MCC Briefing Memorandum: Benin Power Compact

MCC seeks the Advisory Council's advice on structuring an independent power production (IPP) transaction in Benin to identify areas for further due diligence, inform the structure of the transaction, and ensure MCC's grant funds most effectively leverage additional capital.

Problem

MCC seeks to spur solar IPP investment in Benin, but faces structural obstacles including a non-creditworthy off-taker, lack of capacity and track record, small market size, and elevated country investment risk.

Background

MCC's large grants have played an outsized role in Benin, a small West Africa nation of 10 million with a GDP of only $8.5 billion. A first compact, centered on port expansion, land rights, agribusiness finance, and commercial justice reform, made MCC a household name in Benin given the infrastructure built and sector reforms achieved.

A second compact, signed in September 2015 and totaling $403 million, $28 million of which is contributed by the Government of Benin, aims at delivering far-reaching reforms and infrastructure improvements in Benin's electricity sector, which is characterized by a dependence on imports, low rates of electrification, high demand growth, politicized decision-making, weak financial management, deteriorating assets and tariffs below cost recovery. The MCC compact seeks to remedy many of these issues through an ambitious program that will touch nearly every aspect of the Benin's electric power sector:

- Reforms supported by the compact include cost-reflective electricity tariffs, de-politicized utility governance and more professional management, private investment in power generation, and off-grid electrification. The compact includes $41 million for technical assistance to support the Government of Benin and, to provide further incentive for action, MCC has conditioned $100 million of infrastructure grants on the satisfaction of reform and policy conditions[1].

- $136 million for power generation, $122 million of which is for the construction of 45 megawatts (MW) of utility-scale photovoltaic (PV) generation, with the potential for more capacity and/or storage through an IPP investment. The compact also includes funding for smaller-scale thermal and hydroelectric generation.

- Rehabilitation and reinforcement of existing electricity distribution infrastructure totaling $110 million to improve reliability, reduce losses, and strengthen grid monitoring through national dispatch, along with line and substation upgrades.

- Finally, $46 million is budgeted for off-grid clean energy solutions and the development and implementation of requisite policy and regulatory framework to assist the two-thirds of the country's population without access to modern energy. Individual projects will be funded

[1] The total includes $80 million in solar PV funding and $20 million in off-grid funding.

through a competitive grant-matching facility to leverage private sector finance and participation in off-grid electrification in Benin.

- Managing this entire effort is MCA-Benin II, a special purpose vehicle attached to Benin's Office of the President, established pursuant to MCC policy and the compact for the designated purpose of implementing the compact. Compact administrative expenses, including support contracts for MCA-Benin II, total $42 million.

Utility-Scale Photovoltaic Generation and Potential for Energy Storage

An MCC feasibility study completed in mid-2015 identified six potential sites for utility-scale solar PV generation, based on grid proximity, capacity and insolation. A combined capacity of 82 megawatts (MW) was identified, with annual energy production from the six sites estimated at 121 gigawatt-hours (GWh), nearly ten percent of Benin's current power consumption.

MCC's solar feasibility study also examined lithium ion battery storage at one site[2], but the option was not pursued given prohibitive costs of $18 million for 8 megawatt-hours (MWh) of storage. Since that time, there have been developments in the market for energy storage that may make integrating batteries into one or more of the solar PV plants more realistic.

Given the advantages of enhanced grid stability and reliability with storage and in light of ongoing technological and manufacturing advancements that may lower prices, the battery storage option remains under consideration. If undertaken by MCC, it would be a risky, yet pioneering effort.

Independent power production

While MCC funding would be sufficient for 45 MW of solar PV capacity implemented through a traditional public sector design-bid-build procurement process, leveraging private capital through an IPP could allow for the installation of additional capacity, potentially up to the full 82 MW identified in the feasibility study. Therefore MCC and the Government of Benin have decided to pursue a competitive tender for an IPP for the solar PV plants. To support IPP investment, MCC has already funded feasibility studies, and moving forward MCC will support MCA-Benin II to:

- Manage the resettlement and land acquisition process;

- Provide technical assistance in support of an IPP competitive solicitation process, standard bidding documents, and transaction advisory services;

[2] Lithium ion was determined in the feasibility study to be appropriate for Benin; lead acid batteries and concentrated solar power generation with other storage technology were ruled out for technical reasons.

- Deliver technical assistance for reforms that move tariffs towards cost-recovery;

- Incentivize arrears payments by the government to the utility;

- Support an independent regulatory authority; and,

- Fund technical assistance, training, and equipment in support of a more independent and professional national utility.

The risks of such an ambitious program are significant, particularly in the short time horizon anticipated for the implementation of the compact, which is limited to five years (2017-2022). However the government is highly motivated by the substantial sums of funding at risk to enact the reforms cited above.

Questions for the Advisory Council

MCC seeks the Advisory Council's feedback to inform a bankable IPP with blended capital, with the following specific questions:

Transaction Questions

- What type of deal will maximize the benefit of MCC grant financing and be most likely to attract serious energy sector investors to Benin's small and risky market?

- What would be the optimal financing structure and terms of a tender, e.g., should MCC work with a lender in advance of the tender or expect the bidders to line up their own financing?

- What types of blended finance are needed for a solar PV transaction, e.g., equity, debt, guaranties, grants for capital expenses, climate financing?

- How can the risk of non-payment be mitigated outside of traditional partial risk guarantees?

Other

- Does the Advisory Council have any experience with utility-scale renewable energy storage to share with MCC?

- Are there any increased environmental management risks associated with IPPs?

- Are there any increased social risks associated with IPPs?

- What are emerging best practices in utility governance and management in low-income countries?

Annex: Benin's Electricity Sector

Only one-third of Benin's population of ten million has access to electric power, with major rural and urban disparities. Due to low access, electricity consumption is below Africa's low-income country average, at 110 kWh/capita/year, despite rapidly growing demand (six percent average annual growth).

Key facts	
Load Profile	200-250 MW evening peak 100-120 MW base load
% demand met by imports	80%
Subsidized electricity import price	USD 0.10 / kWh
Cost of emergency diesel generation to meet shortfalls	USD 0.30 / kWh
Average consumer tariff	USD 0.20 / kWh
Solar (with storage) feed-in tariff fixed by GoB	USD 0.13 / kWh

Insufficient Supply

- As a small energy market, relies for most of its electricity through imports from Ghana and Nigeria, which are also experiencing energy shortages, and as a result both countries have been unable to meet contractual obligations. In addition, the West Africa Gas Pipeline has failed to meet delivery of natural gas from Nigeria, making natural gas as fuel for power generation unreliable.

- Benin's domestic generation capacity is not reliably available due to a combination of disrepair, poor maintenance, and inability to secure steady and cost-effective fuel supplies. To meet supply gaps, the GoB has entered into short term leasing arrangements for 180 MW of containerized diesel generators.

- Technical and commercial losses in the distribution system are estimated at 22% and the utility's network is reaching its capacity limit.

Weak Utility Finances and Operations

- The utility (SBEE) is faced with financial and operational issues related to low tariffs, high technical and commercial losses, unqualified and/or untrained staff, and poor financial and asset management practices.

- Low tariffs lead to an undercapitalized utility unable to properly operate and maintain existing assets or invest in expansion. While low tariffs may be justified by policymakers as a means of protecting the poor and domestic industry, they achieve neither goal.

- Industry and commerce are held back by insufficient power and forced to resort to expensive diesel generators or absorb losses of inventory, operating hours, and/or productivity.

Sector Governance

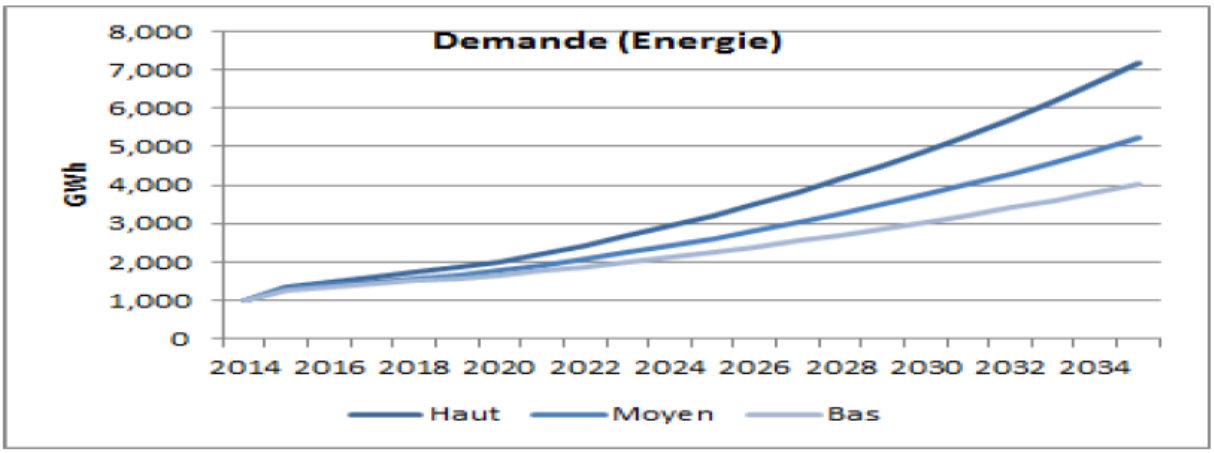
- Benin's policy and institutional framework is characterized by poor planning and lack of independent regulation. Sector decision-making is generally politicized and major decisions (e.g., on tariffs) are taken by the Council of Ministers, the country's highest policy-making body. Inadequate planning has led to persistent energy shortfalls and the response to crisis has been to resort to costly emergency measures.

- Benin did not have a regulatory authority for the electric power sector until 2015, and the regulator remains understaffed and underfunded.

Consumption and Demand

Per capita energy consumption is relatively low at 0.392 tons of oil equivalent ("toe") per capita – less than Ghana (0.4), Tanzania, (0.46) or Togo (0.47). Biomass consumption accounts for more than 75% of total energy consumption. All petroleum products are imported.

Nonetheless, electricity consumption doubled between 2005 and 2013, and is projected to continue rising. The graph below is drawn from Benin's Electricity Sector Master Plan, which estimates between a four-fold and seven-fold increase in electricity demand between 2014 and 2035.



Source: Plan directeur de développement du sous-secteur de l'énergie électrique au Bénin ; Rapport final ; août 2015

Benin's current demand profile is illustrated at right, showing a strong preponderance of domestic consumption, with low industrial demand.