you go/service model e.g. M-Kopa, BBOXX
- Business model viability is closely linked with mobile payment technology e.g. M-Pesa

Note: large Solar home systems are defined as larger than 10W solar panels. Historical data is based on lighting global and GOGLA data and Bloomberg New Energy Finance estimates
Source: Bloomberg New Energy Finance , Lighting Global, GOGLA

Beyond generation, rural areas face 3 challenges to effectively deliver energy

Consumer Financing

Households are unable to afford investment in solar

- Typical energy expenditure is on a daily basis (e.g. candles)
- Energy expenditure can be up to 40% of a household's income
  - Used for heating, lighting and cooking
- Rural income is often erratic/seasonal

Last Mile Distribution

Limited distribution channels for distributing SHS/batteries

- No regular deliveries to areas
  - e.g. no retail stores, brands etc.
- Poor road and vehicle quality
- Insufficient postal address system

Educating for Demand

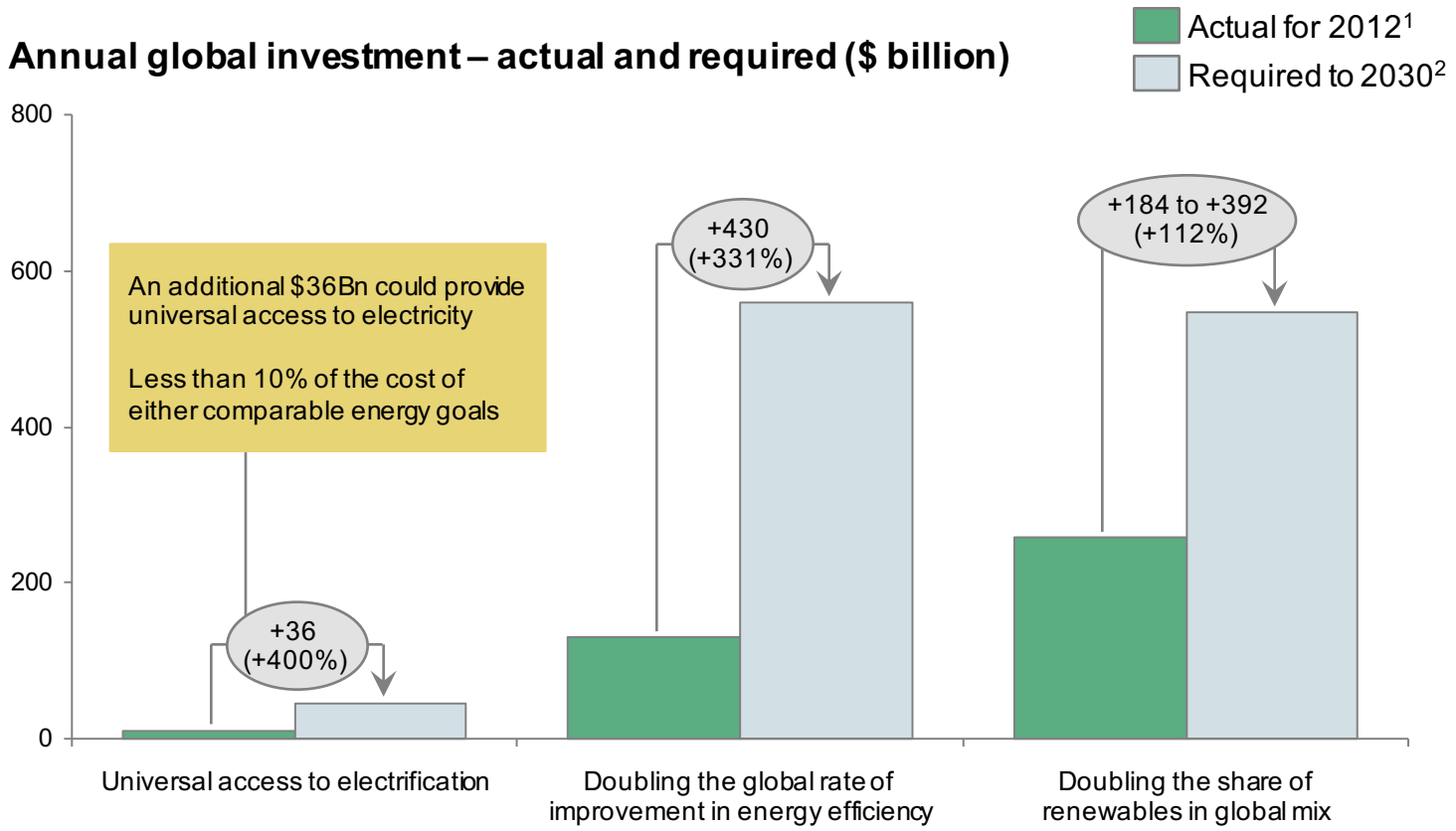
Historical poor quality products have damaged reputation

- Quality and lack of product education created wariness
- Education in new technology needed to create demand
- Capability in maintenance needed locally to retain reputation

Source: BCG project experience

Energy access requires relatively modest investment

Especially when compared with other comparably transformational energy goals



1. The total assumes 2010 investment in access figures for 2012

2. Estimates are derived from various sources: Energy access, electrification: *SE4ALL Finance Committee Report, World Bank (2014); Energy access, cooking:* Energy for All Scenario, *WEO (IEA, 2012); Energy efficiency: 450 scenario, WEO (IEA, 2014); Renewable energy lower bound: WEO 450 (IEA, 2014),* corresponds to a 29.4 percent renewable energy share in total final energy consumption by 2030; Renewable energy upper bound: REmap 2030 (IRENA, 2014), corresponds to a 36 percent renewable energy share in total final energy consumption by 2030.

Source: IEA (Global Tracking Framework 2015)

There is broad institutional support for energy access

We must continue to maintain momentum through institutions, governments and business

United Nations

Sustainable Development Goals[1]

- 17 goals focused on topics from *no poverty* to *climate action*
- Goal 7 is *Affordable and Clean Energy* aiming for (by 2030) with a goal of *Universal access to affordable reliable and modern energy*

Sustainable Energy For All (SE4ALL)[2]

- One of 3 objectives is to *ensure universal access to modern energy services*

World Bank[3]

World Bank Group energy financing has supported $49Bn since 2010

- $21Bn for energy efficiency and renewable energy projects
- $6.5Bn was funded in FY15

Provides a knowledge hub for SE4All

- Developed and runs Global Tracking Framework to track progress towards SE4All goals
- Developed Readiness for Investment in Sustainable Energy (RISE), comparing the investment climate for SE4All Goals

OPEC Fund for International Development (OFID)[4]

Energy Poverty Program in 2015

- $4M in approved grants, All in renewables
- Benefitting 12 countries in Africa and South East Asia

Committed $125M in New Financing for public sector projects in 2015

- 3 projects ($90M) Directly benefitting rural electrification

Activities are run through the 7 year old Energy for the Poor Initiative

Sources: 1. http://www.un.org/sustainabledevelopment/energy/ 2. http://www.se4all.org/ 3. http://www.worldbank.org/en/topic/energy 4. http://www.ofid.org/FOCUS-AREAS/Energy

Key questions for our discussion

1. How can governments work together to ensure sustainable energy access for all, particularly in developing nations?

2. How can governments incentivise the private sector to invest in sustainable energy projects?

3. What are the most effective legal and regulatory frameworks for granting affordable energy prices and appropriate quality standards?

4. What are the main barriers faced with the expansion of energy access?

5. How could distributed generation be regulated for sustainable expansion?

Disclaimer

The observations presented herein are meant as background for the dialogue at the 15th International Energy Forum Ministerial Meeting. They have been prepared in collaboration with the Boston Consulting Group, and should not be interpreted as the opinion of the International Energy Forum or the Boston Consulting Group on any given subject.

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