

BeninCajù



Cashew shell to power
generation— waste to
wealth, a reality

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Content

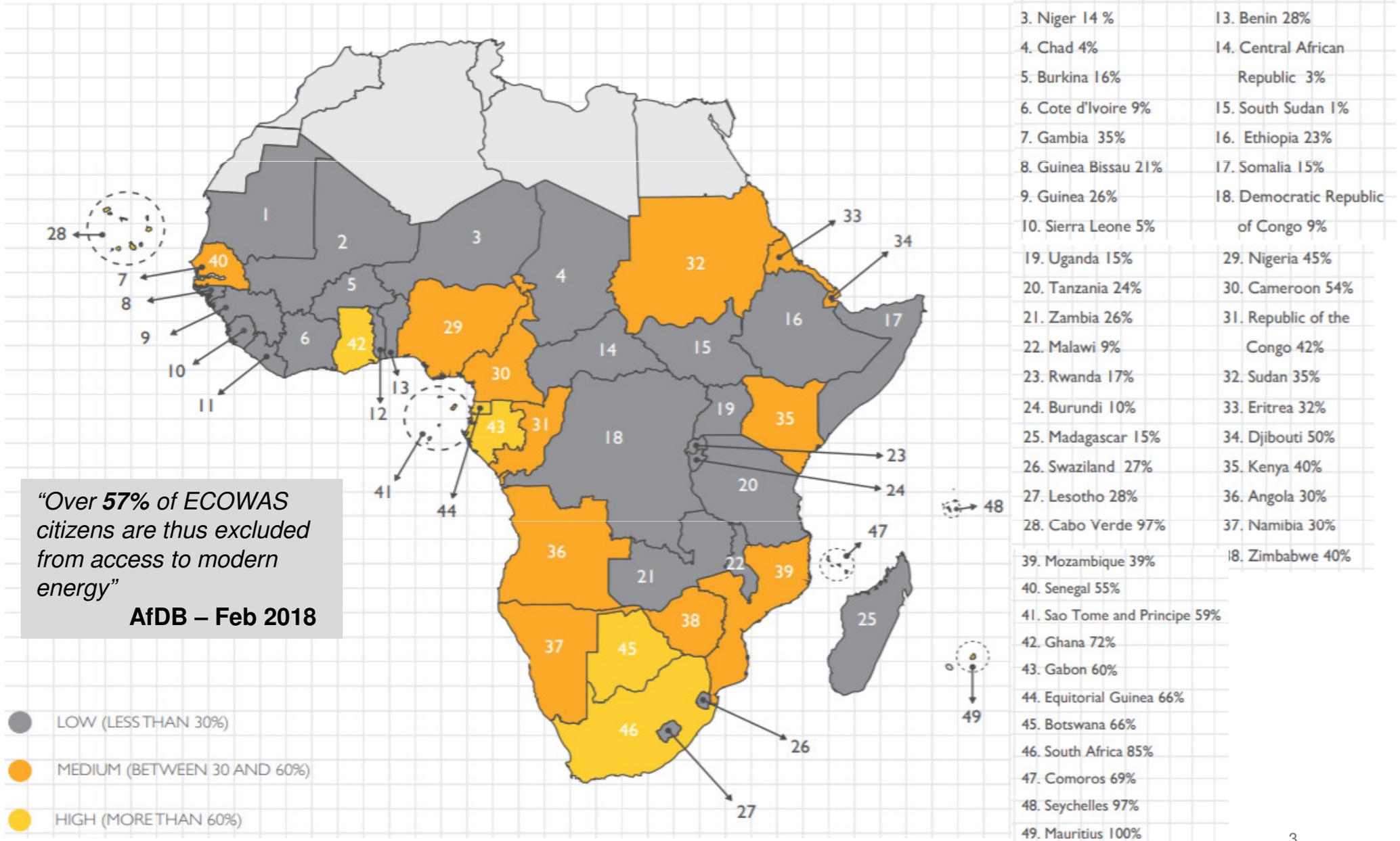
- Context overview**

- BeninCajù power generation initiative – a brief

- Power generation in regional context

On average, electricity access in ECOWAS nations is ~16%; for six most advanced nations, rate is ~50%

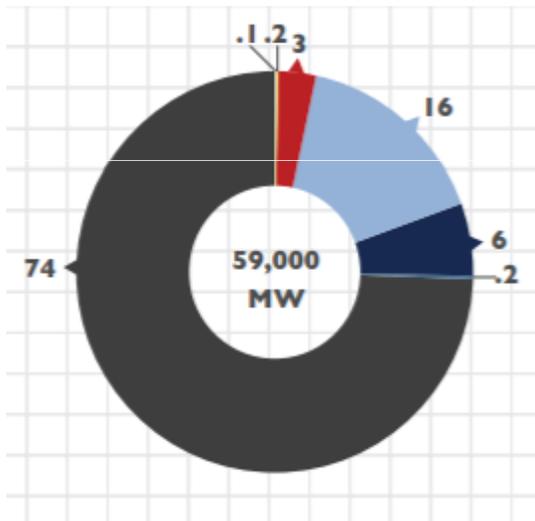
Electricity access in Sub-Saharan Africa, 2013



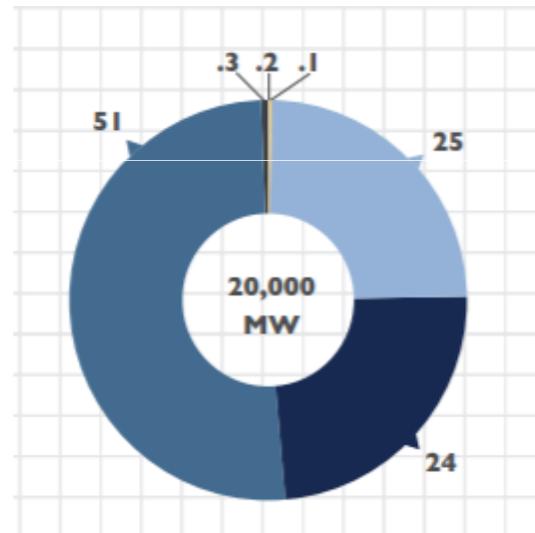
Region of Southern Africa has highest installed capacity on the continent; West Africa at a distant second

Installed capacity by technology (% breakdown, 2015)

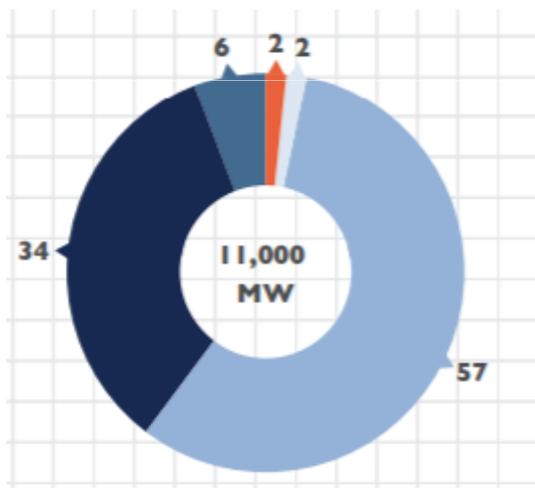
SOUTHERN AFRICA



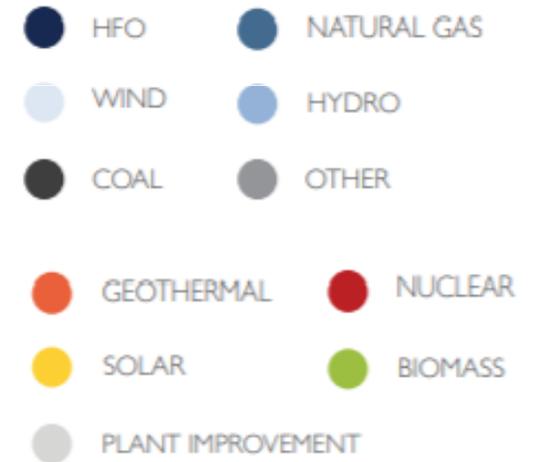
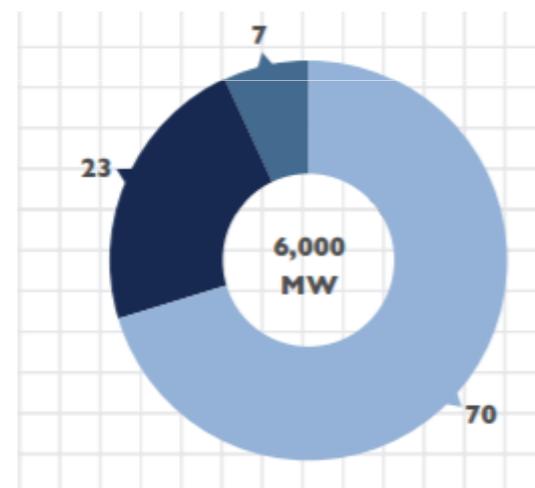
WEST AFRICA



EASTERN AFRICA



CENTRAL AFRICA



Installed capacities, 2015

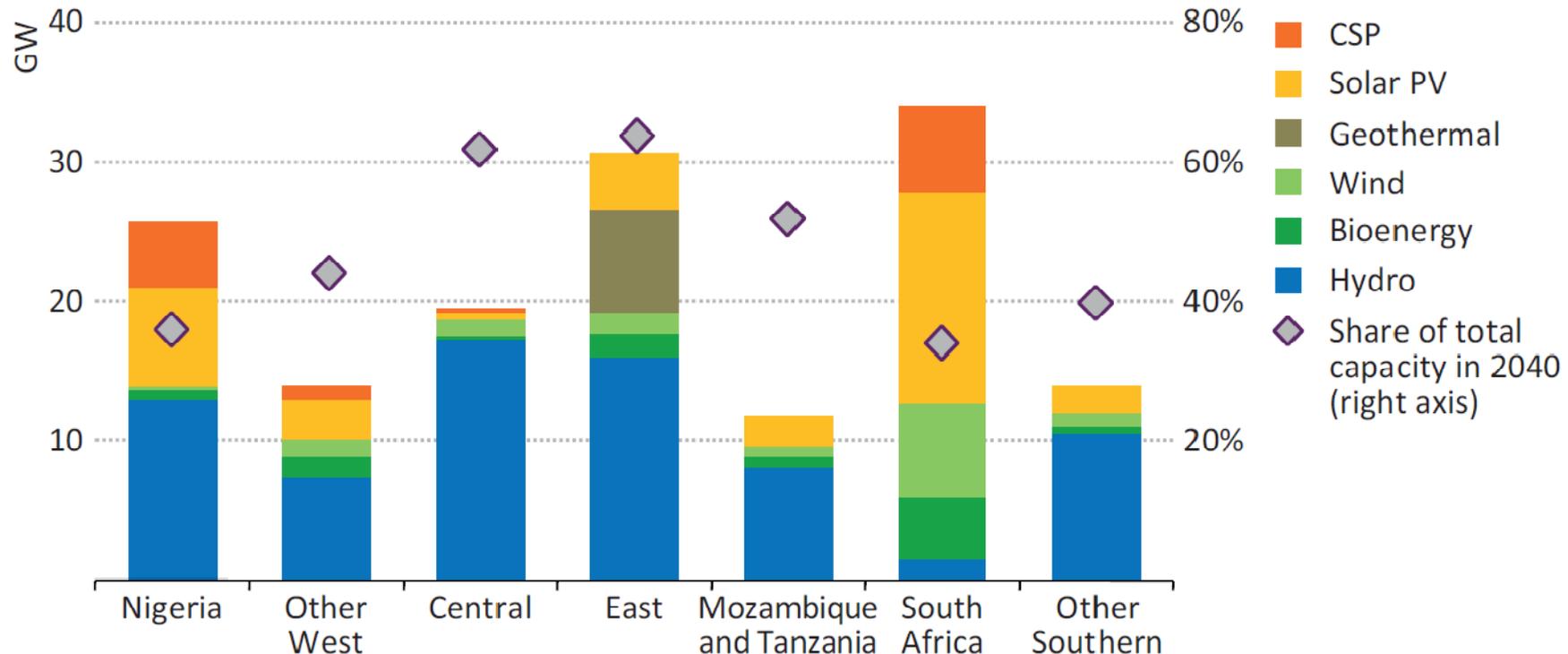
- *UK = 80GW*
- *USA = 1,060 GW*

Up to half of new energy demand in Africa to be met by renewables

- **Energy demand in Africa will double by 2030** with rapid economic growth, changing lifestyles
- By 2040, renewables may account for 40-60% of supply



Increase in renewables-based capacity by sub-region and type in sub-Saharan Africa in the New Policies Scenario, 2012-2040



Power generation via cashew shell is a clean and efficient source of energy

PROBLEM STATEMENT

- Majority of cashew shell produced in Africa from processing is burned in open pits
- Open Burning cashew shells is a big economic loss for cashew industry and has a huge negative impact on environment

OPPORTUNITY

- Cashew shell cake is categorized as one of the best biofuels, similar to lignite coal with a very high calorific value of ~4700 kcal/kg
- Many countries have seen success with environmentally-friendly electricity generation using cashew shell. In India, power plants fueled by cashew shell range from 1-6MW, supporting power needs of the country



WHY NOT IMPLEMENT THIS IN AFRICA?

Content

- Context overview

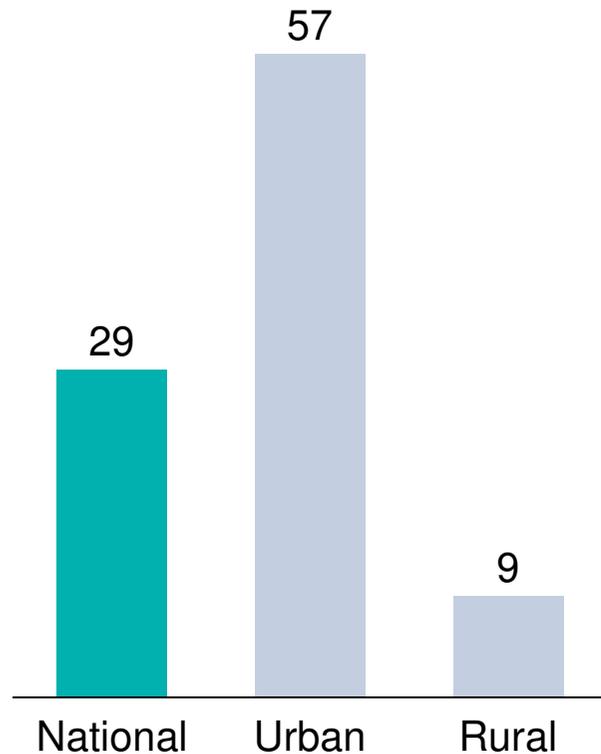
- BeninCajù power generation initiative – a brief**

- Power generation in regional context

Energy consumption in Benin sub-par to regional and global averages, with demand met primarily through imports

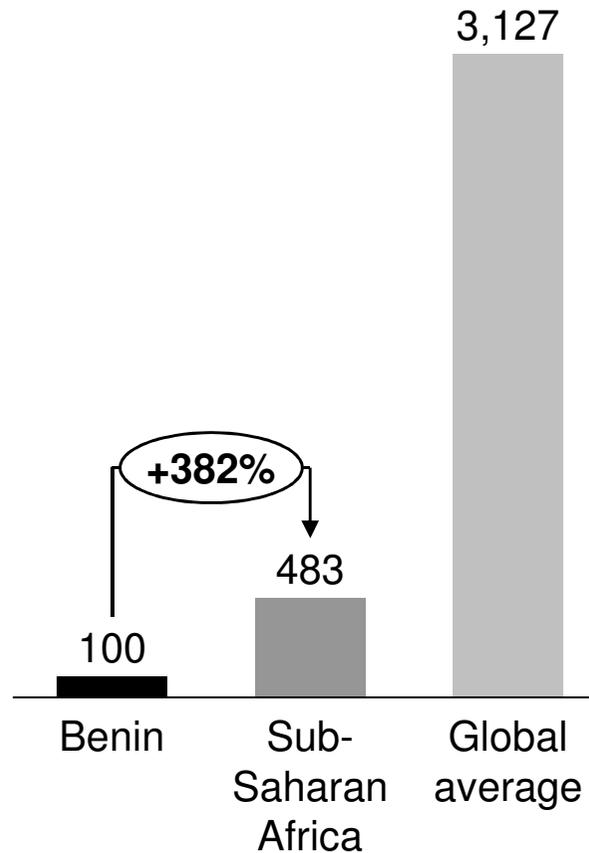
HUGE DISPARITY BETWEEN URBAN AND RURAL ELECTRIFICATION

Electrification rate (%), 2013



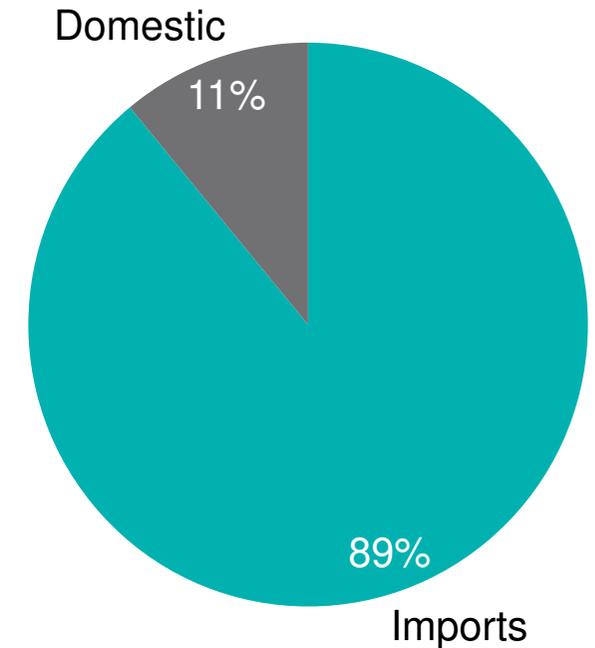
PER CAPITA ELECTRICITY CONSUMPTION <1/4 OF SUB-SAHARAN AFRICA AVERAGE

Per capita electricity consumption (kWh), 2014



MOST OF CURRENT DEMAND MET FROM IMPORTS

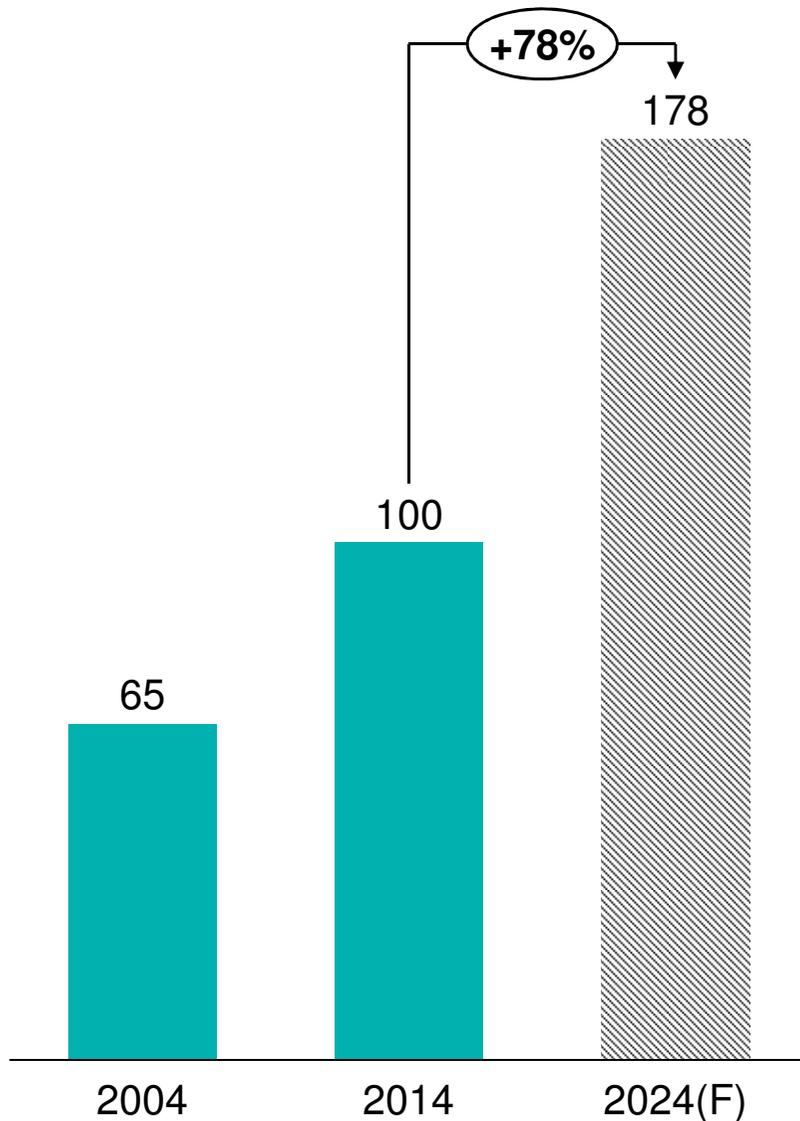
Electricity consumption by source, 2015



Key import sources:
Ghana, Cote d'Ivoire and Nigeria

Govt. of Benin has committed to ambitious targets to meet rising energy needs

Per capita electricity consumption (kWh)



- According to the draft Master Plan for Benin's electricity sector, the country's demand is expected to grow annually at 6 to 9 percent
- Government of Benin has committed to generate 70 percent of its electricity needs domestically by 2025, a significant shift from its current energy dependence on neighboring countries
- Government has already established an independent electricity regulator with the authority to regulate tariffs
- Other planned reforms include strengthening the independence and management of Benin's national utility (Société Béninoise d'Énergie Électrique or SBEE), reforming tariffs, developing an IPP framework, and creating enabling policies for off-grid electrification

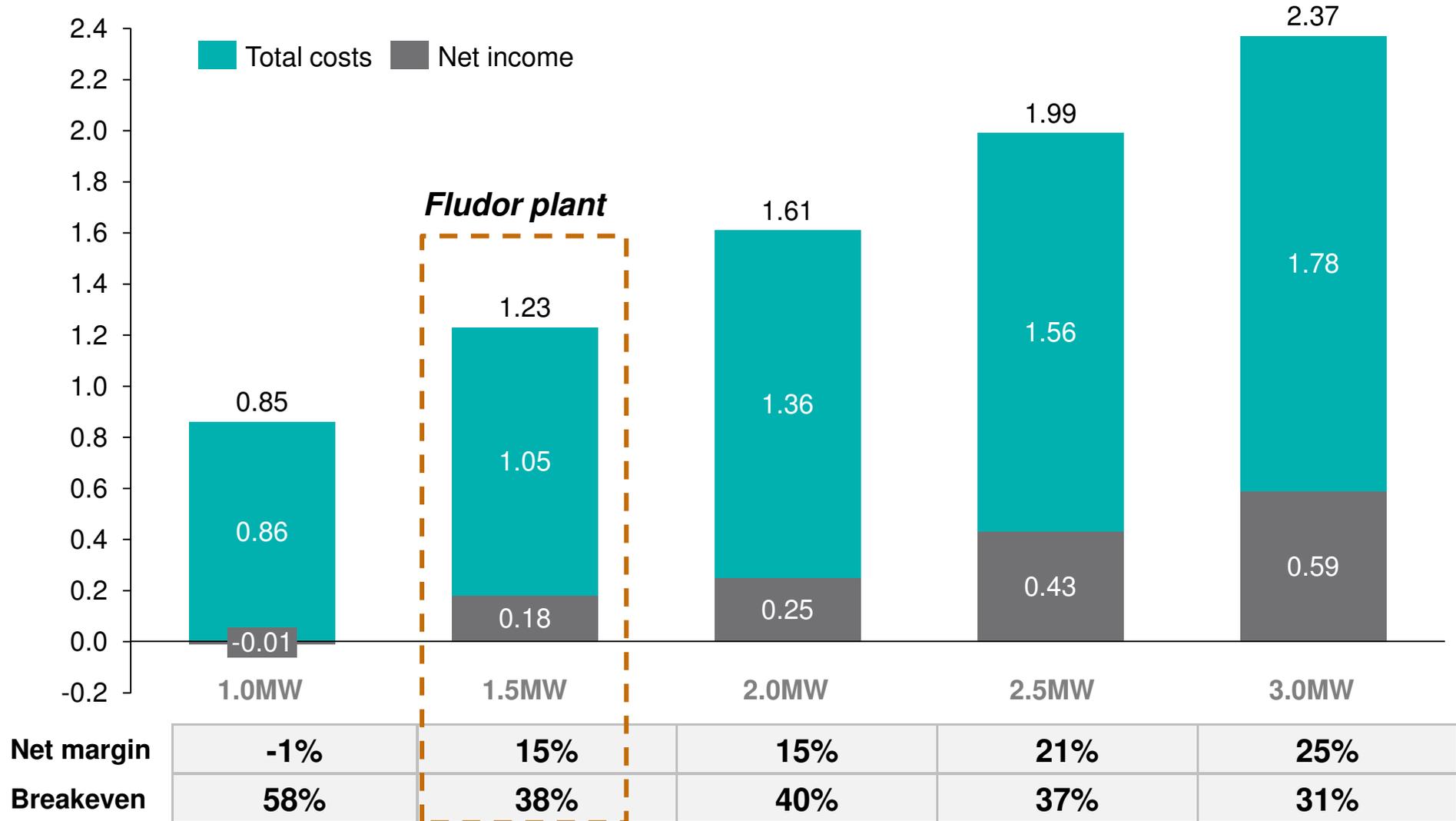
BeninCajù saw cashew shell as opportunity to address both cashew sector competitiveness and national electricity needs

- Worked on successful models of power generation, supported by cashew de-oiled cake as fuel
- Selected/designed an ideal mix of technologies fit for African working environment (working feasibility within African context)
- Drafted detailed financials for different capacities of power generation starting from 0.5 MW up to 3 MW
- Designed technical process manual and business implementation planning for successful start-up businesses in power generation
- Built in-house technical assistance to support investors in successful implementation

In our sector analysis, many African countries currently have critical mass of shell available to support at least one power plant

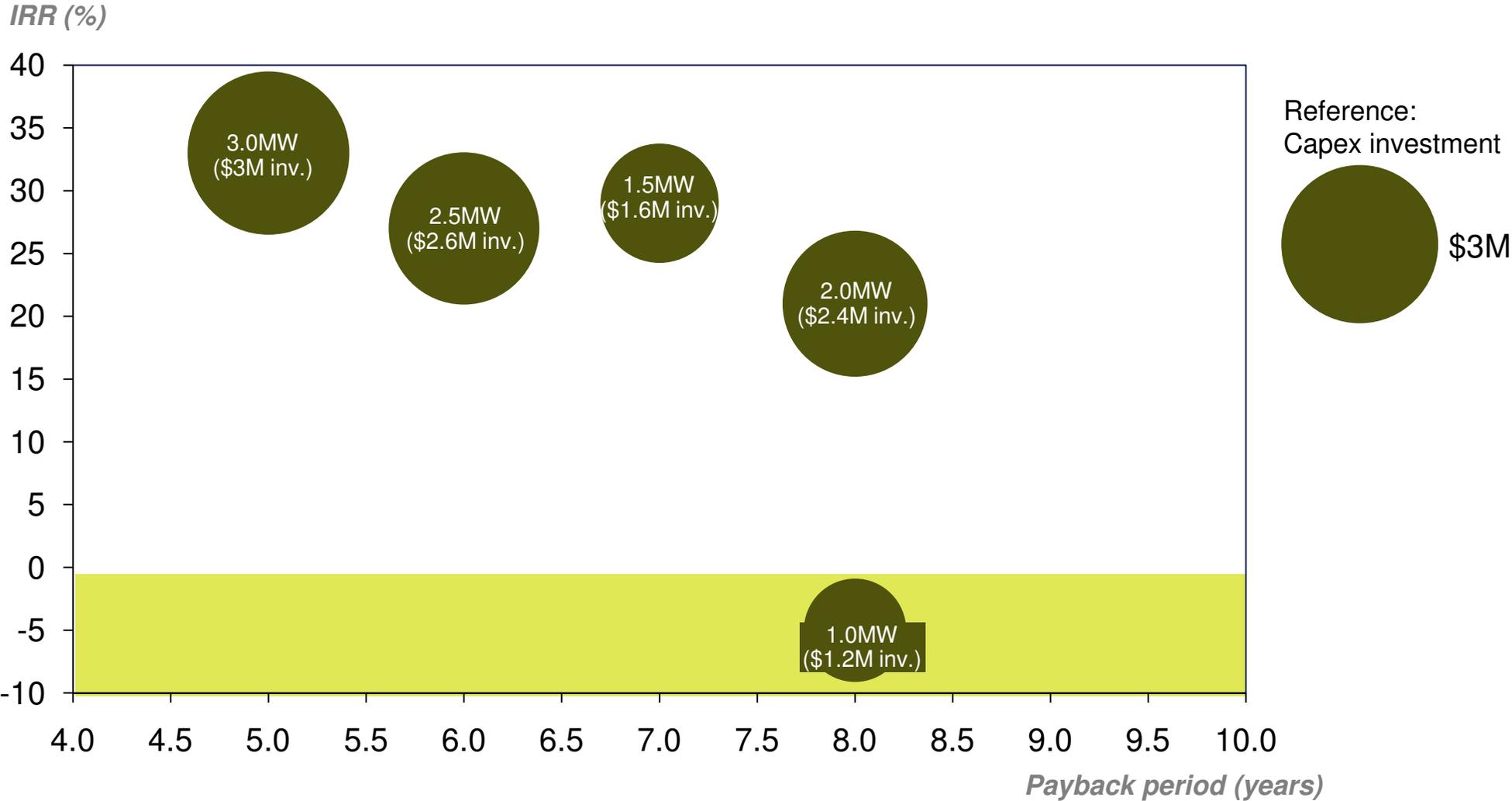
Fludor, a leading cashew processor in Benin, to invest in 1.5MW plant best suited to their needs

Sales breakdown, Year 1 (US\$M)



Planned unit of 1.5MW plant will breakeven in the 3rd year, generating annual revenue of \$1.5M and net margin of ~15%

In Benin context, >1 MW power plants are convincing investment opportunities with good IRR and reasonable pay-back period



Content

- ❑ Context overview
- ❑ BeninCajù power generation initiative – a brief

❑ **Power generation in regional context**

African processing is gaining momentum and cashew shell utilization will add needed economic and environmental competitiveness

- African cashew production stood at 1.9m MT growing on average 7% per annum
- Processing volumes ~160,000 MT and growing ~32% per annum, still not enjoying economic gains from cashew shell
- If Africa processes all production locally, produced cashew shell will be able to support generation of ~105 MW electricity



<u>POWER GENERATION</u>	<u>CASHEW SHELL VALORIZATION</u>	<u>JOB CREATION</u>	<u>REDUCED CO2 EMISSIONS</u>
Additional \$122m in revenues	Over \$67m in revenues	3,500 professional jobs = \$16m in salaries annually	575,058 MT of CO2 = ~\$7.93m annually

Power generation by cashew shell in cashew producing countries shows a lucrative business opportunity

Net profits, Year 1 (US\$)

	1.0MW	1.5MW	2.0MW	2.5MW	3.0MW
Cote d'Ivoire	-\$75,281	\$72,357	\$95,534	\$230,594	\$352,974
Nigeria	-\$37,772	\$134,770	\$182,851	\$342,815	\$490,099
Mozambique	-\$24,654	\$156,597	\$213,388	\$382,061	\$538,054
Benin	-\$9,511	\$181,793	\$248,637	\$427,364	\$593,411
Senegal	\$14,729	\$222,128	\$305,067	\$499,888	\$682,029
Ghana	\$51,425	\$283,187	\$390,489	\$609,673	\$816,178
Burkina	\$58,461	\$294,894	\$406,867	\$630,723	\$841,899
Guinea Bissau	\$68,149	\$311,015	\$429,421	\$659,709	\$877,318

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