INTERNATIONAL ENERGY FORUM
NEW DELHI 2018

India | New Delhi

Plenary session 2:
Sustainable and Inclusive Growth: Energy Access and Affordability

Background Paper

INTERNATIONAL ENERGY FORUM

BCG ENERGY

Disclaimer

The observations presented herein are meant as background for the dialogue at the 16th International Energy Forum. 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.

Introduction

Market Context

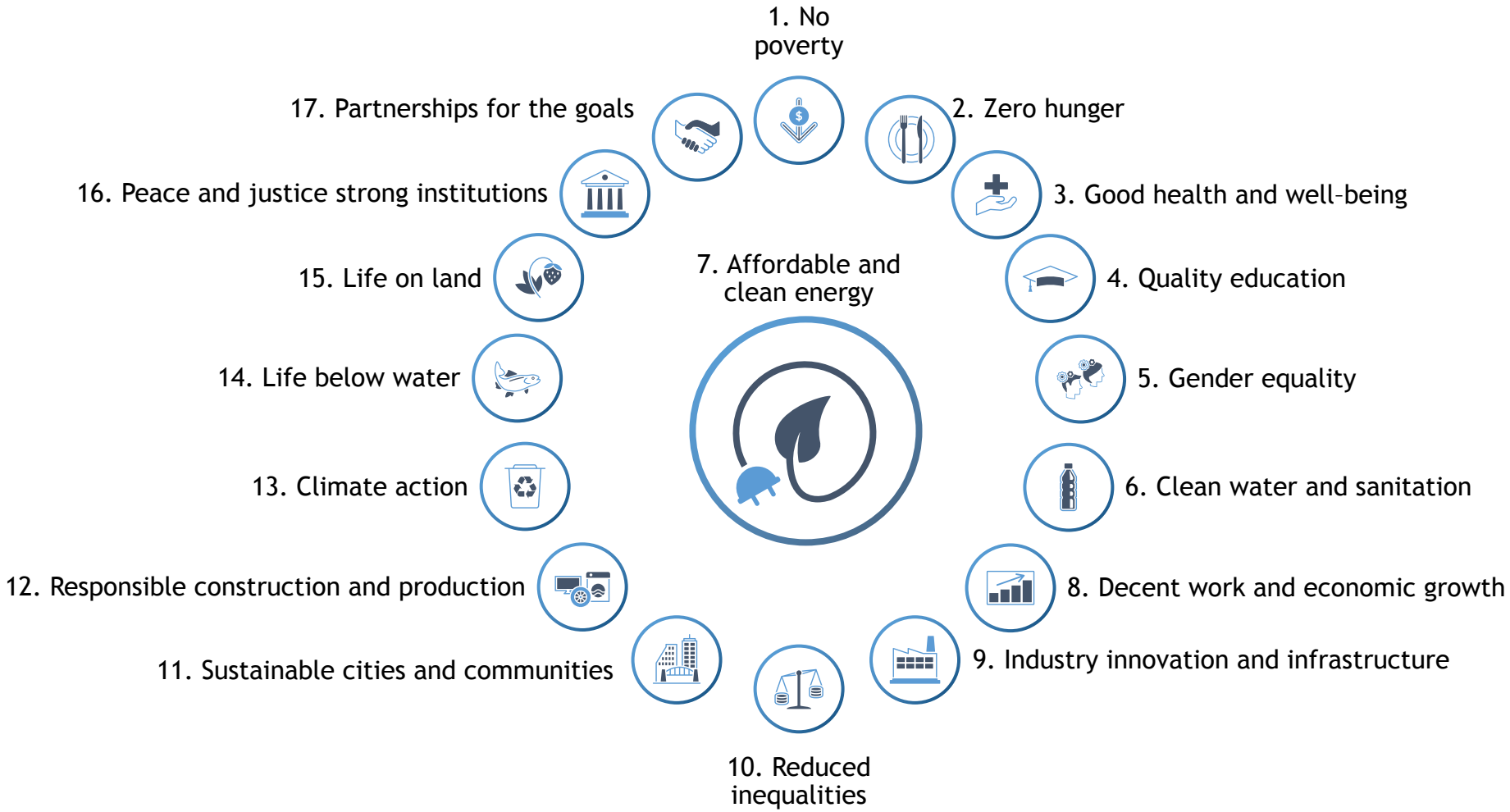
- Energy Access is a key enabler for achieving Sustainable economic, environmental, health and social development
- There are 1.2B people globally without electricity access where Renewable and micro-grids can play an important role
- Investment in clean energy is on the rise and countries are taking these measures seriously

Session Objectives

- To understand key enablers, drivers and benefits of Sustainable energy access
- To explore how renewables and micro-grids could help fill the energy access gap and what the key challenges are
- Overview of where the world is headed in terms of technological investments in this space

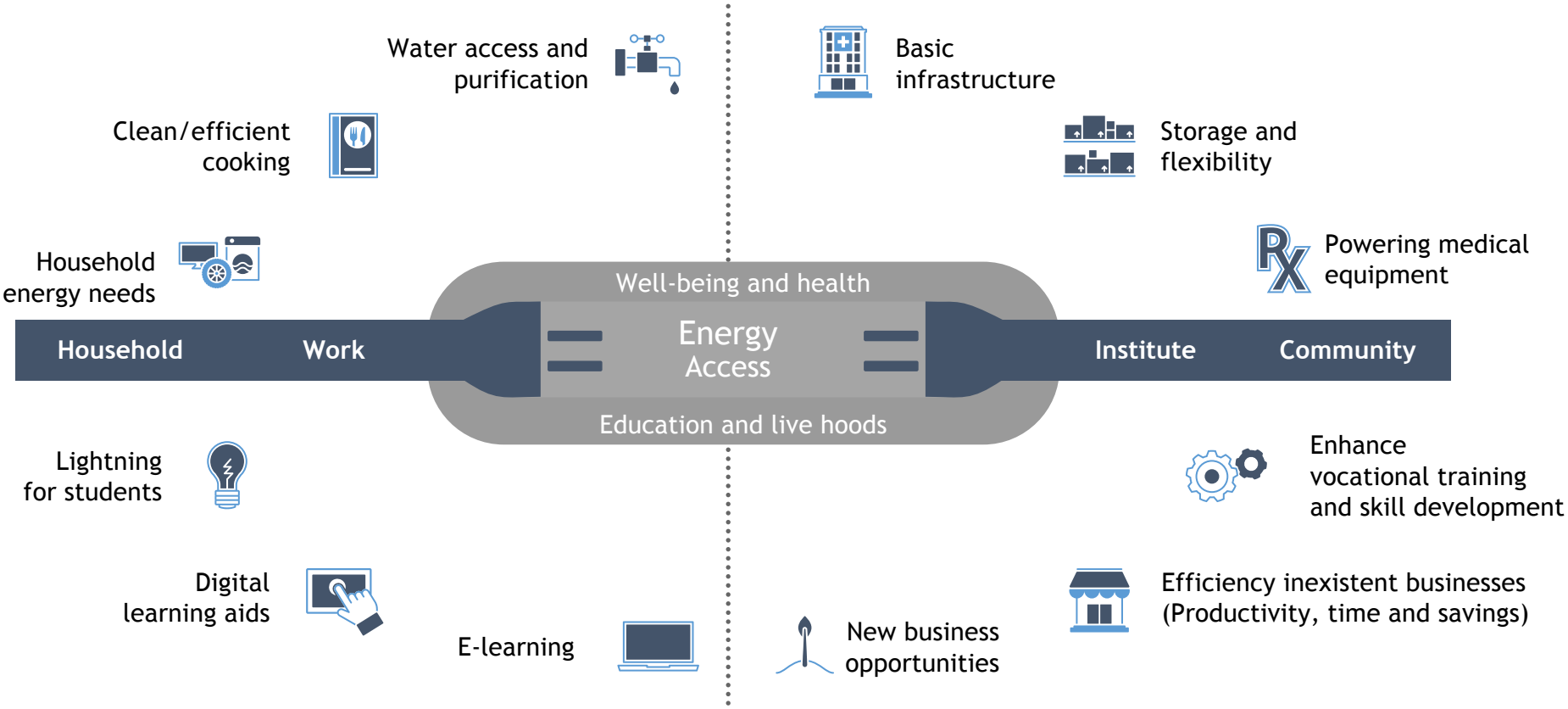
Key Question: How can universal energy access and affordability be promoted, can the energy-water-food nexus create new opportunities?

Energy Access is a key enabler for Sustainable Development



Source: United Nations

Energy Access: What it means to society?



Source: BCG Research

Sustainable Energy Access creates significant benefits in four 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

Reduce exposure to particulate matter

Reduce risk of accidental ingestion of kerosene

Reduce risk of compromised visual health

Social

Longer hours of better illumination

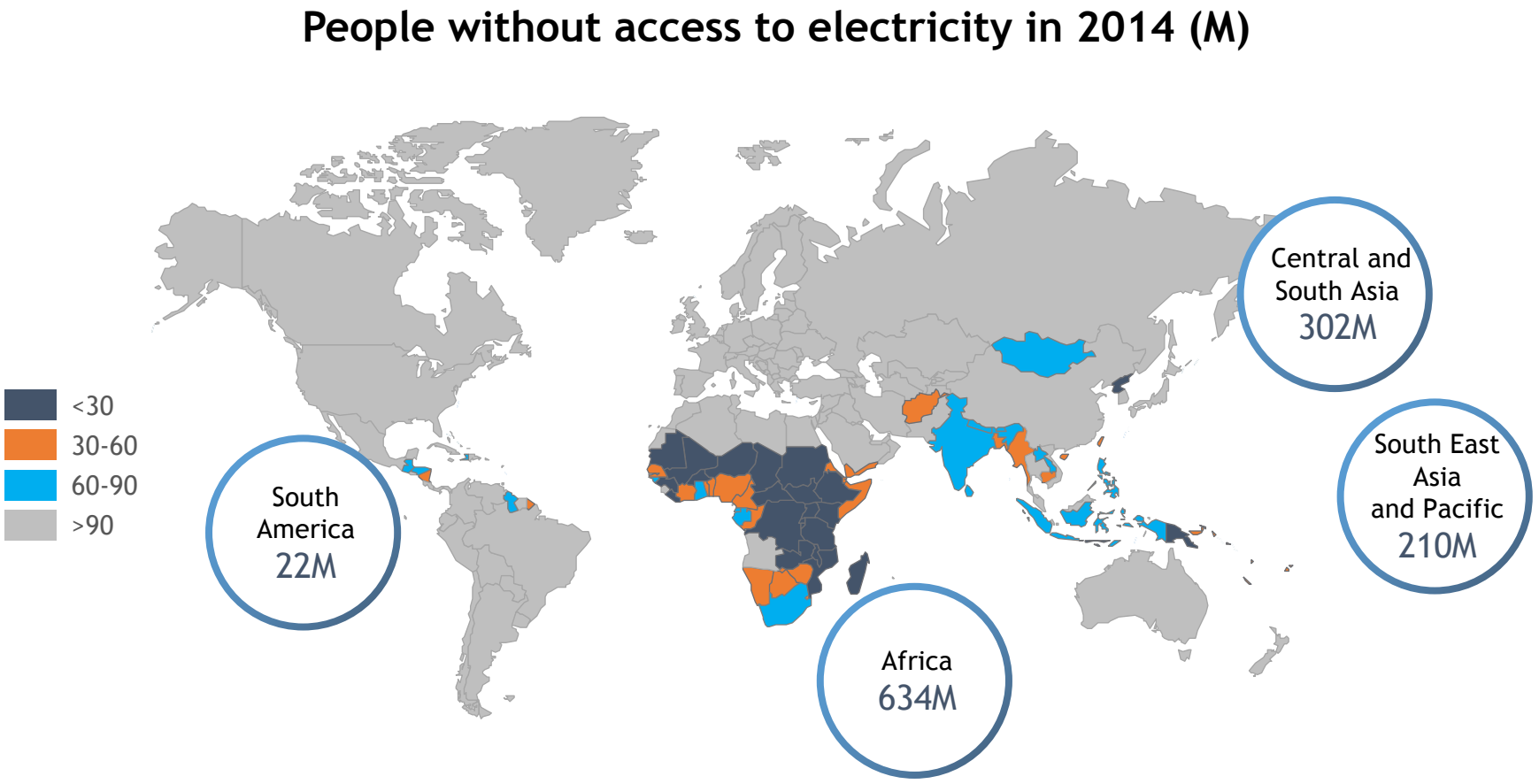
Improved education

Improved safety

Improved social cohesion and leisure quality

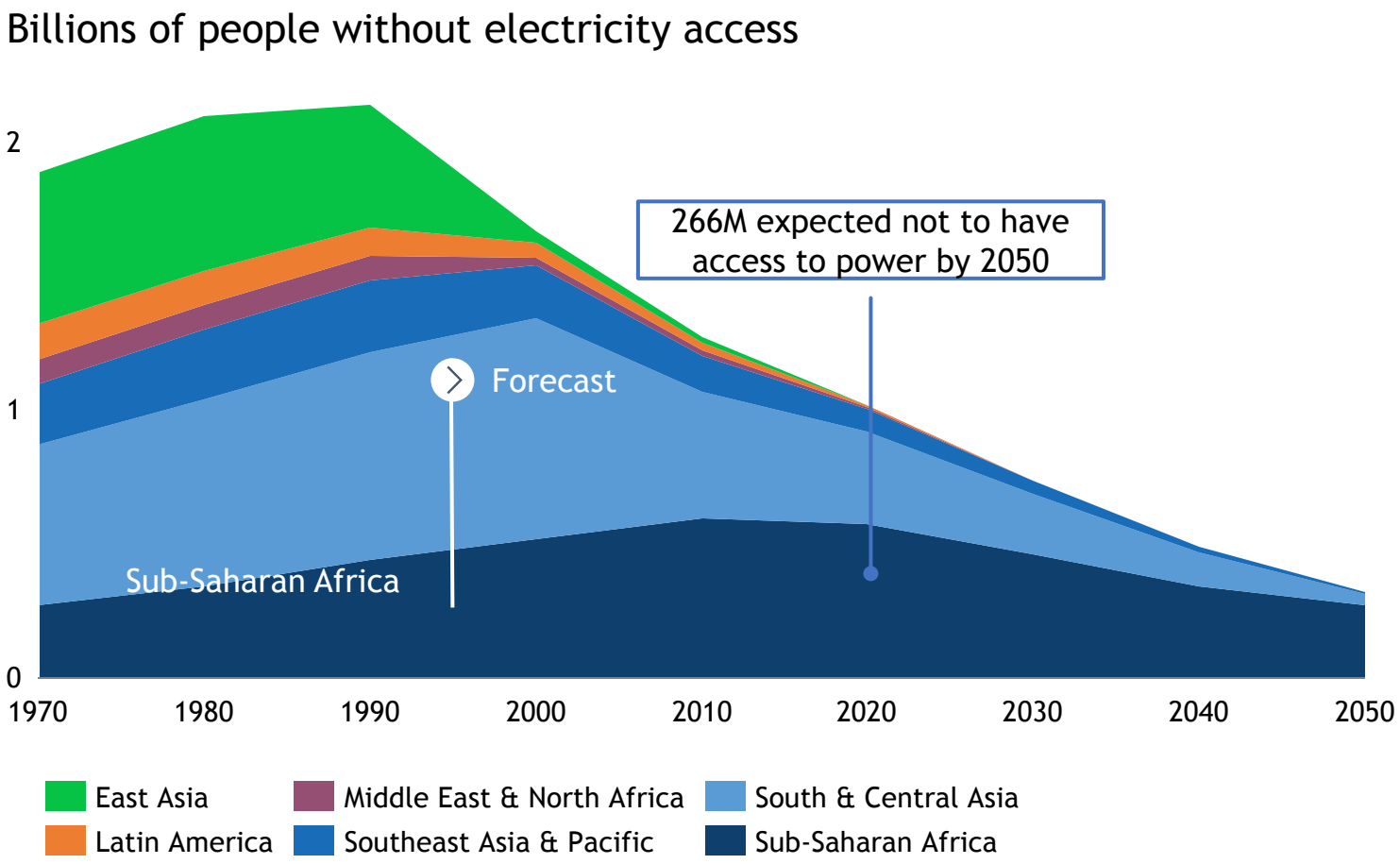
Source: BCG Research

There are 1.2B people globally without electricity access Half of them are in Africa



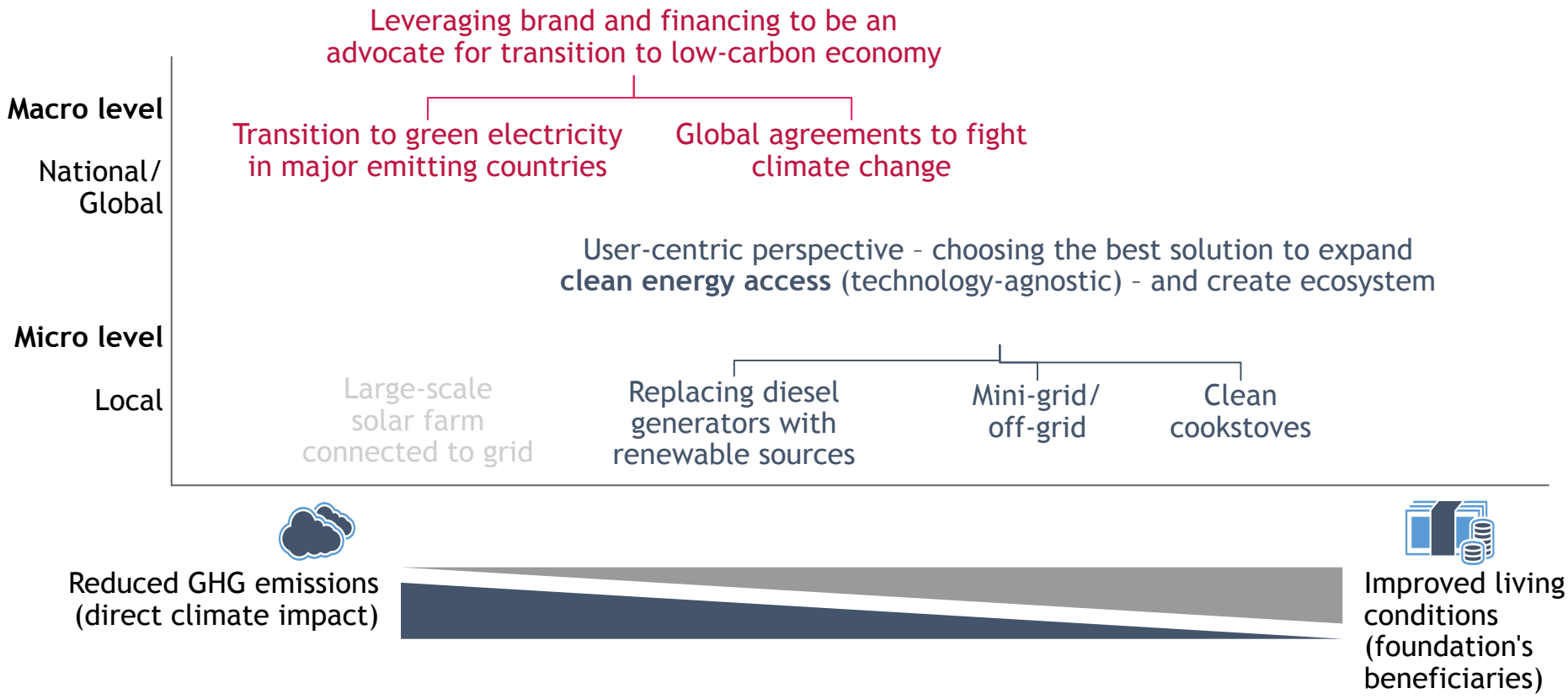
Source: IEA WEO

Sub-Saharan Africa is the (single) geography with a large population expected not to have access to power by 2050



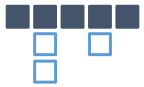
Note: A scenario with high GDP growth but lower increase in population
Source: World Energy Council

Renewable and micro-grids are the local measures to reinforce Energy Access



Renewables and micro-grids are facing some challenges in developing countries





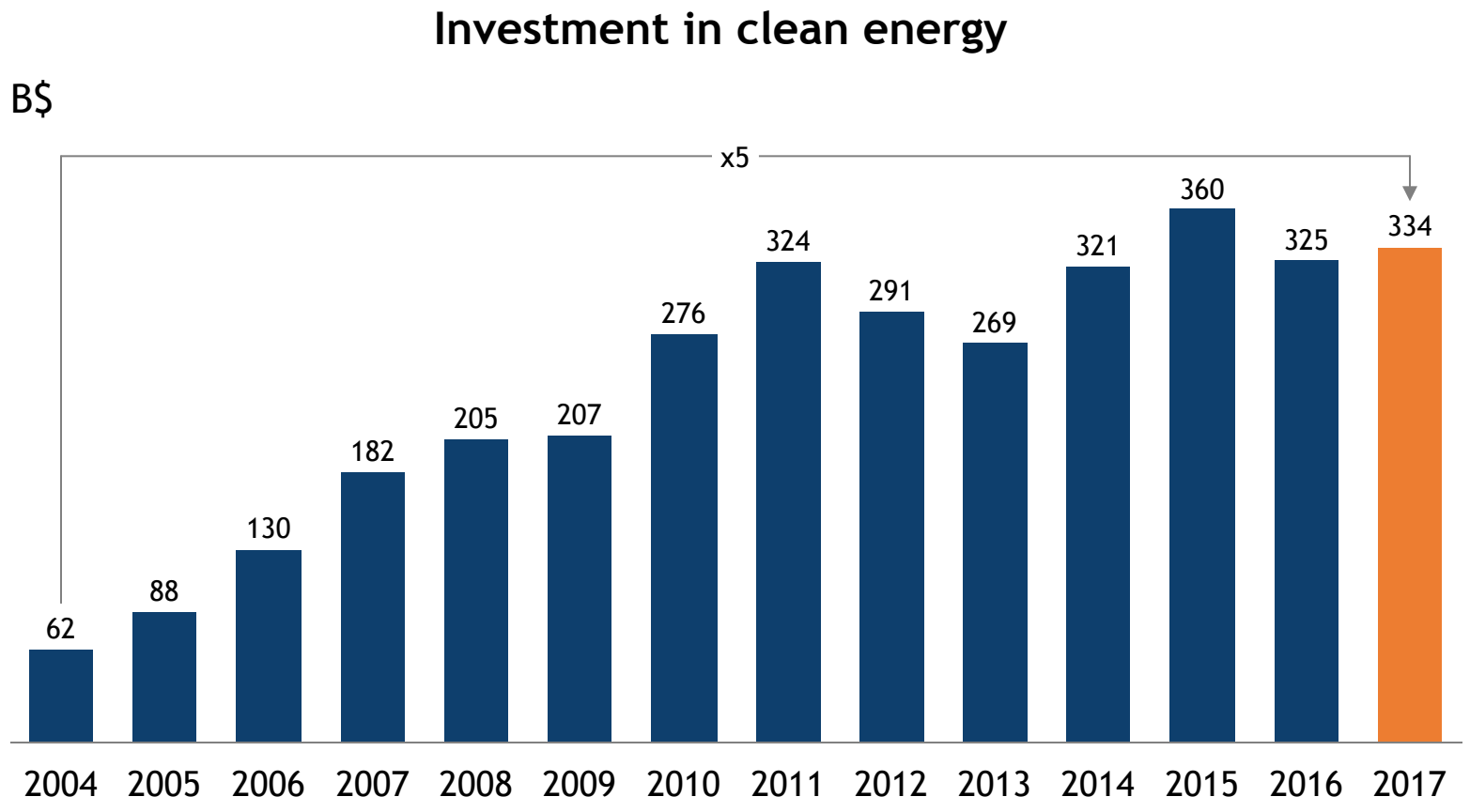
	Large-scale solar (grid connected)	Replacing diesel generators	Off-grid/mini-grid solutions	Clean cook stoves	Pico solar/Solar Home Systems
Challenges					
Barriers	Policy framework and support policies Openness to (foreign) investors CapEx financing	CapEx financing Regulation (e.g., mandatory replacement, capital subsidy also for solar and storage) Customer awareness	CapEx Financing (e.g.,high tariffs) Uncertainty around grid connection Uncertain/low customer demand Technical problems High O&M costs	Awareness/Educ.: Consumer adoption and correct usage Stove design Distribution (stoves and fuel) Financing (CapEx & OpEx)	CapEx Financing/Customer lease financing Distribution Regulation (VAT and import levies)

Notes: Global impact estimates take into account current household expenditure and affordability of clean systems. Lower-bound estimates.
Source: IFC; Hystra; CSE; BCG Analysis

Renewable energy is a credible solution to some of these issues and will help increase access to electricity

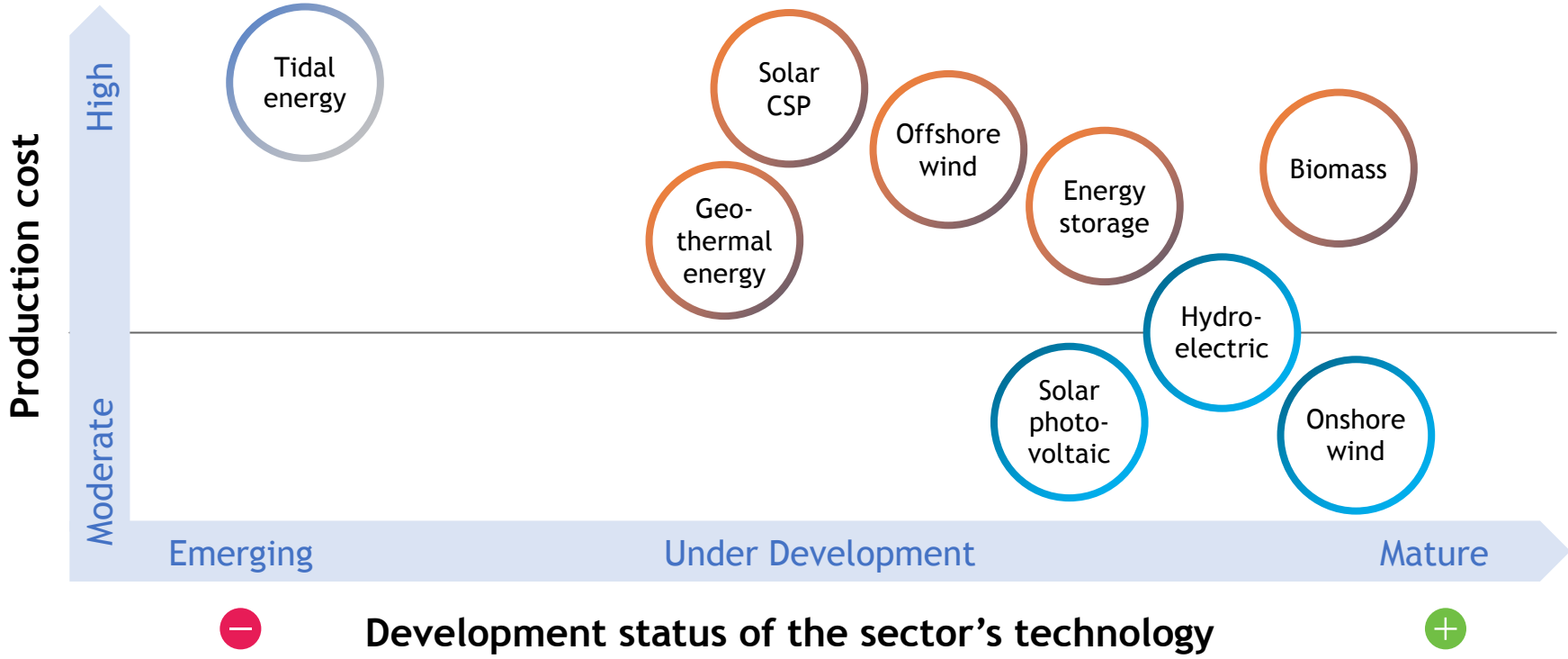
Structural issues resulting in underinvestment		Selected opportunities for renewable energy in Africa
 Heavy investments with long lead times	✓	• Smaller, more flexible investments with shorter payback time • Increased investment appetite both from developed countries and from African governments as well (>$7B invested in RE in 2015)
 Unreliable sourcing and high distribution costs	✓	• Near unlimited capacity of solar PV energy (>10 TW in Africa) • Technology cost decreases (-80% in last 5 years in India for Solar), RES today already competitive versus fossil fuel in selected areas—by 2030 likely one of cheapest power in >50% of African countries
 Operational issues	✓	• More mature, newer technology—including off-grid technology to mitigate power shortages • Renewables could help diversify energy supply and ensure the best use of available regional resources—especially in rural areas
 Regulatory framework and other (country) risks	≈	• Strong international lobby and committed from selected local governments, acceleration of RE agenda since COP 21 • New Initiatives launched (e.g., Africa Renewable Energy Initiative) • Some specific country risks remain, but positive long-term outlook (e.g., borrowing in local currency, political stability)

Clean Energy Investment equals—B334$ in 2017



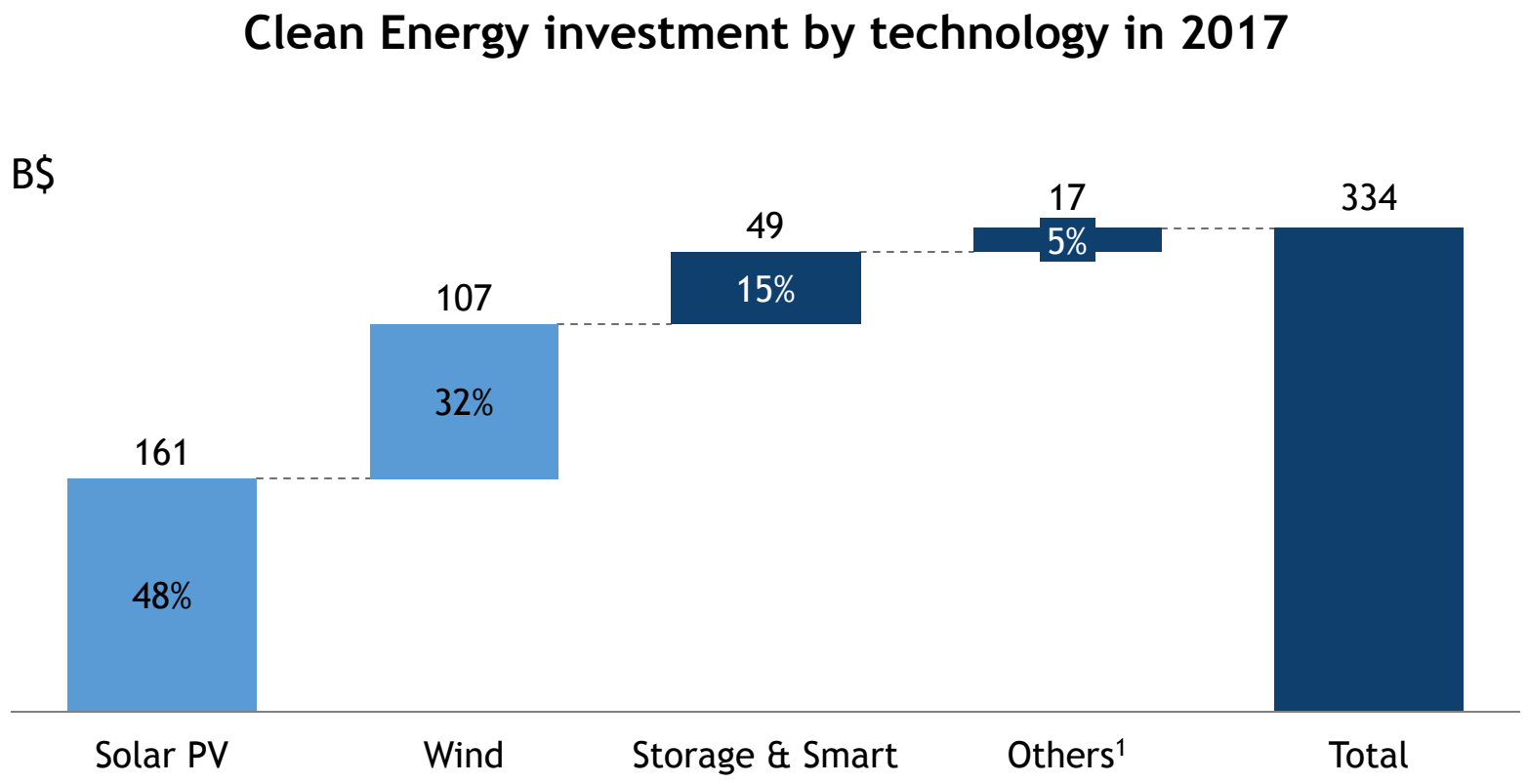
Source: Bloomberg New Energy Finance

Onshore wind and solar PV are leading the race, but energy storage can be a game changer



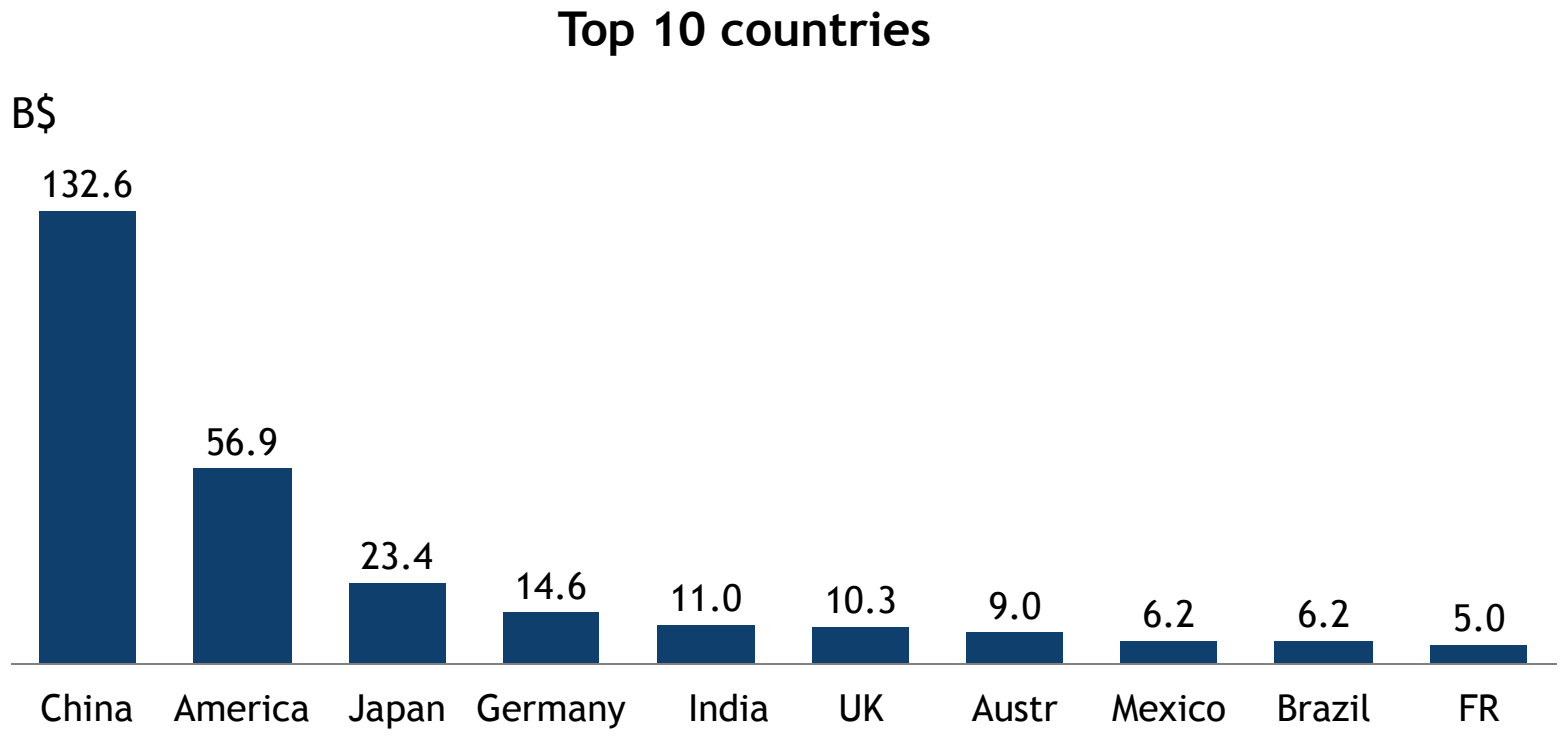
Wind and Solar reported 80% of total investments

Energy storage and smart technologies gaining critical mass



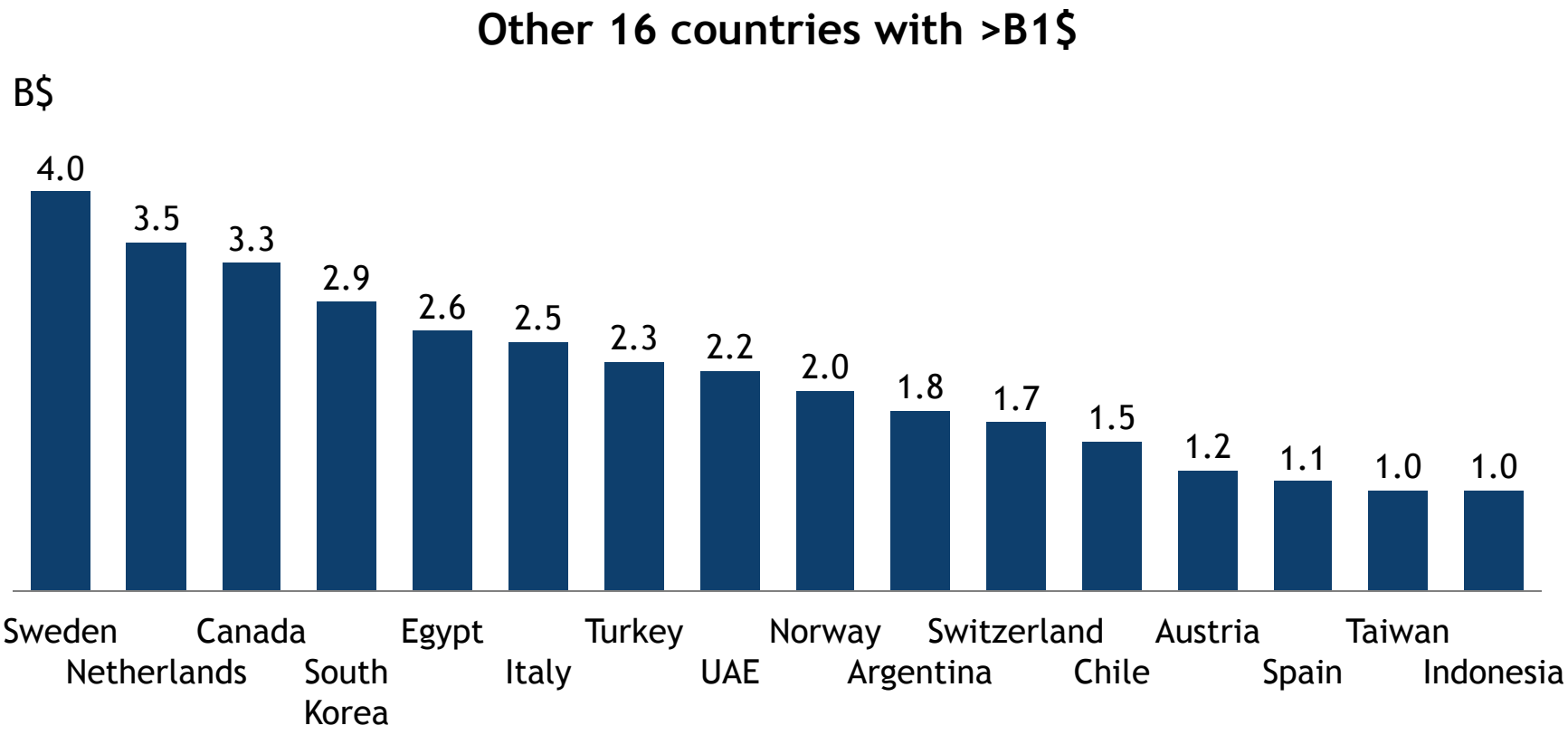
1. Biomass, biofuels, marine, geothermal, small hydro
Source: BNEF 2017

26 countries worldwide with >B1$ clean energy investments in 2017 (I)



Source: BNEF

26 countries worldwide with >B1$ clean energy investments in 2017 (II)

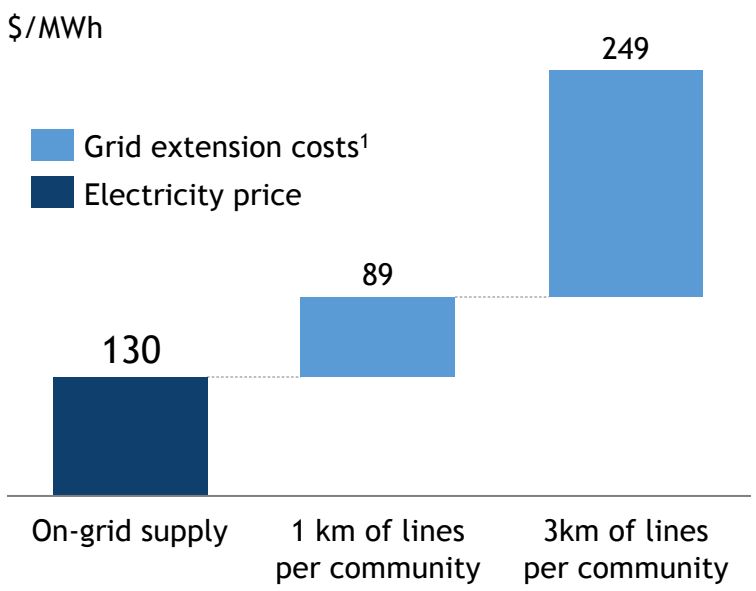


Source: BNEF

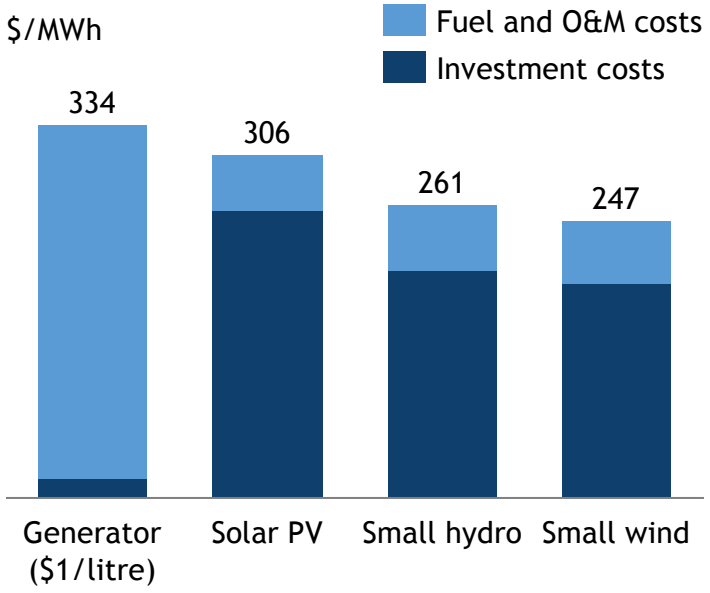
Micro-grid is the most viable option in most developing countries

Indicative levelized costs of electricity for a traditional grid vs. micro-grid and off-grid technologies in sub-Saharan Africa (2013)

Cost of extending a traditional electricity grid to an isolated community

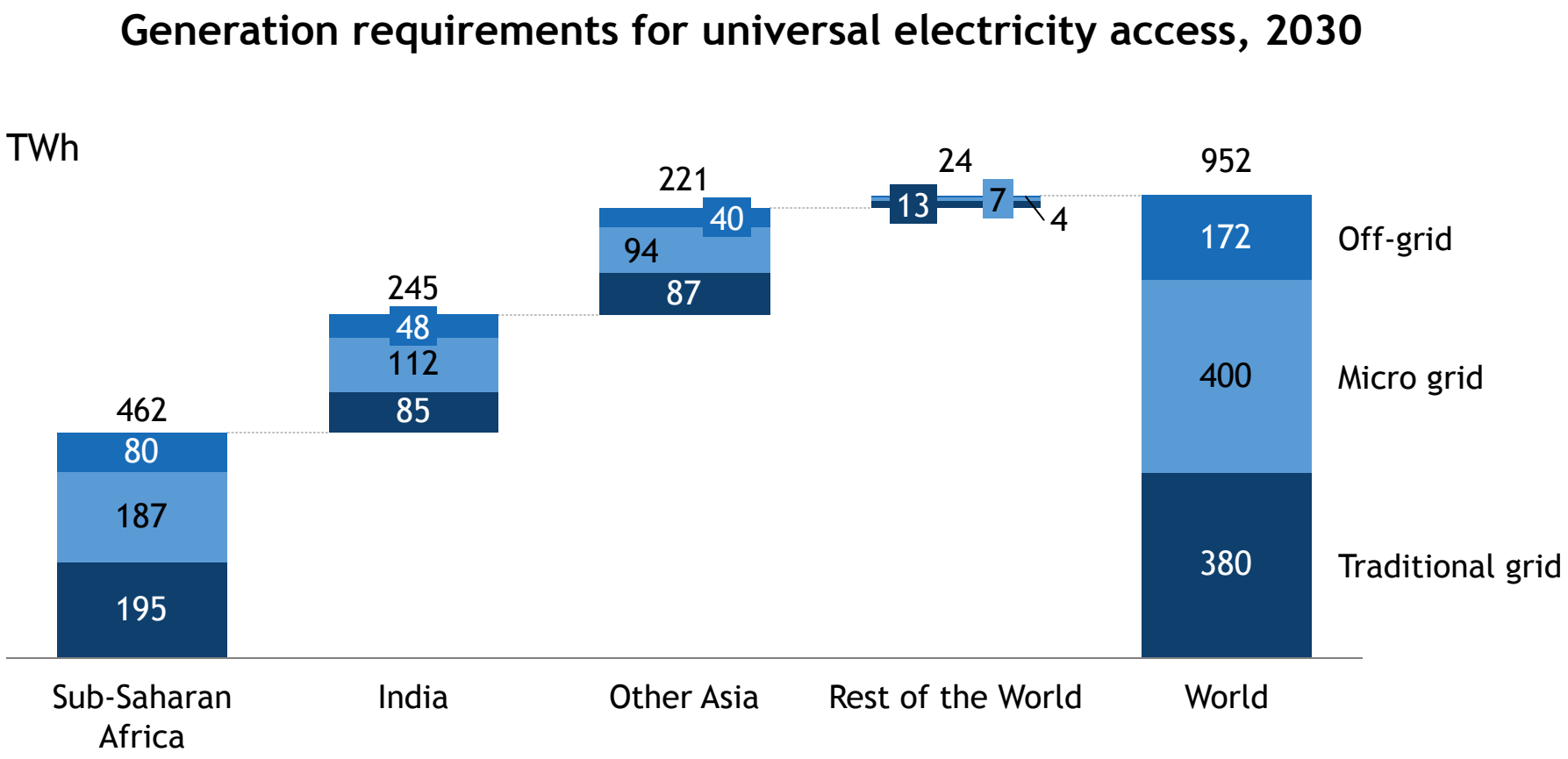


Cost of installing a micro-grid and off-grid with different distributed generation technologies



1. Costs of grid extension are calculated as the average cost of extending the medium-voltage grid a certain distance (e.g., 1 km) to each community on a levelized cost basis.
Note: Costs are indicative and could vary significantly depending on local conditions such as electricity tariffs, population density and the delivered cost of diesel
Source: World Energy Outlook 2014

60% of new generation to be connected to micro-grids or off grid if full electricity access is to be achieved



1. Includes OECD and transition economies
Source: IEA (Estimates 2010)

Key Questions

1. How can governments provide a conducive environment for new technologies to grow and support sustainable energy access for all?

2. What role must traditional energy companies play and why would it be of critical importance for them to make sustainable energy access a success?

3. What innovative business models can help sustain robust investments into Renewables and Micro-grids?

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