Centre Energie - Centre for Energy

Sub-Saharan Africa’s electricity challenges and opportunities

Ifri-OCP roundtable, 09 November 2018, Rabat
1. Electricity access in SSA: status and challenges to meet the SDG of universal access by 2030
Population increase is stronger than energy access progress

Number of people with and without electricity in Sub-Saharan Africa (without South Africa)

Source: World Bank, World Development Indicators, and own calculations
Electricity access challenge unaddressed: around 550 millions without access, 700 million without clean cooking

Access to electricity (% of population) in 2016

Source: World Bank, World Development Indicators
Tiny installed power generation capacity, less than Germany

Installed capacity, actual and projected population

Source: World Bank, World Development Indicators, United Nations' Database, UN Population Division World Population Prospects 2017
When there is access, power outages impede economic activities

Power outages in a typical month (indicative)

Source: World Bank, World Development Indicators
2017 renewable investment high but too little in Africa, especially solar PV where the potential is strongest

Global RES investments in 2017 in key countries ($ billion)

- China: 58.3
- US: 132.6
- Australia: 6.2
- Mexico: 11
- Germany: 23.4
- UK: 14.6
- Japan: 10.3
- India: 14.6
- Brazil: 9
- Other: 6.2

Global RES investments in 2017 by technologies ($ billion)

- Solar: 48.8
- Wind: 160.8
- Energy smart technologies: 4.7
- Biomass and waste-to-energy: 3.4
- Biofuels: 1.6
- Small hydro: 0.156
- Low-carbon services: 0.044

Source: Bloomberg New Energy Finance
2.5 times more power sector investments needed per year, private sector investment is dominated by South Africa

Power sector investments in Sub-Saharan Africa, 2013-2016 ($ billion)

*Source: Infrastructure Consortium Africa*
2. Opportunities, options and solutions: stepping up efforts and progress to another scale
The toolbox and options: supply side

- Solar (PV and CSP) and onshore wind potential with sharply declining costs
  - Centralized, coupled with batteries
  - Decentralized: mini/micro-grids and individual solar home systems; private or publicly supported

- Biomass potential: small biogas digesters

- Gas fired thermal plants:
  - LNG to power
  - Gas flaring capture, utilization of local gas production

- Hydro: large, small, mini dams, can be covered by solar cells

- Grid extension, interconnections

- Waste to energy: large untapped potential, only one plant operational (Ethiopia)

- Nuclear?
The toolbox and options: demand side

- Capacity building in EE indicators
- Energy efficiency in buildings: standards, best practices
- Standards for appliances at regional level
- Centralized cooling systems instead of individual air conditionning
- Designing efficient and sustainable cities/urban areas
  - Avoid urban heat island effects
  - Improved and sustainable public transportation
  - Better fuel quality standards, more efficient cars&motorcycles
  - Electric mobility
  - Capacity building, knowledge sharing
  - Standards and controls
  - Slow down of urbanization with country side development & climate mitigation
LNG to power is an option, but no game changer

Main proposed LNG import terminals in Sub-Saharan Africa

Type: FSRU  
Start-up date: Expected to start in 2018  
Capacity: 3 Mtpa

Type: FSRU  
Start-up date: Expected to start in 2019  
Capacity: 3.4 Mtpa

Type: FSRU  
Start-up date: was expected to start in 2019

Type: FSRU  
Start-up date: was expected to start in 2019

Source: New and emerging LNG markets: the demand shock, IFRI.
Hydro has a further potential

<table>
<thead>
<tr>
<th>Top 5 African countries by installed hydropower capacity (2016)</th>
<th>MW</th>
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<tbody>
<tr>
<td>Ethiopia</td>
<td>4 054</td>
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<tr>
<td>South Africa</td>
<td>3 583</td>
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<tr>
<td>Egypt</td>
<td>2 800</td>
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<tr>
<td>DR Congo</td>
<td>2 509</td>
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<td>Zambia</td>
<td>2 392</td>
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- Technical **potential** of hydropower production of about **1 800 TWh/y**, compared with **1,238 TWh** in **2015**.

- Total **installed** capacity of about **34 GW**

- In Africa, **large** hydropower project have an **average LCOE** of about **0,05$/kWh** and about **0,07-0,08$/kWh** for **small** project

- Projects: Ivory coast (Singrobo, Gribopopoli), Tanzania (Rusumo falls), Uganda, Ethiopia (Renaissance), DRCongo (Inga)…
Lessons from India and Bangladesh

- Need to plan for maintenance of system, especially when financed via grants
- Pay as you go systems to avoid non-payments
- Mini grids: Not necessarily enough electricity to meet demand from small industries; systems often not well designed for demand;
- Entrepreneurs looking to develop mini-grids project to un-electrified rural India control risks such as revenue collection problems, or theft associated risks by tailoring each project’s business model...but:
  - What happens if the central grid reaches a mini-grid?
  - Customers would switch to the main grid to benefit from lower government subsidized electricity prices.
  - Entrepreneurs would be left with stranded assets.
- Need for an efficient and stable regulatory framework
- Business models can be diverse, but effective when including services
- Need for strong governmental support, political will, availability of finance and local& micro-finance
- Need to overcome the investment challenge: high capital costs, short term risk takers, high RR
- Local communities & people must be involved at all stages to define technology, needs, business model (pay as you go, ESCO model)
- Feasibility studies key
International initiatives helpful but only private sector investments can scale up electrification

✓ UN Sustainable Development Goals (2015)- Sustainable Energy for All (SE4All), hosted by ADB
✓ NEPAD, Programme for Infrastructure Development in Africa (African Union/ADB), focusing on eight African regions
✓ World Bank
✓ Power Africa
✓ Sustainable Energy Fund for Africa
✓ Electrification Financing Initiative (ElectriFI) – European Union
✓ Partenariat Afrique-UE pour l’énergie (PAEE)
✓ Bilateral development aid and support programmes (Afd, Norad, GIZ, DevCo)

All key to provide funding and structure bankable projects, but slow, inefficient, insufficient...
Conclusion 1/2: scaling up and accelerating RES is now possible, need of greater private investment

✓ No silver bullet, no unique solution: combination of technologies, business models tailored to specific needs
✓ Combination of demand side and supply side measures needed!
✓ Technical conditions are in place: innovations, technology costs are down, business models work, best practices and numerous pilot projects & larger scale deployment exist
✓ Foreign aid, grants, guarantees and credits are important but will not be enough and cannot be enough
✓ Need for much greater private investment
✓ Need to make more cheap funding available
✓ Private entrepreneurship is already successful!
✓ Need of greater coordination among donors and greater focus on Sub-Saharan Africa
✓ Need to overcome the finance bottleneck with a reform of the global financial system
Conclusion 2/2: Local governments must do more, need for strategic approach with climate adaption

- Governance of public institutions and state-owned companies
- Investment framework: robust banking and financial sector
- Regional cooperation and interconnections, capacity building at the local, national and regional level
- Regulation, land registries
- Need for tariff reforms
- Improved tax collection, higher saving rate, higher share of domestic investments key, especially of pension funds