Universal access to affordable, reliable and modern energy services

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What does the energy access challenge involve?

Energy Access Redefined: adequate quantity, available when needed, good quality, reliable, convenient, affordable, legal, healthy and safe
Why do we care about energy access?

Access is a means to many ends

Access to energy is crucial for socio-economic development.

HOMES
- Energy for:
  - extending the day
  - reducing drudgery
  - telecommunications and entertainment
  - clean cooking

HOSPITALS
- Energy for:
  - safer births
  - vaccinations
  - better health outcomes

COMMUNITY SPACES

SCHOOLS
- Energy for:
  - making and distributing goods
  - economic activity
  - creating jobs

STREET LIGHTS

ARTISANS
- Energy for:
  - extending the day
  - reducing drudgery
  - telecommunications and entertainment
  - clean cooking
Why think beyond connections?

BEYOND CONNECTIONS MEANS:

- Off-grid solutions
- Quality and quantity of grid electricity
- Upstream electricity projects
- Clean cooking solutions
- Energy for community facilities and productive engagements

Energy access can no longer be understood in terms of number of grid electricity connections.
Measuring energy access: the multi-tiers

Improving attributes of energy supply leads to higher tiers of access.
PROGRESS TOWARD SUSTAINABLE ENERGY: GLOBAL TRACKING FRAMEWORK 2015
Shifting the energy access paradigm

Multiple technologies

Multiple socio-economic benefits

Multiple attributes of energy supply

Multiple locales of energy use

People with Energy Access
1.1 billion people live without any electricity

2.9 billion cook with health-damaging solid fuels

Another 1 billion are connected to the grid but have only intermittent service
**SPATIAL DISTRIBUTION (TOP 5 COUNTRIES)**

**Top 5 countries with largest population without electricity access, millions of people, 2012**

- Congo, DR
- Bangladesh
- Ethiopia
- Nigeria
- India

**Top 5 countries with largest population without access to non-solid fuels, millions of people, 2012**

- Pakistan
- Nigeria
- Bangladesh
- China
- India

*Source: World Bank, Global Tracking Framework, 2015 (data from 2012).*
Increased energy access leads to **economic growth, poverty reduction, and shared prosperity**

- 600 million people and 10 million SMEs have no access in Africa
- Energy growth is not keeping pace with GDP growth

Source: EU and World Bank Estimates
ECONOMIC IMPACT OF SHORTFALL

Economic Cost of Power Outages as Share of GDP, 2005

Source: Briceño-Garmendia 2008 and authors’ calculations of own-generation costs based on Foster and Steinbuks 2008.
Note: GDP = gross domestic product.
At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030.

**SDG 7** Ensure access to affordable, reliable, sustainable and modern energy for all
THE UNIVERSAL ACCESS CHALLENGE IS ENORMOUS

- Only 14 years left to reach the universal access target
- 1.1 billion need electricity today = 1.9 billion by 2030 (= average 120 million annually)
HOW CAN WE SCALE UP?

**A. Provide more resources**
- Increase access lending as a share of energy lending (currently 5%)
- Integrate with non-access projects (e.g. more explicit links with G+T+D investments)
- Integrate with non-energy projects (e.g. urban/rural; agriculture)

**B. Improve cost-effectiveness**
- Scope to scale up lower-cost connections through densification and off-grid solutions
- Scope to reduce costs of grid extension through more appropriate designs
- Scope to be more active in slum electrification (high density + poverty = high impact)
- Make access an integral part of sector reform / sector dialogue
- Improve planning and implementation – e.g. support programmatic involvement

**C. Leverage innovation**
- Off-grid electrification – tremendous innovation in technology, markets, business models
- Possible to leverage impacts undreamed of 5 years ago
- Distributed generation – potential to combine grid-connected and off-grid renewable energy market
- Energy efficiency – can help drive access agenda
- Support productive uses/gender to increase impact
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**ENERGY EQUITY: INVESTMENT REQUIREMENTS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Current Annual $US bn</th>
<th>Required Annual $US bn</th>
<th>Scale-Up Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Access</td>
<td>9</td>
<td>45</td>
<td>500%</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>225</td>
<td>393 (615 WEO-450)</td>
<td>175%</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>244</td>
<td>320 (442 WEO-450)</td>
<td>131%</td>
</tr>
<tr>
<td>SE4All Total</td>
<td>478</td>
<td>758 – 1,102</td>
<td>158%</td>
</tr>
</tbody>
</table>
MOBILIZING PRIVATE CAPITAL TO ADDRESS CHALLENGE

56 World Bank Guarantee Operations have been approved to date spanning 45 countries

$4B IBRD/IDA Guarantee Commitments

$12.6B Private Financing

$31.2B Total Infrastructure Financing

*All guarantee operations, 1990-2015

✓ Optimizing the Use of the Bank’s “AAA” Balance Sheet to Leverage Private Capital
B. Improve cost-effectiveness

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Many countries have a population density that supports successful grid upgrade.

**Vietnam** - last mile grid electrification

- **Household electrification rate**

  - **1976**: 0%
  - **1985**: 20%
  - **1994**: 40%
  - **1996**: 60%
  - **1998**: 80%
  - **2000**: 100%
  - **2002**: 100%
  - **2004**: 100%
  - **2006**: 100%
  - **2008**: 100%
  - **2010**: 100%
  - **2013**: 100%

- **Number**

  - **2008**: 110,868
  - **2009**: 143,863
  - **2010**: 187,596
  - **2011**: 265,881
  - **2012**: 337,324
  - **2013**: 390,000
ENERGY EQUITY: GRID EXTENSION FOR THE POOREST

Slum populations
- Nearly one billion people live in slums; UN Habitat forecasts 1.5 billion by 2020 and 2 billion by 2030
- Slum dwellers often show as electrified in household surveys, but many connections are illegal and unsafe
- Current potential: 300-500 million households.

Unelectrified in electrified areas
- Over half of the unelectrified in South Asia and about a third in SSA live in electrified areas. These are an “easy” target for densification

Reduce grid extension costs
- US distribution networks built at fraction of costs of African grids (NRECA)
- Better planning, appropriate technical standards and procurement processes can cut the costs by at least half

<table>
<thead>
<tr>
<th>Country</th>
<th>Densification potential (mn)</th>
<th>% of unelectrified</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>214.2</td>
<td>68%</td>
</tr>
<tr>
<td>Tanzania</td>
<td>7.9</td>
<td>22%</td>
</tr>
<tr>
<td>Ghana</td>
<td>5.4</td>
<td>54%</td>
</tr>
<tr>
<td>Kenya</td>
<td>20.9</td>
<td>61%</td>
</tr>
<tr>
<td>Nigeria</td>
<td>62.5</td>
<td>82%</td>
</tr>
</tbody>
</table>

WB estimates based on available data
HOW CAN WE SCALE UP?

C. Leverage innovation

- Off-grid electrification – tremendous innovation in technology, markets, business models
- Possible to leverage impacts undreamed of 5 years ago
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TECHNOLOGY ADVANCES ARE HELPING ACCELERATE ACCESS

<table>
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<tr>
<th>System sizes</th>
<th>Able to power</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Wp</td>
<td>2 LED lights + a 14” flat-screen color TV</td>
<td>Under US$ 200</td>
</tr>
<tr>
<td>50 Wp</td>
<td>4 LED lights + a 14” flat-screen color TV + a fan</td>
<td>Under US$ 400</td>
</tr>
</tbody>
</table>

Soon to be available (with the state of the art energy efficient appliances)

| 40 Wp | 2 LED lights + a 21” flat-screen TV + a fan + a mobile phone charger + a radio | Under US$ 250 |

10 years ago = one light

Today = two lights, TV, radio fan, cell phone charging
CHANGE INTERVENTION MIX: BALANCE QUICK WINS WITH HIGH IMPACT

Electrification potential
(size of the bubble = million people)

- Grid ext.
- Grid dens.– supply constraints
- Grid dens. – demand
- Slums
  Half billion more by 2020
- Offgrid

More costly

More difficult / takes time

- Potential to increase impact and lower costs
  - Increase support to grid densification and slum electrification
  - Reduce costs of grid extension through appropriate designs
  - Leverage cost reductions and innovations in the off-grid space
CLIMBING THE ENERGY LADDER

- Not only falling costs and efficiency improvements:
- Pay as you go, mobile payments, smart micro-grids are transforming business models
- Gradual move from sales model to service provision
- Overlapping technologies and business models to choose from

- Device sales (mostly lanterns)
- PAYG Rent to own… (Lanterns/SHS)
- SHS fee for service
- Village micro-grids
- Larger grid-quality mini-grids
- Grid

- Lanterns often the first step in energy service chain
- Higher tiers limited by affordability
- Service approach improves affordability (no high upfront payment) and helps people to reach higher tiers
THE CLEAN COOKING SOLUTIONS PYRAMID

URBAN

• Induction cookstoves (electricity)
• LPG /Natural Gas for cooking
• Advanced-combustion cookstoves
• Pockets using efficient cookstoves

PERI-URBAN AREAS

• Some early adopters of induction cookstoves
• Introduction of LPG, Natural Gas, for cooking
• Introduction of Advanced – combustion cookstoves
• Efficient cookstoves

RURAL AREAS

• Pockets of LPG for cooking
• Pockets of Biogas for cooking
• Introduction of Advanced combustion cookstoves
• Promotion of mostly efficient cookstoves
Thank you