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Report No: 49183-BW

PROJECT APPRAISAL DOCUMENT

ON

A PROPOSED IBRD PARTIAL CREDIT GUARANTEE
IN THE AMOUNT OF US$242.7 MILLION

AND

A PROPOSED IBRD LOAN
IN THE AMOUNT OF US$136.4 MILLION

TO THE
REPUBLIC OF BOTSWANA

FOR A

MORUPULE B GENERATION AND TRANSMISSION PROJECT

October 2, 2009

Energy Group
Sustainable Development Department
Africa Region

Finance, Economics, and Urban Department
Sustainable Development Vice-Presidency

CURRENCY EQUIVALENTS
(Exchange Rate Effective August 28, 2009)

Currency Unit	=	Botswana Pula (BWP)
1 US$	=	BWP 6.95
100 Thebe	=	1 BWP

FISCAL YEAR
April 1 – March 31

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AGC	Automatic generation control
BPC	Botswana Power Corporation
BWP	Botswana Pula
CBM	Coal-bed methane
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CEDIF	Clean Energy for Development Investment Framework
CFB	Circulating fluidized bed
CFL	Compact florescent lamp
CMM	Coal-mine methane
CNEEC	China National Electric Equipment Corporation
CO_2	Carbon dioxide
CPS	Country Partnership Strategy
CSP	Concentrating solar power
CV	Calorific value
DCCSF	Development and Climate Change, A Strategic Framework for the World Bank Group
DEA	Department of Environmental Affairs of MEWT
DGS	Department of Geological Survey of MMEWR
DNA	Designated National Authority
DNI	Direct normal irradiation
DSCR	Debt service coverage ratio
DSM	Demand-side management
DWMPC	Department of Waste Management and Pollution Control of MEWT
EE	Energy efficiency
EIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, procurement, and construction
ERR	Economic rate of return
FGD	Flue gas desulfurization
FM	Financial management
FS	Financial statements
GABS	Government Accounting and Budgeting System
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GJ	Gigajoule
GWh	Gigawatt-hour
ICB	International competitive bidding
ICBC	Industrial and Commercial Bank of China Limited
IFR	Interim financial report
IMF	International Monetary Fund
IPP	Independent power producer
kg/kWh	Kilograms per kilowatt-hour
kg/sec	Kilograms per second
kJ	Kilo joule
km	Km
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hour
MCL	Morupule Colliery Ltd

MEWT	Ministry of Environment, Wildlife, and Tourism
MFDP	Ministry of Finance and Development Planning
$\mu g/m^3$	Micrograms per cubic meter
mg/Nm^3	Milligrams per normal cubic meter
MJ/kg	Mega joules per kilogram
MMEWR	Ministry of Minerals, Energy, and Water Resources
MW	Megawatt
MWh	Megawatt-hour
NCB	National competitive bidding
NDP	National Development Plan
NGO	Nongovernmental organization
NOx	Nitrogen oxides
NPV	Net present value
NSC	North-South Carrier
O&M	Operation and maintenance
OECD	Organization for Economic Co-operation and Development
OPGW	Optical ground wire cable
PC	Pulverized coal
PCG	Partial credit guarantee
PMU	Project Management Unit
PPA	Power Purchase Agreement
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public-private partnership
RAP	Resettlement Action Plan
RESA	Regional Environmental and Social Assessment
RFP	Request for Proposals
RPF	Resettlement Policy Framework
SADC	Southern African Development Community
SAPP	Southern Africa Power Pool
SBD	Standard Bidding Document
SBW	Shenyang Blower Works
SC	Supercritical
SIA	Social Impact Assessment
Sinosure	China Export & Credit Insurance Corporation
SO_2	Sulfur dioxide
SOx	Sulfur oxides
SSA	Sub-Saharan Africa
TA	Technical assistance
TCF	Trillion cubic feet
UNFCCC	United Nations Framework Convention on Climate Change
US$	US dollar
WUC	Water Utility Corporation

Vice President:	Obiageli K. Ezekwesili
Country Director:	Ruth Kagia
Sector Director:	Inger Andersen
Sector Manager:	Subramaniam V. Iyer
Task Team Leader:	Varadarajan Atur

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AFRICA REGION

AFTEG

DATA SHEET

Date: October 2, 2009	Team Leader: Varadarajan Atur
Country Director: Ruth Kagia	Sectors: Power (80%); Mining and other extractive (20%)
Sector Director: Inger Andersen	
Sector Manager: Subramaniam V. Iyer	Themes: Infrastructure services for private sector development (100%)
Project ID: P112516	Environmental screening category: Full Assessment
Lending Instrument: Specific Investment Loan	

Supplemental Project Information

Supplemental ID: P116784	Team Leader: Varadarajan Atur
Country Director: Ruth Kagia	Sectors: Power (80%); Mining and other extractive (20%)
Sector Director: Inger Andersen	
Sector Manager: Subramaniam V. Iyer	Themes: Infrastructure services for private sector development (100%)
	Environmental screening category: Full Assessment
Lending Instrument: IBRD Partial Credit Guarantee	

Project Financing Data

[X] Loan [ ] Credit [ ] Grant [X] Guarantee [ ] Other:

For Loans/Credits/Others:

Total Bank financing (US$ million): 136.4

Proposed terms: US$ Loan, 30 year with variable spread, 4 year grace and level repayment

Financing Plan (US$ million)

Source	Local	Foreign	Total
Borrower	153.7	344.7	498.4
Commercial lenders (95% covered by Sinosure)	282.1	300.2	582.3
Commercial lenders (100% covered by IBRD PCG)	0.0	242.7	242.7
International Bank for Reconstruction and Development	28.2	108.2	136.4
African Development Bank	52.4	150.1	202.5
Total:	**516.4**	**1,145.9**	**1,662.3**

Borrower of the IBRD Loan: Republic of Botswana

Borrower of the commercial loan: Botswana Power Corporation (BPC), as guaranteed by the Republic of Botswana

Guarantor: Republic of Botswana and IBRD

Responsible Agencies: Ministry of Minerals, Energy and Water Resources and BPC

Content		
For Guarantees:	**[X] Partial Credit [] Partial Risk [] Both Partial Credit & Risk**	
Proposed Coverage:	Botswana sovereign risk of nonpayment of principal and some interest in years 16-20 of the commercial loan.	
Nature of Underlying Financing:	Commercial bank loan underwritten by the Industrial and Commercial Bank of China Limited with 95 percent credit insurance coverage in years 1-15 from the China Export & Credit Insurance Corporation.	
Terms of Financing for IBRD Guarantee:	**Principal Amount (US$ million):**	242.7
	Final Maturity:	year 20
	Amortization Profile:	straight-line
	Grace Period:	15 years
Financing available without Guarantee:	**[ ] Yes [X] No,** not beyond 15 years	
If Yes, estimated Cost or Maturity:		
Estimated Financing Cost or Maturity with Guarantee:	The IBRD Partial Credit Guarantee allows the Borrower access to funding for 20 years.	
Bank Group Participation:	**[] IFC [] MIGA**	

Terms of Financing for IBRD Loan:	**Principal Amount (US$ million):**	136.4
	Final Maturity:	30 years
	Amortization Profile:	Level repayment
	Grace Period:	4 years

Estimated disbursements (Bank FY/US$ million)					
FY	FY10	FY11	FY12	FY13	FY14
Annual	22.0	35.0	42.0	22.0	15.4
Cumulative	22.0	57.0	99.0	121.0	136.4

Project implementation period: October 29, 2009 to December 31, 2013
Expected effectiveness dates: PCG: November 30, 2009; Loan: February 15, 2010
Expected closing date: June 30, 2014

Does the project depart from the CAS in content or other significant respects? ***Ref. PAD I.C.***	[ ]Yes [X] No
Does the project require any exceptions from Bank policies? ***Ref. PAD IV.G.***	[ ]Yes [X] No
Have these been approved by Bank management?	[ ]Yes [ ] No
Is approval for any policy exception sought from the Board?	[ ]Yes [X] No
Does the project include any critical risks rated "substantial" or "high"? ***Ref. PAD III.E.***	[X]Yes [ ] No
Does the project meet the Regional criteria for readiness for implementation? ***Ref. PAD IV.G.***	[X]Yes [ ] No

Project development objective ***Ref. PAD II.B., Technical Annex 3***

The objectives of the project are to support Botswana in: (i) developing reliable and affordable supply of electricity for energy security; (ii) promoting alternative energy resources for low-carbon growth; and (iii) building its institutional capacity in the energy sector.

Project description *[one-sentence summary of each component]* ***Ref. PAD I.C., Technical Annex 4***

The proposed project consists of (1) a 600 MW coal-fired power station, related transmission lines, substation, and backup water supply system, (2) low-carbon strategy and alternative energy projects preparation, and (3) institutional and capacity building technical assistance to the Government and the BPC.

Which safeguard policies are triggered, if any? ***Ref. PAD IV.F., Technical Annex 12***

OP 4.01 Environmental Assessment, OP 4.09 Pest Management, OP 4.12 Involuntary Resettlement, OP 4.37 Safety of Dams, OP7.50 Projects on International Waterways

Significant, non-standard conditions, **if any**, for:
Ref. PAD III.F.

For effectiveness of the PCG: BPC to amend the EPC Contract to ensure compliance of contractor with the power station EMP.

For effectiveness of the Loan: (i) execution of the IBRD Guarantee Agreements (Indemnity, Guarantee, and Project Agreements), and (ii) execution of the Subsidiary Agreement between the Ministry of Finance and Development Planning and BPC.

Covenants applicable to project implementation:

Republic of Botswana to:

(i) appoint a high-level Project Coordinator for the project within three months of effectiveness of the Loan;
(ii) reach agreement with the Bank on the agreed measures for interim adjustment, and carryout such electricity tariffs adjustment within three months of effectiveness of the Loan;
(iii) discuss with the Bank a draft electricity tariff policy, developed under terms of reference satisfactory to the Bank, no later than September 30, 2010; and
(iv) establish an independent regulator and entrust implementation of the agreed electricity tariff policy to such regulator by no later than June 30, 2011.

BPC to:

(v) prepare and discuss a pest management plan for the control of vegetation at the Isang Substation and other areas controlled by BPC, and adopt the agreed plan before start of construction of the Isang Substation;
(vi) execute the contract with MCL for supply of coal by no later than December 31, 2009;
(vii) regarding the air quality monitoring: (a) take measures to monitor the impact on air quality emissions of Morupule A and Morupule B power stations; and over the life of Morupule B power station; (b)in accordance with an agreed timetable, formulate a plan to take action, including the possibility of retrofitting Morupule A power station so as to remedy any emissions causing exceedances of air quality

standards in the joint operation of Morupule A and B power stations to ensure that it does not exceed air quality standards permissible under the relevant rules, laws or regulations of Botswana and in accordance to Bank satisfaction; and (c)review with the Bank, on a semiannual basis the results of the air quality monitoring for Morupule A and Morupule B power stations and implement recommended measures for remediation;

(viii) regarding the water collection system: (a) connect only the southern compartment of the new Paje well field for drawing water for the use by BPC and for local customary use; (b) obtain Bank's prior no-objection if it proposes to connect the northern compartment to the new Paje well field; (c) use the water from the north-south carrier as its main source of water and the new Paje well field for backup source of water only; and (d) not permit Morupule Colliery Limited or any other person to use the new Paje well field water for main source of water; and

(ix) regarding the ash dam: (a) implement recommendations contained in the ash dam survey for stabilizing and protecting the ash dam site in accordance with a time frame to be agreed with the Bank; (b) within an agreed time frame discuss with the Bank and make a record of any agreed remedial measures in respect of the existing ash dam that may have not been contained in the ash dam survey, and thereafter implement such agreed measures; (c) re-route the ash no later than December 31, 2012 from Morupule A power station to the new ash dam to be constructed in respect of the Morupule B power station; (d) appoint an independent expert for review of the design of the new ash dam; (e) ensure that the new ash dam has a sealed base; and (f) promptly on the completion of the site for the new ash dam, ensure that Morupule A ceases using the existing ash dam, and ensure that Morupule A power station thereafter solely uses the new ash dam for both bottom ash and top ash.

I. STRATEGIC CONTEXT AND RATIONALE

A. Country and sector issues

1. **Botswana, a landlocked country of about 1.9 million inhabitants, is an African success story with an extraordinary record of economic growth and transformation**. At independence from Britain in 1966, Botswana had a per capita gross domestic product (GDP) of about US$70. Botswana has enjoyed one of the most rapid rates of economic growth in the world—at 9 percent per year for nearly four decades—and has transformed itself from one of the poorest nations on earth to an upper middle-income country with a per capita income of US$6,150 today. Strong growth has allowed the halving of poverty over the past twenty years to an estimated 30 percent. Botswana's remarkable development has been driven by the discovery and production of mineral resources (predominantly diamonds, but also nickel and copper), democratic governance, political stability, and sound macro-economic management. In terms of governance and transparency, Botswana ranks thirty-sixth internationally (according to the Transparency International Corruption Index) and regularly comes at the top of the continent in terms of governance, transparency, and business environment.

2. **Despite its economic success and Middle Income Country status, poverty, inequality, unemployment, and high incidence of HIV/AIDS are persistent development challenges for Botswana**. The incidence of poverty in Botswana is deeper than in countries of similar income, with about 28 percent of the population still living on less than US$1 a day.[1] This is partly due to the country's narrow economic base which limits employment opportunities, particularly in rural areas where the majority of the population still resides. Unemployment has been persistently above 20 percent and unemployment continues to be a serious problem affecting the young in particular. Botswana ranks as the fifth most unequal country in the world.

3. **The diamond production is expected to decline over the coming decade and Botswana needs to diversify its economy in order to sustain its economic development and create new employment opportunities**. The diamond and government sectors still dominate the economy. The relatively short horizon—ten to fifteen years—until the projected decline in diamond production implies that non-diamond growth must accelerate significantly in the coming years in order to avoid a contraction of the economy. In addition to constraints to competitiveness in the investment climate, a mismatch between the skills produced by the education sector and those required by a modern labor market, and growing infrastructure bottlenecks, including in the power sector, has hampered diversification. There is also a growing recognition that a greater focus on public sector effectiveness is needed in order to support diversification efforts, including more effective implementation of policies and programs, and more efficient and effective delivery of services to the population. The Government is aware that while the economic and development models used in the past have served the country well, their limitations have become increasingly evident.

4. Given the small size of its market, the foundation for diversification needs to rest on a private sector that can compete and thrive in regional and global markets. The historic dependence on mining will reach its limits as diamond revenues start to decline, and emerging resource constraints will mean that infrastructure and social services will have to be provided by a leaner public sector. The country's diversification strategy is founded on a number of pillars, including the strengthening of the enabling framework for private initiative and investment through continued political and economic stability, a strong education system and skills training, a constant strengthening of the business climate, and greater openness to the global economy. A number of sector initiatives have been identified in the diversification

[1] UNDP Human Development Report, 2007-08

and growth strategy on the basis of the exploitation of regional opportunities tailored to Botswana's existing strengths, resources, and capacities. These focus on a range of activities, including, but not limited to: (a) tourism initiatives to take further advantage of Botswana's unique resource base and track record in the industry; (b) comprehensive downstream diversification of the diamond sector and related processing activities such as diamond sorting, valuing, cutting, polishing, and jewelry manufacturing; (c) building further mining diversification around Botswana's metals, coal and gas energy base together with the creation of a range of support industries and activities; (d) commercializing, restructuring, and rebuilding the livestock sector to enhance its contribution to economic activity; and (e) creating areas of excellence in services fields such as public health management in HIV/AIDS and training for the hospitality sector, and education, innovation and transportation hubs.[2]

5. **However, Botswana's economic diversification strategy is threatened by two serious challenges requiring urgent actions**, namely protecting its economy from the worst impacts of the global economic crisis and avoiding a looming energy crisis. The economic crisis could roll back Botswana's past gains and create hardship for not just the one-third of the population living below the poverty line today but could also plunge countless others into poverty. The energy crisis could cripple the existing economy, prevent diversification, and potentially create labor, social, and even political instability.

6. **The global economic crisis has hit Botswana severely**. Diamond exports have fallen by nearly 70 percent[3] since the global crisis began and are not expected to recover their pre-crisis levels for a number of years. Quarterly GDP fell by 22 percent between the fourth quarter of 2008 and the first quarter of 2009 as diamond mines were temporarily forced to suspend operations (some have since reopened). Current forecasts are for economic growth to slow substantially over the next three years, with a contraction of near 10 percent forecast for 2009 (according to IMF and World Bank estimates), sharply down from an estimated growth of 2.9 percent in 2008.[4] The decline in diamond export income has also induced a fall in Government revenues of close to 20 percent, and significant fiscal deficits are expected through 2012, averaging 10 percent of GDP over the coming two budget years (2009/10 – 2010/11) according to Government estimates. The current account balance will shrink substantially from the 19 percent surplus seen in 2007. External public debt will expand from less than 3 percent of GDP to near 20 percent. While the expected decline in GDP growth is very large, the impact on most sectors of the economy—with the exception of mining sector and its suppliers—will be much smaller. The enclave nature of mining in the Botswana economy means that much of the non-mining sector has so far escaped relatively unscathed, with real output in the non-mining private sector growing at 9.4 percent in the first quarter of 2009 relative to a year earlier. Nevertheless, general conditions will remain challenging into the medium-term as Government spending comes to terms with the new reality of constrained revenues, and as the fall in exports and growing credit constraints filter through to the rest of the economy.

7. **Botswana's history of prudent economic management is now paying dividends**. Large international reserves and savings from previous years' surpluses have served their intended role as a cushion to support the economy and the exchange rate. Foreign exchange reserves have declined by about 10 percent (in US dollar terms) relative to pre-crisis levels, and in May 2009 stood at US$8.4 billion or

[2] *Botswana Excellence: A Strategy for Economic Diversification and Sustainable Growth*, Business and Economic Advisory Council, Government Implementation Coordination Office, Office of the President. November 2008.

[3] CSO Trade Digest Q1 2009.

[4] This scenario assumes a 40 percent decline in diamond production for both 2009 and 2010 and a 20 percent decline in 2011 (with respect to 2008 levels), only returning to 2008 levels in 2012. It is a fairly conservative scenario. Indications in Q2 2009 are that the fall in diamond sales has bottomed out and, while still very subdued, production and sales are beginning to rise, although export revenues remain far below pre-crisis levels and a recovery is expected to be gradual and slow.

BWP 57.5 billion. Reserves in May 2009 covered about nineteen months of imports, down from nearly twenty-four months in mid-2008. The level of reserves remains comfortable, however, and the decline reflects both draw-downs to finance balance of payments deficits as well as valuation changes. With an improving trade position expected for the remainder of the year, the rate of decline of reserves is expected to moderate. Botswana also entered the crisis with very low levels of Government debt, at 5.6 percent of GDP (2.9 percentage points of this being external debt) and enjoys the highest credit rating in Sub-Saharan Africa (SSA).

8. **The Government is, however, facing serious fiscal constraints that are expected to endure through 2012**. The prospect of fiscal deficits after years of surplus has led the Government to realign its budget, reassess policy priorities, and implement reductions in capital spending in the medium-term through the tenth National Development Plan (NDP). The Government's strategy for financing projected deficits is evolving with the state of knowledge regarding the depth and duration of the crisis, but is premised on the importance of preserving the country's accumulated savings for future generations in order to generate an income stream in lieu of diamond wealth. The Government's financing strategy thus relies largely on external and domestic financing to fill the financing gap.[5,6] External public sector debt will therefore rise sharply, to a projected 20 percent of GDP by the end of 2010, although this remains a relatively low level by international standards. Domestic debt is also likely to rise from very low levels, both as a result of long-standing Government policy to issue bonds to develop the domestic market and to meet the financing needs of State-Owned Enterprises embarking on large investment programs.[7] The Government is also taking actions to promote more innovative financing mechanisms such as public-private partnerships (PPPs) to share the financial burden and boost private sector activity. A longer recession or weaker recovery will require further selectivity in Government spending to preserve Botswana's strong macroeconomic standing and its position as a net international creditor with a high credit rating. In order to control the size of fiscal deficits and debt, a key challenge looking forward is to sharply focus public spending on priority items that are essential to maintaining Botswana's long-term growth and diversification strategy and that yield high returns.

9. **The Government's response to the economic crisis as well as the diversification strategy requires adequate and reliable energy**. Access to reliable and affordable energy is critical to new business growth and rural development. Electricity access nationally is about 55 percent while the rural access is only about 35 percent with nearly 51 percent of the villages connected to the grid. The Government is targeting to connect 80 percent of the villages by the end of the tenth NDP and expand rural access significantly to support the broader development goals of access to education and health, as well as employment opportunities for the rural and the disadvantaged population. Over the past five years, a 1 percent increase in non-mining GDP has been associated with a 1.6 percent increase in non-mining power consumption. Accelerated growth of non-mining business sector would therefore require similar growth in non-mining energy consumption, which now accounts for less than 25 percent of total power consumption.

10. **Eskom, the South African utility, has indicated that it can no longer provide sufficient power and that it will reduce supply through 2012, and will stop altogether from 2013 onwards**. Botswana, like other Southern African countries, long relied on abundant and inexpensive electricity

[5] A budget support loan for US$1.5 billion has been secured from the African Development Bank to finance the 2009/10 fiscal deficit.

[6] The Government is working with Bank and other regional institutions to develop a Medium Term Debt Management Strategy (MTDS).

[7] Under the *Stocks, Bonds and Treasury Bills Act*, total public debt, which includes publically guaranteed debt, is limited to 40 percent of GDP (with additional limits of 20 percent external and 20 percent domestic debt).

supplies from South Africa. About 70 percent of Botswana's power requirements[8] were met through imports from **Eskom in 2008**. In order to address this deficit, the government has taken a number of short-term interventions but options are limited, costly, and inevitable (as described in paragraph 13 below).

Table 1: Scenario of Botswana's ballooning energy deficit in the absence of actions

MW	2009	2010	2011	2012	2013
Demand	506	530	547	583	613
Eskom supply	325	250	150	150	0
Eskom as % of peak demand	64%	47%	27%	26%	0%
Morupule A (annual net) 1/	90	90	106	106	106
(Deficit)	(91)	(190)	(291)	(327)	(507)
As % of demand	18	36	53	56	83

1/: BPC is aiming for up to 120 MW

11. **Botswana has to fill the supply gaps in the short-term and also ensure reliable supply from 2013 when Eskom stops exports to Botswana**. The energy deficits would not only hurt growth and diversification, but also pose a threat of economic contraction in an already serious economic crisis situation. Botswana has already started regular load-shedding[9] which will worsen as deficits grow, unless urgent measures are taken now. Studies show that power shortages have inhibited growth in Botswana, along with most SSA countries and that investment in the power sector would enhance growth by around 1 percent per annum.[10] Further progress in fighting poverty and reducing inequality in the country is difficult to envisage without strong growth and without the success of Botswana's diversification efforts (*i.e.*, without secure energy supplies, among other ingredients). The diversification efforts rest on an increased focus on competitiveness in order to take advantage of larger regional and global markets. Power shortages have a major negative impact on competitiveness, productivity, business confidence, the investment climate, and economic growth in general. The energy crisis therefore poses a serious threat to Botswana's stability, economic diversification and growth, and poverty reduction strategies.

12. **The economic cost of the energy deficit for Botswana's growing economy is enormous amounting to an average of US$2-4 billion per year in lost production**. The value of lost sales and production due to each un-served kilowatt-hour (kWh) for other African economies ranges between US$1/kWh in Benin and Kenya and up to US$3/kWh in Senegal, Zambia and Uganda. Using these values as a reference, the economic cost of the energy deficit in Botswana can quickly increase from US$0.5-1.6 billion in 2009 to US$3-10 billion in 2013. In the most conservative scenario, the annual average loss is equivalent to 10 percent of Botswana GDP, and even up to one-third of GDP if the energy deficit affects primarily the most productive industries. Inaction, therefore, is not an option for the authorities albeit temporary emergency power generation is also very costly and unsustainable.

13. **Short-term options are limited, costly, and inevitable**. Botswana Power Corporation (BPC), the power utility owned by the Government, has contracted 70 MW portable diesel units (to be installed near Francistown) from APR Energy, LLC (USA). This is a two-year contract renewable on a six monthly basis and the energy is costly at close to US¢50/kWh. The Government, Debswana Diamond Company

[8] The country's energy demand was about 3,073 gigawatt-hours (GWh) in 2008 (peak load of 517 MW). The mining sector presently accounts for about 45 percent of power demand, the commercial sector about 23 percent and the residential sector also about 23 percent. Botswana projects demand to grow at about 4 percent per year, reaching 5,400 GWh by 2017 (peak load of 850 MW) and 6,890 GWh by 2026 (peak load of 1,130 MW).

[9] See http://www.bpc.bw/ for detailed schedule of BPC load shedding.

[10] C. Calderon (2008), *Infrastructure and Growth in Africa*, Working Paper 3, Africa Infrastructure Diagnostic, The World Bank, Washington, DC.

(Pty) Ltd and BPC are working on the development of a 90MW dual-fuel facility to be located at Orapa which is scheduled for operation in August 2010. This facility is expected to use diesel initially and switch to coal-bed methane (CBM) gas when and if reliable supplies become available. These costly short-term supply arrangements will impact adversely on the economy and cannot be borne by small and new businesses and residential customers fully. The cost of bridging the energy deficit with this very costly emergency option would very quickly go from US$0.3 billion in 2010 to about US$1.5 billion in 2013 or the equivalent of an annual average of 5 percent of the projected GDP over the period. A cumulative cost of US$4 billion can hardly be covered with fiscal resources particularly under the current adverse circumstances. The Government and BPC are examining how the increased costs can be recovered from large industrial and mining customers in the current economic environment and the arrangements for covering the remaining costs. Even though this impacts on the budget, it is necessary to address the economic contraction issues described in paragraph 12 above.

14. **Botswana is also facing increasing costs on the dwindling supplies from Eskom**. South Africa supplied power at or below US¢2/kWh until 2007, which is not only inexpensive but is also below global average costs for power even from coal power plants. Electricity tariffs in Botswana, like in the other importing countries in the region, have therefore remained generally low. However, South Africa began to gradually adjust prices to align with costs and enable Eskom to cover its increasing costs of supply and also support its large generation expansion program. Eskom's prices doubled between 2007 and 2008 to about US¢4/kWh, and resulted in financial loss for the previously profitable BPC. In addition to decreasing supply, Eskom prices are projected to increase to above US¢5/kWh in the coming years as per the revised sales agreement, and prices from other countries such as Mozambique and Namibia are also similar or higher. Botswana will need to adjust electricity prices[11] to cover the increasing costs of supply, but steep increases may affect the economic recovery and the poor should be protected from an adverse impact of price increases. At the same time it is also essential to expand access to the rural population. The current tariff structure does not have mechanisms to protect the poor (*e.g.*, lifeline block).

15. **There are no reliable sources in the Southern Africa Power Pool (SAPP) for Botswana to replace the substantial imports from Eskom in the medium-term as the other countries are also facing a similar situation and there is severe shortage of generation capacity**.[12] BPC has managed to obtain one-year supply contract of up to 50 MW from Cahora Bassa Hydro in Mozambique for 2009. Additional or extended period imports from Mozambique or other countries (*e.g.* Zambia) are uncertain at best due to transmission risks associated with routing power via Zimbabwe. The SAPP optimal expansion plan[13] through 2025 identifies 39,000 MW new capacity additions across SAPP countries, about 12,000 MW of which are intended to replace old coal power plants, mostly in South Africa. As indicated by this expansion plan, South Africa will soon cease to be a net exporter and become a significant importer of electricity from the rest of SAPP; Botswana, Namibia, Mozambique, and DRC are poised to become important exporters, mainly to South Africa, which continues to be the dominant player in the SAPP with nearly 85 percent of the demand. The new capacity additions in SAPP consist of 11,000 MW of new hydroelectric generation based on available potential notably in DRC, Mozambique, Zambia, Zimbabwe, and South Africa with the balance of 28,000 MW from thermal sources (mostly coal in South

[11] Average tariffs vary considerably across the southern Africa countries: Zimbabwe, Zambia, South Africa, Mozambique, and Malawi are in the US¢1.3 to 3.7/kWh range while Namibia, Botswana, and Swaziland are in the US¢4.3 to 5.1/kWh range (source: based on 2008 data, compiled by BPC).

[12] South Africa alone suffered a shortfall of about 7,000 MW in 2007 and the low availability of capacity has eroded reserve margins to meet peak demand.

[13] *The Southern Africa Power Pool (SAPP) Generation Expansion Plan Study*, Nexant, October 2007. SAPP expansion of this scale has risks of delay and changes due to several factors. Only four out of twelve countries are investment grade and large capacities identified in DRC, Mozambique, etc., also need PPA with Eskom which timing remains uncertain.

Africa, Botswana, and Zambia, and gas from Namibia, Mozambique, Angola, and South Africa). The medium-term expansion program through 2015 is about 21,500 MW which are at various stages of preparation (see "Annex 1—Country and Sector Background" for details).

Table 2: Select SAPP priority generation projects planned through 2015

	Coal	Gas	Hydro	Total
Botswana 1/	1,800			1,800
South Africa	6,400	2,760	2,331	11,491
Namibia	400	800	85	1,285
Mozambique	1,200	450		1,650
DRC			1,128	1,128
Zambia			1,280	1,280
Rest of SAPP	1,500	288	1,114	2,902
Total	**11,300**	**4,298**	**5,938**	**21,536**

1/: Morupule B 600 MW; Mmamabula IPP up to 2400 MW

16. **Many of the projects planned are likely to suffer delays, as has been common with such projects, and the financial crisis will be an added problem**. Many of the large scale projects are planned to supply Eskom on the basis of long-term Power Purchase Agreements (PPAs); these include the Mmamabula IPP in Botswana (reduced to 1,200 MW), the Kudu gas in Namibia (800 MW), the Moatize in Mozambique (1,200 MW). The Mmamabula IPP has already suffered significant delays due to the difficulty of finalizing a PPA with Eskom, which is also subject to regulatory approval in South Africa. The Mmamabula IPP project is a coal-to-power project in Botswana near the border with South Africa. Originally structured at 2,400 MW, given difficulties in arranging a turnkey contract and power sales at that size, the project was downsized to its current design of 1,200 MW of capacity, of which the Mmamabula IPP expects to sell about 900 MW of its energy and capacity to Eskom and 300 MW to BPC. The project is being developed by CIC Energy Corp and International Power plc. These sponsors have engaged Shanghai Electric Power Generation Group under a turnkey contract for the power block, including supercritical boiler technology in a 2 x 600 MW configuration. The Mmamabula project includes transmission lines to connect with the Eskom system in South Africa, as well as a new substation nearby the Morupule-Isang 400-kV transmission line in Botswana (Component A(2)). The sponsors are in the process of arranging financing and power purchase contracts with Eskom and BPC. The Mmamabula IPP is highly risky until its financing and power sales packages are arranged. It is not expected to start operating earlier than 2014, possibly even later. Therefore, the regional energy security situation in SAPP is unlikely to be resolved in the medium-term and importing energy for base-load power is not an option for Botswana at this time.

17. **Botswana's own resource options include coal, solar, and prospective coal-bed methane**. Coal is extensive (estimated at over 200 billion tonnes) but mostly undeveloped because of South Africa's already well developed and competitive coal mining industry. Botswana does not have hydropower resource and has limited wind power and biomass potential. Imported oil is available but is more expensive than coal and is subject to substantial price volatility. Botswana has considerable solar potential in the Kalahari Desert and solar is already used for off-grid power generation. Solar power is still expensive, and energy storage is unproven at large scale and hence requires backup generation for night time supply. Botswana has large inferred CBM resources which could potentially be also a low- to medium-cost source of power. But these are largely unexplored and thus not yet available for base-load generation. When proven, Botswana's CBM could be a very attractive low-carbon energy resource in the future, serving the sub-regional needs. Botswana also has favorable geological structures and thus promising potential for carbon storage. The Government's draft energy policy therefore emphasizes sustainable development of its energy resources and rapid exploration of CBM and carbon capture and

storage (CCS) potential, promotion of concentrating solar power (CSP), etc. Details of these potential options and respective costs are provided in Annex 1, Attachment 2, and summarized below.

Table 3: Botswana power generation alternatives, costs, and feasibility

Option	Cost US¢/kWh	Availability	Remarks
Existing Coal (Morupule A)[14]	5+	90 MW net	To be retired by 2020
Diesel units	50+	160 MW	Short-term gap fill only
Concentrating solar power (CSP)	~20	Up to 200 MW by 2020	50 MW targeted by 2016; needs donor support (*e.g.* Clean Technology Fund).
CBM	7 to 22	200 MW by 2020; 50 MW likely by 2015/16	Exploration yet to commence; costs, timing and capacity would be based on availability of CBM.
New coal plants	5+	Up to 3000 MW as per SAPP	4 year construction feasible for small and standard unit size

18. BPC's assessment, carried out by PB Power (Parsons Brinckerhoff Inc., USA) in 2004 and updated in 2006, shows that domestic coal is not only the least-cost option but also the only certain option to timely replace the imports from Eskom and meet Botswana's base-load power generation needs. This is also supported by the Bank team's analysis. Botswana coal projects are least cost and a part of the SAPP optimal expansion plan (2007). Thus, coal is the only option in consideration of least-cost analysis and paucity of alternative base-load options. Botswana has the opportunity to diversify its economy and contribute to regional energy security by substituting for Eskom through its coal resources, as well as potential CBM, and solar energy, creating new growth and employment opportunities. In fact, Botswana could be in a position to play an important role in resolving supply bottlenecks in SAPP.

19. **Botswana's approach is therefore to develop an energy portfolio including low-carbon (*e.g.*, CBM and possible coal gasification) and no-carbon (*e.g.*, CSP) technologies and also examine CCS, all of which support economic diversification and also have the potential to make demonstrative impact on the countries in the region in mitigating climate change**. Botswana's energy sector strategy is conceived on the premise of responsible development of coal and support a low-carbon growth path, which aims to minimize the climate change impacts. Even though Botswana is a low emitter and a net carbon sink with about annual negative 29.4 million tonnes of carbon dioxide (CO_2),[15] Botswana's approach will lead the other countries in the sub-region towards adopting and developing low-carbon growth strategies. In order to promote low-carbon growth options such as CSP, Botswana would need access to a large market like that of South Africa or SAPP and appropriate financing for commercial scale development.

20. **Collaboration among the key countries of the SAPP, especially Botswana, South Africa, Namibia, and Mozambique, would be necessary for realizing significant climate benefits from these initiatives**. Coal remains the most abundantly available and extracted resource in the region, especially in South Africa, which also happens to be the sixth largest producer of coal globally. South Africa accounts for significant energy related CO_2 emissions (about 211 out of 221 million tonnes for SAPP in 2007), almost entirely due to its dominant coal-based power generation. The emissions intensity of SAPP is expected to reduce gradually as coal-based capacity in the proposed additions through 2015 is only about 50 percent (Table 2), as old coal power plants are replaced by new technologies (*e.g.*, supercritical

[14] BPC operates a small 25-year old coal power plant (Morupule A, 4x33 MW) using coal supplied by Morupule Collieries Ltd.

[15] Botswana National Communications to the UNFCCC, 2001

boilers[16]) and as more hydro- and gas-based capacities are added. Further reductions could be realized once new renewable energy technologies (*e.g.*, wind, solar) are implemented following attractive feed-in tariffs announced by South Africa in March 2009.

Table 4: SAPP power generation capacity and CO_2 emissions, 2007

	Coal	Gas	Hydro	Nuclear	Total
Installed Capacity (MW)					
SAPP total	37,020	1,278	10,796	1,800	50,894
Of which: South Africa	35,625	342	2,061	1,800	39,828
Botswana	132	0	0	0	132
Rest of SAPP	1,263	936	8,735	0	10,934
CO_2 emissions (million tonnes)					
SAPP total	219.70	1.75	0	0	221.45
Of which: South Africa	211.42	0.47	0	0	211.89
Botswana	0.87	0.0	0	0	0.87
Rest of SAPP	7.41	1.28	0	0	8.69

Source: Compiled by project team from Nexant report and other sources

21. **The proposed project is designed to support Botswana's portfolio approach to develop its energy resources through a low-carbon growth strategy and also achieve energy security**. The project will help Botswana fast track development of new technologies and enable regional collaboration for large scale deployment, including mobilizing attractive financing, such as from the Clean Technology Fund, carbon finance, etc. The energy security is to be achieved through expansion of the existing Morupule A Power Station (*i.e.*, Morupule B Power Station).

22. **Botswana must act quickly to develop new generation capacity for energy security**. In view of the Eskom deadline, timely construction and commissioning before end-2012 is essential to meet energy security needs, but based on international experience, power plant construction is complex and prone to delays. In order to ensure dispatch ready power station as soon as possible, Botswana has opted to utilize readily available, proven technology, design, and size which also meet the technical and operating requirements of Botswana's power system, which is relatively small (less than 600 MW peak load) by international standards. BPC issued a competitive international tender in 2007 for the construction of a new 600 MW (530 MW net) power station (four units of 150 MW each) at Morupule, with coal to be supplied by expansion of the adjacent Morupule Colliery Limited (MCL),[17] the only operating coal mine in Botswana. MCL has over 5 billion tonnes of estimated mineable coal resources in its lease area with relatively good mining conditions and low mining costs. The consortium led by China National Electric Equipment Corporation (CNEEC) won the tender and the offer was finalized and signed in November 2008. CNEEC will design, supply, and install the power station using circulating fluidized bed (CFB) boiler technology adopting air cooling to minimize water use.[18] CFB is a superior technology compared to standard pulverized coal technology and also allows co-firing of alternative fuels such as biomass, CBM, etc., with minimal retrofits. The contract price at about US$1,615 per kilowatt (kW) is competitive (see "Annex 8—Procurement Arrangements" for details) and is thus the least-cost replacement for imports from Eskom.

[16] Power plant sizes are expected to be large (>1,000 MW) and hence allows adoption of supercritical boiler technology which is more efficient than conventional technology and thus reduces carbon dioxide emissions also by about 10 percent.

[17] MCL is wholly owned by Debswana Diamond Company (Pty) Ltd.

[18] Botswana is an extremely water-scarce country. The Botswana National Conservation Strategy recognizes the dependency of all sustainable development in the country upon water resources. CFB uses minimal water and controls local emissions cost effectively. Morupule B has sufficient water for operating at 600 MW capacity.

23. **CFB is the most appropriate available technology for the project.** PB Power as expert consultants examined various configurations in the feasibility study and determined that Botswana's power system with peak load of about 600 MW can support unit sizes no larger than 150 MW[19] based on system stability, operations, maintenance, etc. The technology options examined included the standard pulverized coal (PC), CFB and supercritical (SC). The PC and CFB were both technically feasible, though the CFB was found to be more cost effective taking into account available coal characteristics and water constraints. CFB also enables efficient control of local emissions and potentially allows multi-fuel utilization (*e.g*. CBM, biomass, waste tires, etc.) to reduce coal use. The more efficient SC technology requires unit sizes of at least 500 MW each (typically 600 MW and above) and hence unsuitable for the project. Building a larger capacity plant (*e.g*. two units of 600 MW each with SC technology) would need to be export-oriented (as in the case of the Mmamabula IPP), would critically depend on Eskom for financing and PPA which has already proved to be very difficult. Furthermore, such option would entail the following additional risks to Botswana: (i) the technology and size would be too complex and risky for BPC to manage and operate, as its experience is limited to operating a conventional 33 MW size unit; (ii) the unit size being more than Botswana's national peak load itself, it would affect system stability critically and also pose problems for maintenance; (iii) BPC is in no better position than an experienced private sector developer to construct and commission such a plant before 2012, thereby not addressing the national energy security concerns; and (iv) financing needs would double to about US$3+ billion and BPC's balance sheet would not be able to support it, thereby causing large reliance on the Government for equity, possibly about US$2+ billion when the Government finances are already stretched. The proposed project is structured minimally to address Botswana's energy security concerns, consistent with the SAPP optimal expansion plan.

Box 1: Climate Change and Botswana's Energy Strategy

Botswana's comprehensive energy strategy contained in Vision 2016, NDP 9 and NDP 10, and its Energy Sector Policy (draft 2008) recognizes climate change impacts and notes areas where Botswana could support global efforts in this regard, such as promoting (i) new technologies for exploring CBM, solar energy through CSP, CCS, sustainable biomass use, etc. and (ii) energy conservation and efficiency.

Botswana recognizes that potential developments (Morupule B, CIC Energy Corp, Aviva Corporation Ltd, etc.) involving coal will entail many risks and uncertainties and climate change concerns. Botswana intends to broaden its energy alternatives to support its economic diversification by augmenting coal with a low-carbon energy mix.

Recent studies have confirmed earlier indicative estimates of large CBM resources (over 190 trillion cubic feet (TCF)) in Botswana. If proven, this magnitude would be the largest gas find in Southern Africa and even a commercial development of 10-15 percent of the above estimate could transform the energy landscape and develop a new industry in Botswana and the region. Furthermore, CBM is substantially less carbon intensive than coal and could eventually even substitute for coal use in Morupule and other coal-fired power plants. The Government intends to promote CBM considering the huge upside potential for Botswana but at the same time recognizes that CBM development remains inherently uncertain due to limited success in other countries (in particular USA and Australia). The Government has issued prospecting licenses[20] and has already received tentative proposals for CBM supplies for the prospective 70 MW and 90 MW new IPPs subject to confirming the CBM reserves. However, the legal framework for CBM in Botswana has yet to be fully developed and adopted and coal licensing arrangements also need strengthening to improve license compliance.

Pre-feasibility studies have indicated attractive sites for developing a commercial scale modular CSP plant up to 200 MW in the Kalahari Desert. CSP is still costly (over US¢20/kWh) and requires huge subsidies at present but

[19] Technical requirements dictate that largest unit size should be no more than 25 percent of peak demand for system stability and optimal operation.

[20] Kalahari Energy and Exxaro of South Africa hold five prospecting licenses over an area of 3,912 square kilometers in the eastern part of Karoo basin (see "Annex 1—Country and Sector Background" for details).

long-term prospects point to commercial feasibility during the next decade. With international support, such as from the Bank's Clean Technology Fund, Botswana could promote commercial scale (*e.g.*, 50 MW) CSP plant during the coming decade.

Botswana has considerable potential due to favorable geological structures for carbon storage at such time as CCS is demonstrated on a large scale and becomes viable. In addition, Botswana has potentially suitable conditions for using carbon dioxide to simultaneously extract CBM. This is being considered by Botswana for examining its technical and economic feasibility.

BPC is now implementing an energy conservation and efficiency program (demand-side management (DSM)) which is expected to reduce demand by up to 10 percent. The DSM includes replacement of one million incandescent lamps with compact florescent lamps (CFLs) and installation of 65,000 smart meters in the two largest cities (Gaborone and Francistown). BPC intends to expand DSM programs and also adopt time-of-use tariffs for peak-load management. All these initiatives could qualify for carbon finance support and potentially Clean Technology Fund support from the Bank.

24. **Botswana's responses to the economic and energy crises involve many risks and need to be managed well,** an important element of which is securing support of the affected population and the stakeholders. Electricity tariff increases amidst load shedding and economic crisis situation would be unpopular even with support mechanisms. The Government is engaging in continual dialog and consultations with businesses and population at local and national level to explain the challenges and develop consensus on measures to deal with them. Botswana should also build support at the regional level as an engaged player by addressing regional energy concerns and at the international level as a responsible country by addressing and supporting global concerns on climate change. The Government has developed a practical communications strategy to address these issues at various levels. It has sought Bank support to implement the strategy and also build capacity in communications and consultations.

B. Rationale for Bank involvement

25. **The proposed operation is fully consistent with the first-ever World Bank Group Country Partnership Strategy (CPS) with Botswana discussed by the Board on May 21, 2009**. The project directly supports the third pillar of CPS, namely, *Increased Competitiveness—Infrastructure and the Climate for Investment and Growth*, which is crucial for Botswana's economic diversification and poverty reduction strategy. The project, *inter alia*, supports Botswana's pro-poor development strategy by: (i) preventing a major economic contraction after 2013 when Eskom will stop exports to Botswana, (ii) creating employment opportunities (both direct and indirect), and (iii) make possible the rural access expansion to bring power to where the bulk of poverty is situated. In the short run, about 1,300 direct jobs will be created during the construction phase (2009-12), and about 310 jobs thereafter for the power station and mine operations. Additional jobs for support services would also be gained. At a time in the country where opportunities are limited, such employment creation would contribute to social welfare and economic gains. In the long run, increased generation capacity and energy security would make Botswana an attractive destination for investment and increased productivity would lead to further reduction in poverty.

26. **The Government and BPC have called on the Bank to partner in the country's energy sector development at the policy, strategy, and investment levels**. The main drivers for this request are to benefit from the Bank's global knowledge and technical expertise as the country faces complex and multiple development challenges and the Bank's convening power to promote regional initiatives. Botswana is also relying on the Bank's financial support in light of the economic crisis. The Bank was instrumental in assisting BPC and the Government to conduct a competitive solicitation process for securing the best possible terms of financing and the Bank's support is essential to bring the terms of financing acceptable to the project's needs considering also the financial crisis. The Bank's support

through the proposed IBRD partial credit guarantee ("PCG") will improve the terms of the commercial financing obtained and thus reduce the pressure on tariff increases and the proposed IBRD Loan will complement the African Development Bank (AfDB) loan to achieve the lowest cost financing for the project. The Bank will also mobilize potential carbon finance and similar support for DSM and low-carbon initiatives.

27. **Botswana has no prior experience in financing and managing a project such as Morupule B**, especially in a time of crisis, and has limited experience in monitoring, evaluating, and enforcing environmental and social aspects for a project of this scale. Bank involvement will, therefore, assist BPC and the Government to: (i) finalize an optimum financing package; (ii) monitor all aspects of project implementation; and (iii) build capacity in relevant Botswana institutions. The Bank will help Botswana develop a new electricity tariff policy, including mechanisms for protecting the poor through targeted subsidies for life-line users, which will also ensure financial viability of the sector and attract private sector financing for new initiatives. The Bank will help improve consultations with stakeholders through effective two-way communication and support to build capacity for transparent regulation of the sector through a new regulatory agency.

28. **Botswana supports global efforts concerning climate change and could spearhead low-carbon growth strategies across the sub-region**. The Bank will help Botswana examine and fast track new technologies for low-carbon (CBM exploration), no-carbon (commercial scale CSP) and carbon storage (pilot CCS), which would help set feasible benchmarks for other countries in the sub-region for evaluation of these approaches and also create new sources of growth and employment. The Bank will help develop a CBM road map and an enabling policy and regulatory framework that would include possible carbon sequestration. The Bank will work with BPC to examine how it can design the proposed project for carbon capture[21] readiness so that Botswana can pilot a CCS when storage option is found to be feasible. On carbon emissions management, the Bank has an ongoing technical assistance grant to support capacity building for the Designated National Authority (DNA) to identify and promote Clean Development Mechanism (CDM) projects. These include exploring energy efficiency in the mines, industry, and in household sectors, among other opportunities. Botswana has indicated interest in accessing post-2012 resources for carbon financing through the Bank's proposed Carbon Partnership Facility as well as through the broader carbon markets. The Bank's involvement will help Botswana implement its portfolio approach for mitigating climate change impacts by preparing clean energy projects and thereby also support economic diversification through energy.

29. **The Bank involvement would also facilitate collaborative efforts between Botswana and South Africa** to carry out a Regional Environmental and Social Assessment (RESA) for examining the cumulative impacts of all the various energy projects planned and existing across their border. Future large scale coal-fired power projects include the Mmamabula IPP (1,200 MW, and possibly expanding to 2400 MW later) in Botswana, plus Bravo (4,400 MW) and Medupi (4,400 MW) in South Africa.[22] Other planned projects in the region include the 1,000 MW power plant by Aviva Corporation in Botswana and a petrochemical complex on the South African side of the border. The cumulative impact of these projects on air quality and water would be significant and require joint and concerted actions by both Botswana and South Africa. The Bank is well placed to support multi-country dialogue on strategic issues. The RESA would support the Bank's policy dialogue with the two countries in addressing their shared concerns through mutual programs and measures. The RESA is proposed to be carried out in two phases and financed from the South Africa trust fund administered by the Bank.

[21] Readiness requires that adequate space be provided for installing carbon capture equipment in the future.

[22] Existing power plants in the region are the Morupule A (132 MW) in Botswana and Matimba (2,400 MW) in South Africa.

30. **The proposed project and intervention is consistent with Bank policies and strategies for energy, development, and climate change**. The Bank's support for the proposed project in Botswana would help to meet Africa's increasingly urgent need for energy to support growth and poverty alleviation. For Africa, Bank strategies support energy generation from all sources in a responsible and sustainable manner. These strategies are consistent with the World Bank's *Africa Action Plan*,[23] *Clean Energy for Development Investment Framework*,[24]and *Management Response to the Extractive Industries Review*.[25] The project is also in line with the approach to provision of energy from coal presented in the *Development and Climate Change: A Strategic Framework for the World Bank Group (DCCSF)*,[26] which was reinforced by the Board during its discussion of the *World Bank Group Energy Strategy Concept Note*.[27] It would thus also support engagement by the Bank on issues of mitigation and adaptation to climate change with Botswana.

Table 5: Assessment of the project against the DCCSF selection criteria

DCCSF criteria[28]	Assessment Summary
There is a demonstrated developmental impact of the project including improving overall energy security, reducing power shortage, or increasing access for the poor	The project supports Botswana's poverty reduction and diversification strategies and provides energy security by rapid addition of domestic capacity before imports from Eskom cease by end-2012. Without the project, Botswana would face significant economic losses, hardship for the poor and its success and stability would be undermined. The project would help expand rural access and development and contribute to Botswana's *Vision 2016* goals.
Assistance is being provided to identify and prepare low-carbon projects	Botswana is taking steps to promote new technologies for promoting low-carbon alternatives. The project includes support for developing low-carbon growth strategy focusing on both demand side and supply side aspects, and for promoting CBM and preparing a CSP project. The project also examines feasibility of a pilot CCS in Botswana.
Energy sources are optimized, looking at the possibility of meeting the country's needs through energy efficiency (both supply and demand) and conservation	The project will support and expand ongoing energy efficiency and conservation program and campaigns (installation of CFLs, smart meters, solar hot water heaters, etc) through potential carbon finance opportunities via the Clean Development Mechanism, and particularly focus on large load customers like mines and industries for maximizing impact. These measures would help but would not be sufficient to close the large and increasing supply gap.
After full consideration of viable alternatives to the least-cost (including environmental externalities) options and when the additional financing from donors for their incremental cost is not available	At this time, Botswana has no other viable alternatives for large scale base load power generation. Adequate and reliable power is not available in SAPP, has no access to gas imports of significance, domestic CBM resource remains to be proven, has very scarce water resources, and insufficient wind speed for energy. CSP is a future option for base load when storage technologies are proven and financing is available (*e.g.*, Clean Technology Fund).

[23] *Meeting the Challenge of Africa's Development: A World Bank Group Action Plan*, World Bank, September 26, 2005

[24] *Clean Energy for Development Investment Framework: The World Bank Group Action Plan*, March 28, 2007.

[25] *Striking a Better Balance—The World Bank Group and Extractive Industries: The Final Report of the Extractive Industries Review, World Bank Group Management Response*, World Bank Group, September 17, 2004.

[26] *Development and Climate Change: A Strategic Framework for the World Bank Group: Technical Report* (DCCSF), World Bank Group, 2008

[27] *World Bank Group Energy Strategy Concept Note*, CODE2009-0052, July 8, 2009

[28] DCCSF, page 29

DCCSF criteria[28]	Assessment Summary
Coal projects will be designed to use the best appropriate available technology to allow for high efficiency and, therefore, lower greenhouse gas emissions intensity	Small unit size and proven technology are critical for fast deployment of needed capacity for energy security. CFB is the best appropriate available technology, also considering Botswana's small power system. CFB also requires minimal water and controls local emissions effectively. Much superior option of supercritical boiler would require unit size of at least 500 MW, which is unsuitable for Botswana power system.
An approach to incorporate environmental externalities in project analysis will be developed	The project analysis considers greenhouse gas externalities in evaluating options. Combinations of load shedding, diesel generation and CSP options are compared with Morupule B to identify switching values of CO_2/tonne equivalence. A portfolio approach to reducing carbon footprint of the project is proposed. Energy efficiency and conservation measures have negative switching values and hence will be supported actively.

31. **The proposed project is least cost both in the national system as well as a part of the SAPP optimal expansion plan**. The technology and unit size was selected based on detailed feasibility study of options, matched to system needs.[29] Site location is right next to the current Morupule A power plant and thus is close to coal mine and enables sharing infrastructure and personnel. BPC has conducted the procurement through a competitive process for the EPC which is economic and efficient. The power plant EPC is about US$1,615/kW, which is below the cost assumptions in the SAPP study and also compares favorably with recent bids by Eskom (close to US$2,000/kW for Bravo/Medupi) and by CIC Energy (over US$2,000/kW for the Mmamabula IPP).

C. Higher level objectives to which the project contributes

32. **The proposed project supports Botswana's response strategy** to cope with the impact of the global economic crisis by providing and mobilizing significant financing on attractive terms and to ensure a reliable, secure, and affordable electricity supply that is critical to sustaining economic growth and expanding energy access to the poor in Botswana. By opening up new growth opportunities for Botswana, by preventing a major economic contraction from 2013 when Eskom will stop energy exports to Botswana, and by making possible further expansion of electricity access to the rural areas, the proposed operation fully supports Botswana's efforts to diversify its economy with private sector involvement, reduce poverty and inequality, and improve living and economic conditions for rural poor. The project is designed to respond to Botswana's needs and demand driven along the WBG's and Africa Region's Middle Income Countries strategy. The project is also fully consistent with the Bank's energy strategy and regional development priorities in Southern Africa, as well as with the priorities of the Bank's CPS for Botswana which seek to promote economic diversification, energy security, and social and environmental sustainability.

33. The proposed project, together with the Botswana National HIV/AIDS Prevention Support Project (project ID P102299), the recently approved Integrated Transport Project (project ID P102368), the signed Global Environment Facility (GEF) Wildlife Protection Project, and the planned Mmamabula IPP project illustrates clearly a proposed re-engagement between the Government and the Bank after an almost twenty-year hiatus in lending.

[29] Coal power technologies include standard pulverized coal (PC), circulating fluidized bed (CFB), and supercritical, which has variations (*e.g.*, ultra-supercritical). In the last decade, no new commercial coal power technology has been advanced.

II. PROJECT DESCRIPTION

A. Lending instrument

34. The Government has requested consideration of an IBRD Partial Credit Guarantee and an IBRD Loan for the project. The PCG will support commercial bank financing for the power station construction (Component A(1)).

35. **Proposed IBRD Partial Credit Guarantee (PCG)**. BPC, through a competitive solicitation, has arranged for a twenty-year loan (export credit facility of fifteen-year maturity without the PCG) from the Industrial and Commercial Bank of China Limited (ICBC), a state-owned commercial bank in China, in the amount of US$825 million. China Export & Credit Insurance Corporation (Sinosure) will guarantee 95 percent of scheduled debt service amounts for the first fifteen years of the ICBC loan. IBRD will guarantee payment of the scheduled outstanding principal amount and one accrued interest payment falling due and payable after the fifteenth year, on an accelerable basis only on and after the beginning of the sixteenth year. The PCG will be denominated in US$. The PCG and the Sinosure insurance policy will not overlap or otherwise cover the same payment obligations under the ICBC loan; consequently, the PCG will not benefit the bilateral agency Sinosure. While the proposed co-guarantee operation is a new feature for Bank guarantee operations, such combination in a non-overlapping manner was assessed appropriate given the current financial crisis affecting Bank's client countries including Botswana.

36. The ICBC loan will be fully amortized over its twenty-year life. When the PCG is first callable at the beginning of the sixteenth year, the nominal value, and IBRD's exposure, would be US$242.7 million (*i.e.*, 10/34 of the total principal amount of the loan). The present value now (*i.e.*, Bank's immediate exposure amount under the PCG) would be about US$121 million. See "Annex 11—IBRD Guarantee" for more detailed information.

37. The developmental impact of an additional five years of tenor on the ICBC loan is to lower BPC's revenue requirement for debt servicing, which will be reflected in their retail tariffs. The proposed coverage of the PCG is appropriate for this transaction to stretch the maturity of the ICBC loan to twenty years, given the current global financial crisis and challenging market conditions.

38. **Proposed IBRD Loan**. Botswana has requested a US$ loan with a variable spread and a thirty-year maturity, including four-year grace period. Botswana has elected level repayment of principal linked to commitment, proposes to pay the front-end fee and applicable premium from its own resources, and has chosen the options for currency conversion, interest rate conversion, and caps/collars. The proposed loan amount is US$136.4 million.

39. The Republic of Botswana would be the borrower of the proposed IBRD Loan. Under a subsidiary agreement, the Government (through its Ministry of Finance and Development Planning (MFDP)) will contribute funds to BPC towards the agreed subcomponents of Components A(2), A(3), B and C procured by BPC under World Bank procurement guidelines. The Government proposes to take the full obligation for repayment of principal and interest and other applicable charges on the proposed IBRD Loan.

B. Project development objective and key indicators

40. The objectives of the project are to support Botswana in: (i) developing reliable and affordable supply of electricity for energy security; (ii) promoting alternative energy resources for low-carbon growth; and (iii) building its institutional capacity in the energy sector. All these objectives are key to

Botswana's development strategy aimed at further reducing poverty and spreading the dividends of progress more equitably among all sections of society.

41. The first objective will be achieved by adding 600 MW new capacity through four units of 150 MW each, adjacent to the existing Morupule A Power Station, and associated transmission lines and substations. Greater availability of affordable electricity to households and industry will benefit the economy as a whole. New electricity connections bring new economic opportunities. The economic growth made possible by increased and secure access to electricity will enhance social welfare, help create jobs, and allow some of the country's rural populations to benefit from electricity

42. The second objective will be achieved by preparing a low-carbon growth strategy to help the Government and private sector to fast track exploration of alternative energy sources (*e.g.*, CBM, CSP) and possible new technologies (*e.g.*, CCS) through feasibility studies and securing appropriate financing. In the short-term, this will enhance the Government's knowledge, capacity, and preparedness for new technologies; in the medium-term, this will enhance the prospects for private sector investment in new technologies and energy alternatives; in the long-term, this will benefit the local population by creating new "green collar" jobs and increasing Botswana's contribution to regional climate change mitigation.

43. The third objective will be achieved by improving the sector frameworks—policy, legal, and regulatory—for the electricity, coal, and CBM, and enhancing capacity of the relevant institutions, including setting up of a new independent electricity regulator.

44. Key performance indicators are the following (see "Annex 3—Results Framework and Monitoring" for details):

(a) domestic electricity generation as percent of peak demand;
(b) potential reduction in CO_2 emissions; and
(c) regulatory agency issuing decisions

C. Project components

45. The proposed project has three components (see "Annex 4—Detailed Project Description" for more information).

Component A- Morupule generation expansion: This component, to be implemented by BPC, includes three distinct and integral infrastructure subcomponents as follows:

Component A(1)-Morupule B Power Station (estimated cost US$1,211.3 million, including taxes and duties of US$138 million) involves construction of a 600 MW (4 x 150 MW) coal-fired power station, adjacent to the existing Morupule A Power Station near Palapye, in the eastern part of the country. The scope includes, *inter alia*: (a) coal conveyor, coal yard, coal crushers, and coal preparation equipment, (b) limestone preparation and feed systems, (c) ash disposal and handling system, (d) circulating fluidized bed (CFB) boilers with associated particulate removal equipment, (e) steam turbines and generators, (f) fans and air cooled condensers, (g) switchyard, (h) balance of plant, and (i) start up fuel for testing and commissioning.

Component A(2)-transmission system (estimated cost US$275.2 million, including taxes and duties of US$ 36 million) involves construction, supply and installation of: (a) Morupule–Phokoje 400 kV transmission line (102 kilometer (km) and associated equipment; (b) Morupule-Isang 400 kV transmission line (215 km) and associated equipment; (c) 3x315 MVA 400/220 kV transformers; (d) 400/220 kV substation at Isang and associated works; (e) reactive power

compensation equipment; and (f) automatic generation control (AGC) equipment, software, and associated installation.

Component A(3)-water supply system (estimated cost US$53.0 million, including taxes and duties of US$6.1 million) involves construction of: (a) pipeline from the new Paje well field to the Morupule B Power Station (80 km) for backup supply; (b) power supply line for the new Paje well field; and (c) an extension pipeline from the MCL reservoir to the Morupule B Power Station (5 km) for the main water supply.

Component B-alternative energy development: This component (to be implemented by MMEWR and estimated cost US$6.8 million, including taxes) will support diversification of Botswana's economy through a low-carbon growth strategy. Given Botswana's energy endowment, its cleaner fuel options are to develop coal-bed methane and to explore solar thermal, while examining prospects for carbon capture and storage as a means to mitigate climate change impacts.

Component B(1)-A low-carbon strategy study for growth and long-term mitigation options for Botswana will analyze and recommend actions on: (i) demand side interventions including energy conservation and energy efficiency across the economy; and (ii) supply side, in which Botswana becomes a net exporter of energy while South Africa becomes an importer, adoption of low-carbon practices, transition to cleaner burning fuels (e.g. CBM, CSP) and CCS.

Component B(2)-A bankable feasibility study for a commercial scale CSP, including implementation approach and funding mobilization assistance;

Component B(3)-A development strategy for the efficient use and supply of CBM, with some reinforcing actions on coal, whose activities include: (i) frameworks for strategic development and efficient resource use; (ii) regulatory reforms and institutional strengthening, (iii) institutional reforms and capacity building; and (iv) resource assessment of CBM with cross support to carbon capture and storage.

Component B(4)-A pilot carbon capture and storage study to assess the opportunities for CCS in Botswana, and to make recommendations as to the legal and regulatory environment necessary to take full advantage of those opportunities.

Component C-institution and capacity building: This component (estimated cost US$13.9 million, including taxes) covers project implementation assistance, institutional and capacity building for BPC and the Ministry of Minerals, Energy, and Water Resources (MMEWR) as follows:

Component C(1) For BPC (power plant and transmission): (a) transmission system harmonic study; (b) transmission control area establishment; (c) technical assistance for transmission system operations; (d) air quality monitoring and management; (e) training and workshops for Project Management Unit (PMU) staff; and (f) project management and supervision.

Component C(2) For MMEWR (sector development): (a) interim tariff policy study; (b) tariff policy and regulatory agency for the power sector, and associated capacity building; (c) design and implementation of a communications program; and (d) training for safeguards monitoring and management..

46. **Associated infrastructure**. Beyond the scope of the project are two elements of associated infrastructure: (1) MCL is undertaking an expansion of their underground coal mine, which also supplies coal to the Morupule A Power Station, for the dual purposes of supplying coal to (i) the proposed

Morupule B Power Station; and (2) MCL has constructed a 22 kilometer underground water pipeline from the North-South Carrier (NSC) for the dual purposes of supplying water to (i) the Morupule Colliery and (ii) the proposed Morupule B Power Station. Both of these undertakings also serve other customers, not just BPC or the project. Given their importance to the project, however, Environmental and Social Impact Assessments (EIAs) for both have been included in the project documentation.

D. Lessons learned and reflected in the project design

47. The Bank's worldwide experience with power sector projects (generation, transmission, sector reforms, etc) and coal-to-power projects in particular (*e.g.*, China, Romania, Kosovo) has been suitably incorporated in the proposed project. For public sector implemented projects, these include the following: (i) client has adequate capacity for all phases from pre-construction to operation; (ii) an experienced owners engineer is in place to support implementation, especially in supervision; (iii) adopt turnkey approach wherever feasible and ensure early actions on procurement; (iv) there is adequate consultation with affected communities and their concerns are properly reflected in remedial measures; (v) project benefits are adequately shared with affected communities; (vi) for high risk and sensitive projects, there is adequate capacity in the client country to undertake proactive communications to inform stakeholders of the benefits and how specific concerns are being addressed; (vii) contractors and suppliers fully comply with safeguards requirements through their contracts, and monitor conformance; (viii) there is satisfactory policy framework, especially regulations, for timely and adequate tariff setting to ensure financial viability of utility/sector; (ix) there is strong ownership of the project and reforms in the client country.

48. For high risk projects, such as the proposed project, experience recommends that Bank supervision is adequately resourced and staffed, including field-presence as necessary. The proposed project design also includes support for the Government to address climate change aspects in a significant manner.

E. Alternatives considered and reasons for rejection

49. The Government's policy is to secure least-cost supply. In this regard, the Government and BPC considered several options for substituting Eskom imports. The Government considered and strongly promoted IPPs by private sector (especially the Mmamabula IPP, 2,400 MW supercritical plant) to build large scale power plants to satisfy both Botswana's needs and supply adequately to South Africa. The project sponsors have been unable since 2007 to reach agreements with Eskom on PPA and to finalize engineering, procurement, and construction (EPC) contract in the then tight equipment market for large size supercritical turbines and boilers, and other essential project arrangements, and the financial crisis has further complicated the financing arrangements and timing even with a vastly reduced size of 1,200 MW for the project. The timing, size and structure of this project remain uncertain at this time. The Government still supports this project for regional energy security and potentially for Botswana's own needs beyond 2018 when Morupule plants would not be able to meet the growing demand.

50. Additionally, the Government and BPC also examined and decided to pursue new low-carbon technologies (CBM and CSP), but these do not ensure reliable power supply and satisfy demand requirements in the short-term. The private sector IPP proposal using CBM (160 MW) is tentative, conditional upon finding CBM of adequate quantity and quality, and proposes use of diesel until CBM is found. As such, the timing and cost was uncertain. CSP was found to be technically feasible for installation in the Kalahari Desert based on experiences in other countries (notably Spain and USA) of a size of up to 200 MW, required large subsidies due to high cost (more than US¢20/kWh) and necessitated diesel backup since storage technology options are still to be proven. Both CBM and CSP technologies are potential long-term options to complement other sources of energy in Botswana and SAPP at large, but do not serve immediate supply and security needs.

51. BPC also examined long-term imports from other sources in SAPP, with diesel units for filling gaps over the short-term. Since all countries are experiencing shortage and have to build new capacity, BPC was able to secure only about 50 MW from Cahora Bassa Hydro in Mozambique, which is both inadequate and risky due to transmission and other constraints through Zimbabwe.

52. As regards Bank instruments, a specific investment loan (SIL), a partial credit guarantee (PCG), and a development policy loan (DPL) were considered. A DPL was rejected as the Government regarded the Bank's involvement with the project as more critical and necessary and since sector reforms could be supported through a SIL itself. Based on financial proposals from commercial banks, a PCG was found to be appropriate to improve the terms of the financing and also enhance capital mobilization for the sector. Accordingly, a PCG for the power station component and a SIL for remaining components under parallel co-financing arrangements with AfDB were combined in the package of Bank assistance to the project.

III. IMPLEMENTATION

A. Partnership arrangements (if applicable)

53. The project will be financed by a combination of loans. The power station (Component A(1)) will be financed substantially (85 percent of EPC cost) by a loan from ICBC, supported by Government, Sinosure, and the PCG. The transmission system (Component A(2)) will be financed by IBRD (28 percent) and AfDB (59 percent) loans under parallel co-financing arrangements. The water supply system (Component A(3)) and institutional and capacity building technical assistance (TA) (Component C) will be substantially financed by the proposed IBRD Loan (88 percent and 42 percent, respectively). The alternative energy project development (Component B) will be financed 95 percent by the Bank. The Government and BPC will finance the remaining costs of the project.

B. Institutional and implementation arrangements

54. Detailed descriptions are provided in "Annex 6—Implementation Arrangements" and summarized below. Day-to-day project implementation responsibility rests with BPC and MMEWR, in coordination with MFDP, the Ministry of Environment, Wildlife, and Tourism (MEWT), and other parts/agencies of the Government. BPC will implement Components A and C(1), and MMEWR will implement the Components B and C(2). BPC will be responsible for all procurement and financial management under the project and ensuring timely conclusion of agreements with MCL for coal supply, with MCL and the Water Utility Corporation (WUC) for water supply and for imports of limestone for the power plant.

55. BPC has set up a Project Management Unit (PMU) and designated a Director-level person as Project Manager to oversee and coordinate four functional units. The Project Manager previously was with Debswana and has considerable experience with managing large and complex projects. The four functional units under the Project Manager are: power plant, transmission, administration and finance, and safeguards, headed by the Engineering Manager, Transmission Director, and Manager Finance and Administration, respectively; the Project Manager directly oversees safeguards team in the PMU. Several existing staff of BPC is seconded to the PMU in a matrix structure of responsibilities. All additional required staff has been hired to support various functions, with only one position remaining to be filled.

56. For the alternative energy and sector development parts (Components B and C(2)), MMEWR has designated the Permanent Secretary to oversee and manage the implementation. The Permanent Secretary will be supported by two Deputy Permanent Secretaries and their department staff. The Deputy Permanent Secretary (Minerals) will oversee the implementation of the coal/CBM strategy. The Deputy

Permanent Secretary (Water and Energy) will oversee the implementation of alternative energy Component B and all other subcomponents of Component C(2).

57. The PMU in BPC will provide assistance to MMEWR for procurement and contracting of the above TA subcomponents, while supervision responsibility would be as described above. The relevant implementing units in MMEWR will be responsible for preparing and finalizing the terms of reference for their respective TA parts, in consultation with the World Bank.

58. The project is complex and requires attention of various parts of the Government and BPC to ensure smooth and timely implementation. International experience indicates that there are potential risks of delays, conflicts resulting in public and stakeholder anger, bad publicity, etc., which should be anticipated and managed through improved internal communication among other means. The substantial financial support from and through the Government (about US$850 million) would also entail frequent briefings to the Ministers, the Cabinet, and Parliament. Continual oversight and coordination by a dedicated high level and experienced executive will be necessary and also helps mitigate the reputational risks to the BPC, the Government, and the World Bank. The Government has agreed to appoint a high-level executive as Project Coordinator, under terms of reference satisfactory to the Bank, within three months of effectiveness of the proposed IBRD Loan.

59. The Bank supervision will be suitably matched to meet the requirements and the complex issues to be addressed under the project. The supervision will be intensive in the early years when most risks are expected to surface, and also include field-based supervision as required. Procurement, monitoring and evaluation, and financial management workshops will be conducted early after effectiveness. The Bank team will be adequately staffed with required expertise (see "Annex 6 – Implementation Arrangements"). Power plant related matters will be given priority in the early period of implementation. At least three to four supervision missions will be undertaken annually during the initial years and include and will include safeguards and fiduciary staff.

C. Monitoring and evaluation of outcomes/results

60. The Project Coordinator will be responsible for coordination and monitoring of complete project progress and performance and prepare reports. The Project Coordinator will facilitate coordination between BPC and MMEWR and such other agencies as required (*e.g.*, MFDP) and also be a focal point for the World Bank's supervision and other discussions of the project.

61. The key indicators to be monitored and used in assessing project progress and evaluation of outcomes are described in "Annex 3—Results Framework and Monitoring." Specific data for gathering and reporting, including responsibility thereof, have been identified and agreed with BPC and the Government. The Project Manager at BPC is experienced but overall in the PMU at both BPC and MMEWR there is need for familiarizing with the Bank's monitoring and evaluation aspects. The Bank will conduct a monitoring and evaluation workshop after effectiveness and also provide additional training opportunities to select PMU staff and also the Project Coordinator depending upon the level of proficiency. A mid-term review would be carried out within approximately twenty-four months from effectiveness of the project.

D. Sustainability

62. Project sustainability depends on several key aspects. First, it hinges on the Government's commitment to its policy for ensuring BPC's continuing viability through timely and required adjustments to tariffs. The Government's track record already shows this commitment and BPC has been able to cover its costs and also earmark some funds over the years as equity for the project. The

Government has also committed to the following: (i) provide additional equity to BPC to strengthen its balance sheet and hence support the borrowings needed; (ii) adopt an appropriate electricity tariff policy, recognizing the substantial increases anticipated and the need for balancing the economic, social, and financial concerns; and (iii) establish an independent regulator to ensure transparent regulation of the energy sector.

63. Second, it depends upon BPC's ability to ensure smooth operation of a new technology plant, conforming to good international practice and applicable safeguards standards. BPC will be supported by both the EPC Contractor and consulting engineers for proper operation of the power plant. BPC has committed to the following: (i) remedy any emission exceedence from Morupule A plant before commissioning of the new plant to ensure that air quality is maintained to acceptable standards; and (ii) ensure that water use from the new Paje well field to stay within sustainable limits and take early measures as warranted to avoid any adverse impact on other users of the same water resources (*e.g.*, farmers, cattle, etc).

64. Third, concerning mitigation of the project's long-term impact on climate change, it depends upon how soon the new technologies (CBM, CSP, CCS) are implemented, which in turn relies on technology development, availability of adequate water, international donor support (*e.g.*, Clean Technology Fund) and carbon finance revenues. A tiered approach to implementing measures and their impact on reducing carbon emission factor is as below (see "Annex 1—Country and Sector Background" for details).

Table 6: CO_2 emission factor (tonne/MWh) scenario (estimates)

Tier	Options / Measures	2013-15	2016-19	2020 ->	Remarks
Target	Supercritical technology (for unit size > 500 MW)	**0.90**	**0.90**	**0.90**	Considered as target benchmark for coal power plant efficiency
Project	Morupule B CFB (150 MW unit size)	1.10	1.10	1.10	Best available for proposed project
(1)	Energy efficiency and conservation up to 50 MW (underway by BPC)	1.05	1.05	1.05	Assuming avoided emissions at 0.5 tonne/megawatt-hour (MWh) for diesel units
(2) (1) + CBM	CBM: As co-fuel in Morupule B plant, and/or new generation. 50 MW in 2016 and gradually raised to 200 MW by 2020	n.a.	1.01 – 0.97	**0.90**	At emission intensity of 0.45 tonne/MWh for CBM. Needs risk capital to cover early development and exploration costs
(3) (2) + CSP	CSP: 50 MW by 2020 (w/o storage)	n.a.	n.a	**0.87**	At zero emission intensity; assuming Clean Technology Fund or similar funding support
(4) (3) + CCS	CCS: Pilot for up to 50 MW or about 650,000 tonnes CO_2 per year	n.a	n.a	**0.76**	Most beneficial impact on overall emissions

65. Each measure in the above portfolio would provide CO_2 avoided/savings. Energy efficiency (EE) savings are assumed to be used to displace otherwise diesel generated energy. If CBM is realized as

planned, then EE and CBM would help to achieve portfolio emission factor equivalent to that of supercritical power plant. A CSP without storage has low capacity factor and hence the further reduction to 0.87 tonne/MWh is not as significant compared to CCS which has the most beneficial impact on overall emissions (0.76 tonne/MWh). The Government is committed to expanding EE campaigns through BPC and promoting CBM, CSP, and CCS with private sector involvement. The Bank will work with BPC and Government in promoting these initiatives, including through mobilization of carbon finance, Clean Technology Fund, and other financing as appropriate.

E. Critical risks and possible controversial aspects

66. Some of the key project risks are: construction and operational risks related to the power station and transmission system, environmental, social, and health risks related to the influx of people to the construction site, and cash flow risks related to short-term supply using high cost diesel generators and inadequate tariffs. At the country level, there are risks associated with the weakening fiscal situation due to global economic crisis and political economy risks associated with tariff adjustments during a crisis period. Further, there are broader Bank reputational risks associated with support for a coal-fired power plant when climate change is a major global concern and attribution of the project negatively to any worsening of the HIV/AIDS epidemic, as well as investigation of the EPC Contract award by Botswana. These risks and mitigation measures are summarized in the following matrix. A detailed list of risks and mitigation measures is included in the Risk Identification Worksheet for the project.

Table 7: Critical risks and possible controversial aspects (L: low; M: modest; S: substantial; H: high)

Risk	Risk mitigation measures	Risk rating with mitigation
Project Specific Risks		
Delays due to weak implementation capacity of BPC and MMEWR	The power plant part is complex and is prone to delays based on international experience. BPC has appointed consultants with adequate qualifications and experience to support implementation and supervision of both the power station and transmission line. The Bank, through field based supervision, would also support BPC for timely actions to avoid delays. MMEWR has a good track record of monitoring large projects within the associated mining and water sectors.	S
Quality issues due to EPC consortium performance	Subcontractors manufacturing critical equipment (CFB boilers and turbines) are very experienced (*e.g.*, AE&E Lentjes GmbH (Austria/Germany)) and the plant will use standard design and unit size. The consortium members have experience with building power plants in various countries.	M/S
Coal supply is not timely or adequate	MCL is very experienced and has finalized investment plans and financing for expansion works in the mine. Morupule B is an important and crucial business for MCL's expansion plan.	M
The new technology plant poses O&M problems for BPC	The EPC contractor will provide O&M support for a period of up to 2 years post commissioning as per contract. During construction, the contractor is required to provide training to BPC staff at manufacturing facilities and on site. The training will be overseen by BPC's engineer, Fichtner.	L

Risk	Risk mitigation measures	Risk rating with mitigation
BPC is unable to cover its costs and becomes a fiscal burden	The Government is committed to preserve the viability of BPC, and has agreed to adopt a tariff policy, establish a regulator along international best practice and effect interim adjustments to ensure adequate cash flows to BPC. The Bank will provide support and TA required. The Government has already provided equity funds to cover 25 percent of project costs, the AfDB and IBRD loans cover about 50 percent and hence additional funds required are minimal and manageable.	M
Environmental and social impact mitigation are not managed properly	Botswana has adopted World Bank standards and has a good record of performance in related sectors, such as mining and industry. BPC will monitor contractors' conformance through appropriate EMPs. RAPs are implemented before start of construction in each relevant area. BPC will adjust routing of transmission lines to minimize social impacts. BPC will install air quality monitoring system and remedial measures would be implemented before commissioning of the new plant. The NSC will be the main source of water supply and hence the sustainability of the new Paje well field is to be ensured. The Bank will supervise actions by BPC and its contractors.	M/S
Community conflicts with migrant workers cause social and political unrest	BPC is aware of the risks due to expected large influx of workers from neighboring countries, EPC Contractor personnel from China and other countries and community expectation of employment, etc. BPC has appointed a community outreach person, who will interface with affected and involved parties and ensure communication and consultations as warranted to address issues and also prevent conflicts. BPC would also review the experience with airport and dam construction projects which involve similar situations. BPC would also consult with the Chinese embassy for language and other assistance that may be helpful in effective information exchange. The Government has constituted a Reference Group comprised of local authorities to address these concerns proactively and help prevent such problems.	M
Country / Fiscal Risks		
Further weakening of fiscal and macro-economic conditions due to prolonged global economic crisis	The Government is prioritizing expenditures to contain the size of projected fiscal deficits. It has also decided to selectively supplement its substantial accumulated savings with external and domestic borrowing in order to take advantage of its very low pre-crisis debt levels and to guard against the rapid depletion of its savings. The Government is also engaging with the Bank and other regional institutions in developing a Medium Term Debt Management Strategy in order to ensure that the best mix of financing instruments is selected. In addition, the Bank is engaged in a dialogue around the ongoing Public Expenditure Review to improve the quality of public spending within a framework of long-term macroeconomic and fiscal sustainability.	S

Risk	Risk mitigation measures	Risk rating with mitigation
Tariff increases cause hardship, especially for the poor, and create political instability in a time of crisis	The Government's plan is to waive value added tax on electricity and cover rural electrification costs from the budget during the interim period which have neutral impact on customers but provide additional revenue to BPC, and then adjust tariffs incrementally along with specific measures to protect the poor from undue burden (*e.g.*, lifeline tariffs). The Bank will support the Government to engage the people and businesses through communications and consultations and develop consensus and support.	S
Bank Reputational Risks		
Criticisms that the Bank and Client are not doing enough to mitigate climate change impacts	On substantial aspects, the Bank will help Botswana adopt all feasible measures (energy efficiency and conservation, appropriate technology, etc) and develop low-carbon energy alternatives (*e.g.*, CBM, CSP) and consider financial support through the Clean Technology Fund. On perceptional aspects, (i) the Government will implement an informed and proactive communications strategy on responsible development of all available energy resources including coal; and (ii) the Bank's communications team will provide support to create a clear understanding of the Bank's stance on climate change and energy access/security needs (*i.e.*, that the two are not mutually exclusive).	S
HIV/AIDS incidence around Palapye worsens	The Government, working at multiple levels has already taken actions to manage HIV/AIDS and would take further action to manage this project risk. Sub-national and local authorities would be provided support to deal with control of employees and job seekers. BPC would hire community liaison specialists to communicate with people and authorities to ensure smooth functioning of services. Scale up of outreach activities for HIV/AIDS prevention will be supported under the Botswana National HIV/AIDS Prevention Support Project (project ID P102299). The Government has set up a Reference Group chaired by the Palapye District Commissioner to manage local government support and actions.	M/S
Media allegations concerning EPC Contract award	Media allegations were confined to one paper (Sunday Standard in Botswana) during last week of November 2008. The Government immediately asked the Directorate of Corruption and Economic Crime (DCEC) to investigate. The DCEC's investigation report (May 2009) concluded that the allegations were without basis and that there were no irregularities in the contract evaluation and award. The Bank team's due diligence found the ICB procurement process to be competitive and transparent and the contract price to be in line with benchmarks. In addition to Bank's remedies, Botswana's standing on governance and transparency is high and there have been no challenges to DCEC findings and report in the media or from other parties.	M
Overall Risk Rating		**S**

F. Guarantee and Loan conditions and covenants

67. **Guarantee Agreement with lenders**. During the availability period, the Bank may suspend coverage of future disbursements if, *inter alia*: (i) there is a default under the ICBC loan; (ii) a material default of BPC occurs under the Project Agreement and continues after any applicable cure period; (iii)

there is a suspension by the Bank of loans to or guaranteed by Botswana owing to a failure by Botswana to pay amounts due to the Bank, including those due under the Indemnity Agreement. The PCG also contains provisions permitting the Bank to terminate or deny payment in certain situations. The Bank will have subrogation rights if it makes any payment under the Guarantee Agreement and Botswana does not reimburse it under the Indemnity Agreement. For more details, see "Annex 11-IBRD Guarantee".

68. **Project Agreement with BPC for the PCG**. BPC will covenant, among other things, that it will: (i) use the proceeds of the Bank-guaranteed loan for eligible expenses; (ii) provide the Bank access to the project site; (iii) keep adequate insurance in place; (iv) obtain the Bank's consent before making material changes to certain key provisions of the commercial loan agreement and documentation; (v) not engage in sanctionable practices (coercive, collusive, corrupt, fraudulent, or obstructive practices); (vi) not hire World Bank Group-debarred firms; (vii) comply with applicable environmental and social laws of Botswana and World Bank safeguard policies, including the World Bank-approved EMPs, Resettlement Policy Framework (RPF), RAPs, and Pest Management Plans; and (viii) provide annually a copy of its audited financial statements.

69. **Indemnity Agreement with the Republic of Botswana**. Botswana will indemnify the Bank in the event it makes payments under the PCG, and against any other expenses or liabilities incurred by the World Bank. The Republic of Botswana will covenant, among other things, that it will (i) take necessary actions to enable BPC to comply with the power plant's and the associated infrastructure's EMPs, RPF, RAPs in a satisfactory manner, (ii) cause BPC to carry out all of its obligations under the Project Agreement, and (iii) not engage in sanctionable practices.

70. **Loan Agreement with the Republic of Botswana**. The Government will: (i) exchange views with the Bank on a semiannual basis on the progress towards development strategies for low-carbon growth, use of coal and CBM, promotion of CSP and CCS, and associated policies and regulatory frameworks; (ii) cause BPC and appropriate government entities to conduct regular consultations with stakeholders to ensure their concerns related to energy sector development issues; (iii) cause BPC and appropriate government entities to ensure compliance with the World Bank-approved EMPs and RAPs for transmission lines, substation, water pipeline, and associated infrastructure.

71. **Project Agreement with BPC for the IBRD Loan.** This agreement will reflect the implementation responsibilities of BPC as the project implementing entity in respect of Components A and C(1) of the project.

72. **Subsidiary Agreement between MFDP and BPC**. This agreement will set the procedures for BPC access and utilization of the IBRD Loan proceeds which shall form part of the Government's equity contribution in BPC.

73. **Conditions for effectiveness of the IBRD Loan and PCG**

For the PCG: various standard conditions in a financing of this type and some others, including BPC to amend the EPC Contract to ensure compliance of contractor with the relevant EMP.

For the IBRD Loan: (i) execution of the PCG Agreements; and (ii) execution of the Subsidiary Agreement between MFDP and BPC

74. **Implementation covenants**

Government to:

(i) appoint a high-level Project Coordinator for the project within three months of effectiveness of the Loan;

(ii) reach agreement with the Bank on the agreed measures for interim adjustment, and carryout such electricity tariffs adjustment within three months of effectiveness of the Loan;

(iii) discuss with the Bank a draft electricity tariff policy, developed under terms of reference satisfactory to the Bank, no later than September 30, 2010; and

(iv) establish an independent regulator and entrust implementation of the agreed electricity tariff policy to such regulator by no later than June 30, 2011.

BPC to:

(i) prepare and discuss a pest management plan for the control of vegetation at the Isang Substation and other areas controlled by BPC, and adopt the agreed plan before start of construction of the Isang Substation;

(ii) execute the contract with MCL for supply of coal by no later than December 31, 2009;

(iii) regarding the air quality monitoring: (a) take measures to monitor the impact on air quality emissions of MorupuleMorupule A and MorupuleMorupule B power stations; and over the life of Morupule B power station; (b) in accordance with an agreed timetable, formulate a plan to take action, including the possibility of retrofitting Morupule A power station so as to remedy any emissions causing exceedances of air quality standards in the joint operation of Morupule A and B power stations to ensure that it does not exceed air quality standards permissible under the relevant rules, laws or regulations of Botswana and in accordance to Bank satisfaction; and (c) review with the Bank, on a semiannual basis the results of the air quality monitoring for Morupule A and Morupule B power stations and implement recommended measures for remediation;

(iv) regarding the water collection system: (a) connect only the southern compartment of the new Paje well field for drawing water for the use by BPC and for local customary use; (b) obtain Bank's prior no-objection if it proposes to connect the northern compartment to the new Paje well field; (c) use the water from the north-south carrier as its main source of water and the new Paje well field for backup source of water only; and (d) not permit Morupule Colliery Limited or any other person to use the new Paje well field water for main source of water; and

(v) regarding the ash dams: (a) implement recommendations contained in the ash dam survey for stabilizing and protecting the ash dam site in accordance with a time frame to be agreed with the Bank; (b) within an agreed time frame discuss with the Bank and make a record of any agreed remedial measures in respect of the existing ash dam that may have not been contained in the ash dam survey, and thereafter implement such agreed measures; (c) re-route the ash no later than December 31, 2012 from Morupule A power station to the new ash dam to be constructed in respect of the Morupule B power station; (d) appoint an independent expert for review of the design of the new ash dam; (e) ensure that the new ash dam has a sealed base; and (f) promptly on the completion of the site for the new ash dam, ensure that Morupule A ceases using the existing ash dam, and ensure that Morupule A power station thereafter solely uses the new ash dam for both bottom ash and top ash.

IV. APPRAISAL SUMMARY

A. Economic and financial analyses

75. **Economic analysis**. Detailed economic analysis of the project is included in "Annex 9—Economic Analysis" and is summarized in Table 8 below. The economic analysis compared the project

with two alternatives: (i) 600 MW of solar thermal capacity by 2012 with and without storage and (ii) shedding load, installing 220 MW of diesel self-generation for larger industrial users by 2012 and an additional 350 MW of solar power by 2020. It should be noted that the total solar thermal capacity (CSP) in operation around the world is about 430 MW, of which only one plant at 64 MW with storage option went into operation in 2007 (see Annex 1 for details). The economic analysis confirms that Morupule B is more economic to meet future electricity demand in Botswana at an estimated average cost for electricity of US¢5.43/kWh with an economic rate of return (ERR) at about 14.1 percent. In comparison, installing 600 MW solar capacity without storage would almost triple electricity costs to over US¢15/kWh, whereas it would be US¢11.4/kWh if large-scale power storage were available and added to the option. The corresponding ERRs are respectively 0.7 percent and 5.4 percent. The cost of the diesel alternative with load shedding would be about US¢14.1/kWh with an ERR of 6.7 percent.

Table 8: Results of economic analysis

Option	Cost per kWh (US¢/kWh)	ERR (%)	Switching value 1/ US$/tonne CO_2
Morupule B	5.43	14.1	n.a.
Solar thermal, no storage, diesel backup	15.0	0.7	112
Solar thermal, with storage	11.4	5.4	69
Diesel and load-shedding alternative 2/	14.1	6.7	99

1/: 'Switching Value' is the value at which the net present values (NPV) of the options are equal.
2/: The 'diesel + load shedding' option also includes provision of solar power in 2020 to meet future demand.

76. The switching value for solar combined with storage option indicates that the price for CO_2 has to be at least US$69/tonne to make it an attractive alternative to Morupule B. If this option were treated as a CDM project with a 10-year credit for avoided CO_2 emissions from the Morupule B alternative, then the price would need to be US$87/tonne of CO_2. The switching value for solar option without storage is much higher at US$112/tonne of CO_2, reflecting the need for expensive back up generation to meet peak and nighttime demand when the solar thermal plant does not produce electricity. The switching value for the diesel and load-shedding alternative indicates a price of US$99/tonne of CO_2 to make it equally attractive as Morupule B, assuming that emissions from the diesel units are ignored.

77. **Financial analysis**. Detailed financial analysis is included in "Annex 10—Financial Analysis." BPC is the third smallest power utility in SAPP with only 132 MW of installed capacity, compared to over 50,000 MW in SAPP combined. Only Lesotho (73 MW) and Swaziland (42 MW) are smaller than BPC. BPC's financial performance has been generally satisfactory, though its reported profits have been on the decline in the recent years mainly due to significant increases in power import costs. The unit cost comparators for BPC are summarized below.

Table 9: BPC tariff components (in thebe/kWh)

FY ending March 31	2004	2005	2006	2007	2008	2009
Own generation	15.21	12.70	16.10	24.88	30.66	36.76
Imports	7.38	8.88	11.36	11.98	15.81	24.79
Combined average cost	**10.65**	**11.36**	**14.18**	**16.83**	**20.05**	**27.00**
Transmission & Distbn.	5.76	5.15	7.44	7.63	10.06	9.94
Admn. and overheads	6.70	7.90	7.74	8.34	7.17	7.09
Total unit cost	**23.11**	**24.41**	**29.36**	**32.81**	**37.29**	**44.03**
Average tariff	**24.59**	**26.24**	**28.25**	**29.52**	**32.49**	**36.00**
In US cents eq.	**5.1**	**5.2**	**5.2**	**4.9**	**5.3**	**5.04**
Unit contribution	1.48	1.83	(1.11)	(3.29)	(4.80)	(8.03)
Financial income	6.43	6.31	6.12	6.39	7.20	6.30
Net contribution	7.91	8.14	5.01	3.10	2.40	(1.73)

78. Both own generation costs and import costs have doubled in nominal terms during 2004-08, accounting for the largest component cost increases for BPC. Since Morupule A power generation costs has been consistently higher than import costs, BPC gained financially by imports rather than own generation from Morupule A plant. But it is estimated that Eskom prices[30] would reach up to thebe 31/kWh during 2009-10 and increase further thereafter to reach about thebe 45/kWh by 2012. BPC does not have much control or influence over costs of imported energy and need to be passed on in the rates to customers by BPC, while at the same time aiming for improving its own operating efficiency to keep the rate increases in an efficient range. BPC estimates that it would require thebe 55/kWh to cover all operating expenditures during the 2009-11 (thebe 45/kWh excluding depreciation), but excluding costs of emergency power from diesel generators (see "Annex 10—Financial Analysis" for details). The tariff increases would need to be about 23percent from current average level to reach thebe 45/kWh for covering cash expenditures and 50 percent for covering also depreciation. The already negative impact of the economic crisis on businesses and population and the undue burden on the poor necessitate careful approach to tariff adjustment during 2009-11.

79. The Bank supports the Government's approach to handle the tariff issue as follows. The Government has initiated the procurement of consultants to undertake analysis of options for interim BPC tariff adjustments. The consultants are expected to provide their recommendations within three months, by early-2010. The options to be examined include: (i) waiver of the 10 percent value added tax on electricity by classifying it as "essential service," and instead allow BPC to collect the same amount as part of its rate which has neutral impact on customers; (ii) administering a proposed National Electrification Fund for financing BPC's rural network operations and maintenance; and (iii) administering the budget support measures for emergency power supply from diesel units during 2010-12 to cover gaps in electricity supply. These measures are intended to ensure BPC's ability to cover its cash operating costs through periodic (*e.g.*, quarterly) adjustments, and gradually start the process of adjustment to the full cost-reflective tariffs that will be developed as part of the long-term tariff policy study. The Government recognizes that these interim tariff increases will need to be done in concert with a public communication and consultation program, for which procurement process is underway for hiring consultants supported under the project. The Government will develop interim measures for tariff adjustment, and carryout such electricity tariffs adjustment within three months of effectiveness of the Loan.

Box 2: Electricity Tariffs and Social Considerations

Increases to electricity tariffs contemplated are substantial in Pula terms, which could adversely impact the poor. The current tariff policy does not include specific measures to protect poor households (*e.g.*, lifeline block tariffs). All domestic customers pay the same rate (currently US cents 5.3/kWh) plus a monthly fixed charge of BWP 10.2 (US$1.56). The threshold for affordable energy is about 10% of monthly household income. The household income and expenditure survey of 2002-03 (the last one available) indicates that 38 percent of rural and urban village households and 18 percent of city households had a monthly income (including non-cash) less than BWP 500 (US$76 or US$2.50 a day for an average household of four persons). For these households, the 10 percent limit would mean consumption of about 100 kWh/m month; whereas the average consumption is around 175 kWh/month. Lifeline rate mechanism offers a simple and practical option for Botswana for the protection of the poor.

The proposed tariff policy study will examine options and measures to protect the poor, which would also support the rural access expansion program (see "Annex 1—Country and Sector Background" for details). The study would also include a global workshop in Gaborone on experiences with social tariffs and problems of proxy mechanisms in an environment like Botswana with inadequate statistics. In addition, the Bank will support introduction of appropriate mechanisms to protect the poor in every review of tariffs.

[30] BPC's revised contract with Eskom.

80. The interim measures are inadequate to provide long term basis for addressing social, financial, competitiveness, and efficiency concerns surrounding electricity tariffs. While Morupule B is the least-cost alternative to substitute for Eskom and other imports, the current tariff policy has shortcomings which need to be addressed. Tariffs policy, *inter alia*, should: (i) be based on "efficient costs" rather than actual costs of BPC; (ii) incentivize conservation and efficiency; and (iii) include measures to protect the poor and promote rural access expansion. The Bank will help Botswana carry out a detailed tariff study to examine various aspects: it will (i) benchmark BPC with comparable utilities to establish appropriate cost domain for tariff policy basis; (ii) examine time of use and other proven methods to let customers adopt energy and cost saving behavior; (iii) conduct distributional analysis to identify the poor and impacts, explore lifeline tariffs and other options, evaluate levies, funds, etc., for rural electrification and access promotion; and (iv) develop tariff methodology and models based on selected options by the Government. Further, independent regulatory oversight would help ensure transparency and accountability. The study would also finalize recommendations for a regulatory agency based on detailed work already carried out by consultants in 2005.[31] Botswana should therefore develop and adopt a new electricity tariff policy and establish an independent regulator to implement it. The Government has agreed to: (a) discuss with the Bank a draft electricity tariff policy, developed under terms of reference satisfactory to the Bank, no later than September 30, 2010; and (b) establish an independent regulator and entrust implementation of the agreed electricity tariff policy to such regulator by no later than June 30, 2011. Technical assistance and support to the Government in this regard is included in the project scope.

B. Technical

81. **Power plant design**. The Morupule B Power Station consists of four units of 150 MW (gross) each capable of producing about 132 MW (net). The technology, unit size, and power plant configuration are based on detailed feasibility study (see paragraph 23), which recommended unit size of 100 MW or 150 MW and no larger, considering system and technical aspects. BPC elected the 150 MW unit size during the tendering process based on cost and other operating considerations, in consultation with its engineer (Fichtner). The feasibility study identified both the CFB and conventional pulverized coal (PC) technologies as technically suitable. BPC left the choice to bidders in order to ensure better competition; both prequalified bidders offered CFB technology to meet the coal characteristics and water availability. Morupule B power plant and equipment technical specifications are designed to satisfy World Bank Environmental Guidelines.

82. **Auxiliary equipment**. The plant utilizes a boiler, steam turbine, and electric generator, as well as auxiliary equipment such as coal handling, limestone handling, and ash transport/disposal. The boiler utilizes CFB technology, a state-of-the-art technology capable of reducing acid rain pollutants (sulfur dioxide (SO_2) and nitrogen oxides (NOx) emissions). The CFB boiler is to be designed to burn coal from the neighboring mine (MCL) which has varying quality across the life of the mining operation. Sulfur content of the coal ranges from 0.9 to 2.1 percent, while the heating value is within a range of 21 and 25 mega joules per kilogram (MJ/kg). CFB is flexible and allows a broad range of coal quality to be burned.

83. **Base-load capacity**. The power plant is planned to operate as base load with about 80 percent capacity factor. The unit heat rate is 11,621 kilojoules per kilowatt-hour (kJ/kWh) and the limestone consumption 3.8 kilograms per second (kg/sec) (13.6 tonnes/hour). An air-cooled condenser is included to minimize the need for water. Water consumption for blow down, cooling various components of the

[31] *Regulatory Reforms for Infrastructure and Utility Sectors in Botswana*, Stone and Webster, 2005 (funded by PPIAF, The World Bank, Washington, DC). This report recommended that the new regulator should also have responsibility for the water sector, and the Government has now accepted that recommendation.

plant, dust suppression at the ash disposal site, and miscellaneous uses (*e.g.*, fire fighting, landscaping and potable water) is estimated to be 1.5 million m^3 per year.

84. **Coal supply**. Coal will be supplied by MCL, which is currently also supplying about 650,000 tonnes per year for Morupule A power station. Morupule B is estimated to require an additional 3 million tonnes per annum. MCL is undertaking a major upgrading program. In 2004, MCL introduced two modern continuous miners plus shuttle cars for coal transport to the conveyor belt. A new coal washery was commissioned in 2008 which processes up to one million tonnes per year of coal. MCL will add two more continuous mining machines, upgrade conveyor systems, and develop two new ventilation shafts which, together with other underground and surface mining improvements will enable production from the existing shaft to expand from nearly one million tonnes per year to four million tonnes per year by 2012 to meet the increased demand from the Morupule B Power Station. BPC and MCL are presently negotiating a new coal supply. BPC has engaged a coal specialist to help with finalizing the contract terms. BPC will provide to the Bank a copy of the coal supply agreement executed with MCL by December 31, 2009.

85. **Transmission system**. The new transmission lines (400 kV) and substation (400/220kV, 2x315 MVA) involves standard technology for high voltage transmission line and substation construction. Specifications for equipment are consistent with the design and structure of the existing network and include all appropriate safety measures. The design outlined in the feasibility study has been approved by BPC. The company proposes to engage a single contractor for the detailed design, supply, and installation of the transmission lines and substation for each package financed by the World Bank and the AfDB. BPC will also use three consulting design firms and supervisory engineers for the transmission and substation components, which will ensure accountability and facilitate project management.

86. **Water supply system**. The NSC will be the primary source of water for the power station with a backup supply from the new Paje well field. MCL has completed construction of a 22-km underground water pipeline from the NSC to the colliery, which is designed to draw about 2.5 million cubic meters annually from NSC. BPC will construct the extension line from MCL water reservoir to Morupule B reservoir (about 5 km). The backup water supply system will include gathering and pumping system at the new Paje well field and a pipeline to Morupule B (about 80 km).

C. Fiduciary

87. **Procurement**. The Bank carried out a preliminary assessment of the country procurement environment in October 2007. Botswana has a *Procurement Act* and regulations (2006) to regulate procurement practices in the country. The proposed project would be carried out by BPC, a statutory body wholly owned by the Government. The *Public Procurement and Asset Disposal Act* does not cover statutory bodies/parastatal organizations like BPC. BPC has its own *Tender Regulations* that provides the policy and procedures for adjudication of tenders. The Bank carried out a procurement assessment of BPC including review of its Regulations and procedures in February 2009. The assessment indicated areas of improvements in regulations, staffing, and procurement cycle management.

88. EPC Contract: The Bank has reviewed the procurement process and the evaluation process used by BPC to select the EPC Contractor for the power plant (see "Annex 8—Procurement Arrangements" for details). The Bank finds that although the procurement process deviated in significant ways from the Bank's standard bidding documents, especially concerning point scoring and different commercial requirements, the evaluation process was in accordance with the tender document requirements and the deficiencies have been sufficiently clarified and corrected prior to contract award. It also finds that the prices offered by the two bidders are comparable to those offered under international competitive bidding in several other parts of the world. It concludes that the procurement process has reasonably followed the

provisions of paragraph 3.16 of the Guidelines, on which basis the Bank could guarantee loans for the project made by other lenders, and therefore supports the selection of CNEEC-SBW for the EPC Contract.[32] For the power plant component, there is no procurement financed by the Bank or procurement-related disbursements under the project. Should the PCG be called, the Bank would disburse to the beneficiary (*i.e.*, the commercial lenders) and the Government would then be obligated to repay the Bank in accordance with the terms of the Indemnity Agreement between Botswana and the Bank.

89. Other Components: For components funded by the IBRD Loan, procurement under the project would be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised October 2006 (referred to herein as the Procurement Guidelines) and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004 revised October 2006 (referred to herein as the Consultant Guidelines) and the provisions stipulated in the legal agreements. Bank's Standard Bidding Documents (SBD) shall be used for procurement of goods and works under both International Competitive Bidding (ICB) and National Competitive Bidding (NCB). Bank's Standard Request for Proposal (RFP) shall be used for selection of consultants.

90. Procurement under the proposed project would be undertaken by the Projects and Technical Services Division within the Transmission Business Directorate of BPC. The Projects and Technical Services division has two staff headed by an Acting Head of Projects and Technical Services. The head of the division has over fifteen years experience in project design and management. BPC has recruited two additional engineers to strengthen the capacity of the Projects and Technical Services division with experience in procurement related to multilateral donor agencies such as the World Bank.

91. BPC has engaged four consultants who are undertaking design of the contract packages and preparation of bidding documents under the proposed project. Two of these consultants have experience with Bank procurement. The recruitment of additional staff would further improve procurement capacity in BPC. The Bank would conduct a workshop for BPC staff upon effectiveness and the project also provides for additional training as needed.

92. **Financial management** (FM). The FM system and arrangements at BPC are capable of producing periodic reports for monitoring the financial aspects of the project. The auditing arrangements are also considered acceptable. BPC's FM system will be used for the implementation of the project, with the already laid-down oversight arrangements by MMEWR and BPC's Board. This is based on BPC's acceptable FM system and capability of the system to produce reliable and regular unaudited interim financial reports (IFRs) and other financial reports. BPC will maintain a US$ denominated Dedicated Project Account in a commercial bank for the implementation of Bank-financed components of the project. Disbursements by MFDP into this account will be on quarterly basis and based on the approved work plan. BPC will also maintain a local currency Dedicated Project Account for receipt of the Government contribution and payment of eligible expenditures for the Government-financed components.

93. MFDP will maintain a Designated Account denominated in US$ at the Bank of Botswana for the receipt of the Loan proceeds and disbursements to the US$ Dedicated Project Account that will be maintained by BPC for the implementation of the Bank-financed components of the project. Operation of the Dedicated Account will follow Government-approved procedures, whereby payment vouchers are

[32] The Directorate of Corruption and Economic Crime (DCEC) carried out an investigation prompted a report in the Sunday Standard newspaper in South Africa (24 November 2008) which alleged impropriety in the evaluation and contract award for the Morupule power station to the CNEEC consortium. The DCEC report (May 4, 2009) concluded that there were no element of corrupt practices and that the unsubstantiated accusations are an attempt by the losing bidder to cause confusion in the pretext of corruption.

prepared and authorized by the budget holder, MMEWR in this case, and submitted to the office of the Accountant General for review and check-writing. Government uses the GABS for its budgeting, accounting, and financial reporting. The system is capable of producing accurate and timely financial reports and ensures that funds are properly accounted for.

94. BPC's annual audit report together with the auditors' management letter and management's response are to be submitted to the Bank within six months of the end of each reporting period, that is, by September 30, each year. The FM arrangements meet the Bank's minimum requirements under OP/BP 10.02 Financial Management. (See "Annex 7—Financial Management" for more details.)

D. Social

95. The project's social benefits are discussed in detail in "Annex 9—Economic Analysis," social issues and social safeguards are discussed in "Annex 12—Safeguard Policy Issues" In the context of the EIAs, two Social Impact Assessments (SIAs) have been carried out for the project: one for the Morupule B power station site and another for proposed transmission line corridors. The SIAs examined the resettlement issues present and the broader social issues. In addition, a RAP Baseline investigation has been undertaken for the new transmission line routing.

96. **Project site location**. The Morupule B site falls within the Palapye Planning Area in the Central District. The current population was estimated at 26,293 in 2001; however, Palapye has experienced significant population growth in recent years. This trend is expected to continue with the opening of a new university in the area. Palapye is also located at the junction of major roads linking Gaborone and Francistown (north-south corridor) and Serowe (west). Although Palapye itself is growing, the proposed transmission line corridors are still sparsely settled. During project preparation, World Bank safeguards staff undertook two separate field visits to the proposed corridor, accompanied by BPC staff. The combined factors of strategic location and projected influx of population pose particular issues that will be addressed through different mitigation measures (see Table 7). The principal issues are: safeguard issues, potential conflict, and likelihood of an increase in the incidence of HIV/AIDS.

97. **HIV/AIDS**. Based on the SIAs, the main social risk of the project is the likely impact on the already serious HIV/AIDS epidemic due to expected large influx of job seekers, including from surrounding countries. Both BPC and MCL have established HIV/AIDS prevention and treatment programs that utilize distribution of condoms and information, testing, and peer-to-peer counseling and education. There is the potential to use these programs as a basis for outreach to the temporary construction workforce (including international staff) (adapting for language as necessary with an immigrant workforce imported by the construction company) and also for the in-migrants (including sex workers) who are likely to establish an informal community selling services and goods to the construction force. Such outreach will be supported by resources and interventions from the Botswana National HIV/AIDS Prevention Support Project (project ID #P102299), approved by the Bank in 2008. The current arrangements are narrowly delimited to the formal employees and their legal spouses and families, and the provision of services by government departments receive resources based on the current population, not on expected influx. Local authorities and BPC will need to co-operate in terms of managing informal settlements, both in terms of conflicts between the local population and in-migrants, and HIV/AIDS prevention and outreach.

98. **Consultation** with local communities and local stakeholders was carried out during the course of the SIAs conducted as part of EIAs. Based on mission findings and data in the SIAs, interaction and engagement among community stakeholders, BPC, and MCL is established. The project would also enhance participation of affected communities through improved communication and consultation approaches.

99. **Involuntary resettlement**. BPC has prepared and adopted a Resettlement Policy Framework (RPF) for the project that complies with the requirements of OP 4.12 Involuntary Resettlement. In accordance with the RPF, BPC has implemented an abbreviated RAP for the one family residing on the project site, and will fence the project site before commencement of construction activities onsite. BPC has also commissioned a RAP baseline study to update the information in the EIA and provide better social data for resettlement planning. When the surveys are completed for the final routing of the transmission lines, additional RAPs may be required, in compliance with the RPF. If required, each such RAP will be implemented, any resettlement will be completed, and any compensation will be paid prior to commencement of construction activities on that subcomponent. As of appraisal, the water supply component is not expected to require a RAP, but a detailed EMP would be prepared. If required, a RAP would be prepared in accordance with the RPF.

E. Environment

100. **Environmental impact assessment**. A number of environmental and social studies related to the development of Morupule B have been completed (see "Annex 12—Safeguard Policy Issues"). The EIA for the Morupule B Power Station was approved by the Department of Environmental Affairs (DEA) in February 2008. The EIA for the transmission corridors to the north and south of Morupule was approved as part of the Mmamabula IPP in November 2007. The EIA for the MCL mine expansion was approved in December 2008, and the EIA for the water pipeline connecting the mine to the NSC was approved in February 2008. The EIA for the new Paje well field proposed as a backup water source for Morupule B was approved in February 2009. Each EIA contains an EMP for ongoing monitoring and management; in addition, a supplementary EMP for the northern transmission line was completed in April 2009. The approved EIAs have been made publicly available on the BPC and MCL websites, as well as locally at the public libraries in Palapye and Serowe.

101. BPC has also been in the process refining the southern portion of the transmission line (Morupule-Isang) in order to further minimize the need for resettlement and compensation. An alternate routing is being prepared, and the field investigations have indicated some additional areas in which minor changes may be made to minimize impact. Accordingly, the location of the substation at Isang has been defined and the EIA completed and approved by the DEA. An EMP is being prepared for the Paje-Morupule water pipeline, which is a backup system that will be laid along the existing water pipeline corridor and thus does not involve land acquisition or resettlement. Related environmental studies to be conducted during project implementation include an air quality monitoring campaign focusing on the existing Morupule A Power Station, and a Regional Environmental and Social Assessment to consider the cumulative and transboundary impacts of all planned coal-fired power investments on both sides of the Botswana/ South Africa border.

102. **Emissions of pollutants**. Specifications for the Morupule B Power Station include achievement of World Bank emissions standards (*Thermal Power: Guidelines for New Plants, Pollution Prevention and Abatement Handbook*, 1998).[33] While Botswana has not established emissions standards for power stations, the *Air Pollution (Prevention) Act* of 1971 requires the application of best practicable means to control emissions. World Bank emissions standards are more stringent than the maximum permissible limits specified by the Botswana authorities for Morupule A's current boiler operations. The EIA for the proposed Morupule B Power Station found that current emissions from the Morupule A Power Station may be causing occasional local exceedances of Botswanan and World Bank air quality standards for

[33] The project concept note review meeting was on July 16, 2008.

ambient SO_2 and particulate matter concentrations. The dam safety report[34] also identified existing elevated levels of sulfate in the groundwater adjacent to the Morupule A ash disposal site.

103. The power station will include continuous ambient air quality and in-stack emissions monitoring for compliance with applicable standards. The Department of Waste Management and Pollution Control (DWMPC) holds the primary responsibility for enforcing the compliance of the project with national environmental regulatory requirements, and with the approved EMPs. In order to strengthen the capacity of DWMPC to fulfill their mandate, the TA component of the project includes resources to provide DWMPC with training and equipment for air quality monitoring, and expert advice for the development of national emissions standards for power plants.

104. Prior to making a decision regarding any investment in emissions control at Morupule A, BPC intends to undertake a two-year air quality monitoring campaign to better define the issues to be addressed and possible solutions. This is necessary because the EIA provided only a "predicted baseline" for air quality, due to the limitations of available directly monitored data. Therefore, based on: (a) the results of the two-year air quality monitoring campaign at Morupule A, (b) the performance results from test operations of Morupule B units, and (c) the projected results of combined operations of A and B plants, BPC will implement measures as necessary to ensure that the joint operation of Morupule A and B does not lead to exceedances of World Bank or Botswanan air quality standards. For Morupule B units, the EPC contract guaranteed design value[35] for SO2 limit is 455 mg/Nm^3, which is well within the range of 200-850 mg/Nm^3 limit per the new and more stringent World Bank guidelines.

105. Therefore, key considerations for emissions control from combined Morupule A and B operations are the following: (a) reduced need for Morupule A from 2013 onwards, possibly as stand-by for Morupule B plant, correspondingly decreasing emissions; (b) potential for reducing Morupule A emissions using washed and low sulfur coal from MCL; (c) availability of water for retrofit options for Morupule A (*e.g.*, flue gas desulfurization, FGD); (d) potential for reducing Morupule B emissions by up to an additional 10 percent using additional limestone; and (e) finally, significant emission reductions in Morupule B if required through expansion of limestone and ash handling capacities. BPC has agreed to: (a) semiannually review with the Bank the results of the air quality monitoring and any recommended measures for remediation; and (b) implement the measures in accordance with agreed time table to ensure that the joint operation of Morupule A and B does not lead to an exceedance of World Bank or Botswana air quality standards. To avoid further groundwater contamination from the existing ash dump, BPC will be asked to agree that the ash (slurry and dry) from the Morupule A Power Station will be rerouted to the new ash dump at the Morupule B Power Station, which will have a sealed base, by December 31, 2012.

106. **Water availability**. The primary and backup water supply systems and allocations are consistent with the National Water Master Plan Review prepared by the MMEWR. The primary source of water for the proposed Morupule B Power Station is the NSC. WUC captures surface water from the northeastern part of Botswana and transfers it via the NSC to various users including in the capital city of Gaborone. MCL has an allocation of about 2.5 million cubic meters per year from the existing capacity of the NSC and has built a twenty-two km underground water pipeline linking the Morupule site to the NSC. BPC has purchased a 50-percent interest in the pipeline. The coal mine and power station will use the existing capacity of the ongoing NSC scheme, and will not entail works and activities that would exceed the

[34] *Preliminary Appraisal of Current and Future Ash Dam Design and Operation*, BPC, Morupule Power Station, Ash Dam Complex, Report No. 303-00153-1, by Knight Piésold Consulting, March 2009.

[35] The values for NOx and particulates are respectively 750 and 50 mg/Nm^3. Since CFB boilers have different combustion than typical PC boilers, Morupule B units could meet the 510 mg/Nm^3 limit for NOx with minimal design and/or operating changes. For particulates, Morupule B design meets the new guidelines.

original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme. The Government of Botswana has notified riparians regarding the capture and transfer of the designed capacity of water to the NSC, as required by the SADC Revised Protocol on Shared Watercourses. Consequently, Botswana has conformed with the requirements for notification to riparian states under the Bank's OP 7.50 Projects on International Waterways.

107. As mentioned above (paragraph 102) a new Paje well field will be developed as the backup source of water for Morupule B operations. The EIA of the proposed new well field indicates that meeting the full water requirement from this source would draw down the aquifer by 30 percent in twenty years, potentially affecting a number of cattle post boreholes. The EIA identifies a geological structure separating the new Paje aquifer into distinct northern and southern compartments, both of which lie wholly within Botswana. If the northern compartment of the aquifer is used, the seeps at the foot of the adjacent escarpment which feed the Motloutse River may be affected. To avoid affecting the seeps, BPC has agreed to ensure that only the southern compartment of the new Paje well field will be connected for drawing water. Further studies and modeling will be conducted before taking any decision to connect the northern compartment of the aquifer, before which no-objection from the World Bank would be requested.

108. **Safety of dams**. BPC commissioned an independent assessment by a qualified specialist of the safety of the existing ash impoundment dam, as well as the design of the new ash dam. This assessment indicated that while the existing ash dam appears stable at present, improvements in the structure and operation of the dam are recommended and will be implemented by BPC to address any possible concerns. BPC will: (i) discuss and agree with the Bank, within twelve months from effectiveness, the measures needed to implement the recommendations of the Morupule A ash dam safety assessment; and (ii) implement the measures in accordance with agreed timetable.

109. OP 4.37 Safety of Dams is triggered for the design of the new ash impoundment dam. The new ash dam to be built will meet the design requirements and conform to OP 4.37 Safety of Dams. BPC will appoint an independent expert for the review of the design of the new ash dam. BPC plans to use the new ash dam for collecting ash from both the existing Morupule A and the proposed Morupule B power stations. Ash (both top ash and bottom ash) will be disposed of in a new, compartmentalized, low-density-polyethylene-lined ash pond, with water recovery for reuse. The detailed design of the new ash dam will be subject to review by an independent expert.

110. **Use of pesticides**. BPC does not intend to use pesticides to control vegetation under transmission lines; however, BPC has sought guidance from the Plant Protection Division of the Ministry of Agriculture on appropriate herbicides to use for control of vegetation at substations, and received the recommendation to use preparations of tebuthiuron, an active ingredient categorized by the World Health Organization as Class III, slightly hazardous. For safety, OP 4.09 Pest Management is triggered. The environmental assessment of the Isang Substation (a site that occupies about 23 hectares), which is currently underway, will include a pest management plan providing guidance on the safe storage, handling, application, and disposal of pesticides and herbicides to be used by BPC at this and other substations, as well as recommendations on the training needed to implement this guidance.

111. **Management of cumulative impacts**. A number of further coal-fired power stations are proposed on both sides of the Botswana/South Africa border. To address the possible cumulative, long-range, and trans-boundary effects of these investments, the Bank has initiated discussions with the authorities in both countries to jointly undertake a RESA. The terms of reference for the first phase of the RESA have been agreed with BPC, DEA, and DWMPC in Botswana, as well as with Eskom and the Department of Environmental Affairs and Tourism in South Africa. The World Bank will use trust fund

resources to carry out the first phase as well as the full RESA, with full participation of the relevant authorities in Botswana and South Africa (See Box 10).

F. Safeguard policies

112. The project is designated Category A under OP 4.01 Environmental Assessment reflecting the scale of potential environmental impacts. OP 4.12 Involuntary Resettlement is triggered by the presence of a family at the power plant site and the possibility of resettlement along the transmission corridors. In addition, OP 4.37 Safety of Dams applies to ensure sound management of the ash impoundment dam, and OP 4.09 Pest Management may apply in relation to the safe use of pesticides to control vegetation at substations. OP 7.50 regarding Projects on International Waterways is triggered because the primary source of water for the proposed Morupule B Power Station is the NSC, which transfers surface water from the northeastern part of Botswana to the south. Botswana has conformed with the requirements of OP 7.50 for notification to riparian states regarding the transfer of water via the NSC in accordance with the provisions of the SADC Revised Protocol on Shared Watercourses of 2000.

Safeguard policies triggered by the project	Yes	No
Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[X]
Pest Management (OP 4.09)	[X]	[ ]
Physical Cultural Resources (OP/BP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[X]	[ ]
Indigenous Peoples (OP/BP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[X]	[ ]
Projects in Disputed Areas (OP/BP 7.60)	[ ]	[X]
Projects on International Waterways (OP/BP 7.50)	[X]	[]

113. **Public consultations**. Public consultations were conducted for the project as part of the various environmental and social assessments. A public meeting was held at Palapye main Kgotla on September 4, 2007, and was conducted in Setswana as all the participants could speak and understand the language. A meeting with key local and central government officers was also convened in Palapye in September 2007, and the stakeholder engagement team undertook consultations with focus groups comprised of local farmers in the following lands areas within 10 km of the proposed power station site: Morupule; Mantshadidi; Mmalenakana; Dikabeana; and Molapowadipitse.

G. Policy exceptions and readiness

114. No exceptions to Bank policies are sought. The project is ready for implementation.

Annex 1: Country and Sector Background

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Country and sector background

1. Botswana, a landlocked country of about 1.9 million inhabitants, is an African success story with an extraordinary record of economic growth and transformation from one of the poorest countries in the world to a middle-income country today. Botswana's high and sustained growth of 9 percent a year in the four decades following independence, has been driven by the discovery and production of mineral resources (mainly diamonds, but also nickel, copper and gold), democratic governance and political and macro-economic stability. The mining sector, predominantly diamond mining, accounts for a third of GDP, 50 percent of Government revenues, and over 70 percent of export revenues. Since the 1990s, however, the pace of Botswana's growth has slowed and diamond revenues are forecast to slow down after 2017 as surface diamonds are forecast to be depleted, mining moves underground, and profits are squeezed, unless significant new resources are found.

2. Economic diversification away from diamonds is urgent and prudent for Botswana in order to safeguard its social and economic accomplishments and meet its remaining challenges. Despite its economic success and Middle Income Country status, poverty, unemployment, and high incidence of HIV/AIDS are persistent development issues. The incidence of poverty in Botswana is deeper than in countries of similar income, with about one-third of the population still living on less than US$1 a day, because of the country's narrow economic base which limits employment opportunities, particularly in rural areas where the majority of the population still resides. With only a small domestic market, strengthening regional ties and integration is central to overcoming geographical limitations and is a key element of Botswana's development strategy.

3. Key to Botswana maintaining its successful development path through growth, regional integration, employment creation, and poverty alleviation is the energy sector. Yet the deepening energy crisis across the Southern Africa sub-region is a major impediment to Botswana's economic growth plans, poses a threat to its own stability, and requires a concerted effort at the national and regional levels to address the energy challenge. South Africa and other countries in the sub-region have been experiencing severe shortages of power since 2007 due to high growth and lagging investments in new capacity. South Africa had began intermittent load shedding in December 2007, a condition that is anticipated to worsen through the medium term until ample new generation capacity is built and commissioned.[36] There is growing social and political pressure in South Africa to stop exports to other countries, including to Botswana.[37]

4. As Botswana tackles the longer term goal of diversification away from its dependence on diamonds, however, it faces the more immediate challenge of protecting the economy from the worst of the global economic crisis. As a result of the sharp decline in diamond production and export revenues, economic growth for 2008-2011 is projected to decline substantially, fiscal deficits are emerging after years of surpluses, and the current account balance will shrink substantially from the 19 percent surplus seen in 2007.

5. The effect on GDP growth of the current crisis will be large, with a contraction currently projected to be on the order of 10 percent in 2009, sharply down from an estimated growth of 2.9 percent in 2008. This is largely due to sharply reduced diamond production. For 2009, Debswana Diamond

[36] *The Southern Africa Power Pool (SAPP) Generation Expansion Plan Study* (Nexant, USA, October 2007), which includes twelve countries of the region, shows the need to add nearly 39,000 MW through 2025.

[37] There are reports of disorder and sporadic violence in Zimbabwe, Zambia, and South Africa due to both planned and unplanned power outages.

Company forecasts a 50 percent drop in production. Smaller companies in diamond exploration have shut down operations, as have nickel and copper mines. Looking forward, the prospects for diamonds depend on economic developments in the major rich-country markets. The US, Europe, and Japan together account for 76 percent of the diamond market, with the US alone representing 45 percent (2006). With most predictions being for a slow and weak general economic recovery in the US and other developed markets, it is likely that Botswana's diamond exports will remain depressed for some time to come. The early 1980s recession serves as a bleak reminder: it took seven years before rough diamond sales recovered to pre-crisis levels. To date, Debswana and other mine closures have resulted in the loss of an estimated 4,500 jobs. The secondary effects of a decline in the sector will reach deeper into the economy.

6. In terms of exports, the impact on Botswana has been severe. In the first quarter of 2009, the value of Botswana's diamond exports dropped by 86 percent as compared to a year earlier. Diamond prices have also fallen, with analysts forecasting a total drop of 20-30 percent. In addition to diamonds, copper and nickel export values, which represent about 15 percent of total exports, have also dropped by over 50 percent since the crisis. With diamond exports unlikely to return to pre-crisis levels any time soon, current account balances will shrink, and are likely to turn to deficits for some years. The current account surplus is estimated to have shrunk from 19 percent in 2007 to 7 percent of GDP in 2008. While imports will be restrained by weakening economic conditions, this will be counterbalanced by the import needs associated with the Government's transport and energy infrastructure program.

7. The decline in diamond export income has in turn induced a fall in Government revenues of close to 20 percent. Lower mineral revenues are likely to be compounded by slower growth in other revenue sources, including Southern African Customs Union (SACU) revenues, earnings from foreign exchange reserves, and domestic tax revenues (value added tax and income tax). With the large fall in revenues, significant fiscal deficits are forecast at least through 2011, averaging 10 percent of GDP over the coming two years (2009/10 – 2010/11) according to Government estimates.

8. Despite the large negative impact of the global crisis, Botswana is in a stronger position than many other mineral producing economies in the continent, with foreign exchange reserves providing nearly two years' import cover, and a year's worth of expenditures saved from previous years' fiscal surpluses. Another point in Botswana's favor is the very low level of public external debt, estimated at less than 3 percent of GDP at the end of 2008,[38] and a similarly low domestic public debt, at 2.6 percent of GDP. These all provide degrees of freedom and will serve as a cushion that may enable a gradual, rather than abrupt, adjustment to adverse circumstances. To manage this, Government spending will need to be sharply focused on items with significant contributions to maintaining Botswana's long-term growth.

9. In this respect, investment in the power sector is considered central to the country's growth prospects. Botswana's energy demand was about 3,073 GWh in 2008 (peak load of 523 MW), and is projected to grow at about 4 percent per year, reaching 5,400 GWh by 2017 (peak load of 850 MW) and 6,890 GWh by 2026 (peak load of 1,130 MW). The mining sector accounts for about 45 percent of the demand, the commercial sector about 23 percent and the residential sector about 23 percent. Energy access nationally was about 50 percent in 2007; between 2004 and 2007, rural access to electricity was doubled to 44 percent, although this remains short of the 60 percent target under the NDP. The Government's *Vision 2016* aims at 100 percent rural access to support the broader development goals of access to education and health, as well as employment opportunities for the rural and the disadvantaged population.

[38] At the time of writing, the Government of Botswana intends to contract external debt to cover its deficit financing needs in 2009/10. This would amount to US$1.5 billion, projected to take external debt levels to 15.8 percent of GDP in 2010.

Electricity

10. The electricity sector is dominated by BPC, a vertically integrated electricity utility, which owns and operates substantially all of the electricity generation, transmission, and distribution assets in Botswana. BPC was established as a statutory corporation under the *Botswana Power Corporation Act* (BPC Act) on 30 June 1970 and is wholly owned by the Government. Under the *BPC Act*, the Minister of MMEWR has the authority to appoint the Board of Directors of BPC, including the Chairman of the Board. BPC's Chief Executive Officer is appointed by the Board, with the approval of the Minister. BPC has 2,015 staff working across nine operating units, out of which five are strategic business units: (i) Corporate Services; (ii) Customer Services and Supply; (iii) Generation; (iv) Rural; and (v) Transmission. The remaining four consist of the corporate support units: Human Resources, Finance, Internal Audit, and Office of the Corporation Secretary.

11. Currently, BPC serves a total customer base of 166,651 consumers in four categories, each with its own tariff structure: (i) mining; (ii) commercial; (iii) domestic; and (iv) government. Between 2004 and 2008, rural access to electricity was doubled to 41 percent, although this remains short of the 60 percent target under the NDP. The Government's *Vision 2016* aims at 100 percent rural access to support the broader development goals of access to energy, education, and health, as well as employment opportunities, for the rural and the disadvantaged population.

Legal and regulatory frameworks for electricity industry

12. The legal and regulatory frameworks for the power sector in Botswana are currently at a relatively basic level of development. The 1973 *Electricity Supply Act* and the 1993 *Electricity Supply Regulations* and *Electricity Supply (Licensing) Regulations*, provide that licenses for the generation and supply of electricity shall be issued by MMEWR. The *Electricity Supply Act* requires that anyone supplying or using electricity in excess of 25 kW of capacity must obtain a license from the Minister. This 1973 legislation also provided, in Section 4, that before issuing such a license, "the Minister shall consult the Corporation [*i.e.*, BPC] and shall take into consideration the existing or future plans of the Corporation with regard to the generation and supply of electricity for Botswana, giving precedence to the interests of the Corporation." More recently, the 2007 *Electricity Supply (Amendment) Act* removed previous restrictions on the issuance of new licenses, and authorized the Minister to license "independent producers and suppliers of electricity." All of this legislation, plus other enactments relevant to the power sector, are listed in "Annex 14—Documents in the Project File."

13. The *BPC Act* allows BPC to set its own tariffs, with the approval of the Minister of MMEWR, so as to achieve the financial objective of ensuring a "reasonable return" on the assets of BPC. Section 17 (1) of the *BPC Act* requires BPC to act "on sound commercial lines." Further, the *BPC Act* requires BPC to produce audited accounts annually which are submitted to the Minister (who in turn presents them to the Parliament), supported by a comprehensive operational report. The Minister may also require BPC to produce forecasts of revenue and expenditure (and other information and records) and may give BPC directions as to the exercise of its powers and functions, subject to these not being inconsistent with the *BPC Act*. The Section 17 (1) of the *BPC Act* also requires the BPC to set its charges to customers at a level "as to ensure that its revenues are sufficient to produce on the fair value of its assets a reasonable return" (a reasonable return is defined as net operating income sufficient to meet interest and loan repayments, investment requirements, reserves, and dividend payments to the Government). Section 18.1 of the *BPC Act* gives the BPC the power to establish tariffs to meet the requirements of Section 17, on the basis that the proposed tariffs are subject to the approval of the Minister.

14. A considerable body of analytical work has been carried out in regard to potential reforms of the existing legal and regulatory framework. A notable document in this regard is the 2005 Stone & Webster Report on *Regulatory Reforms for Infrastructure and Utility Sectors in Botswana* (funded by the Public-Private Infrastructure Advisory Facility (PPIAF)). This Report recommended the establishment of an

independent electricity regulator, with the power to issue licenses and regulate tariffs, and the Government has indicated that it now wishes to implement that recommendation.

Policy framework for electricity industry

15. The policy framework for the electricity sector is enshrined in several documents, namely, Vision 2016, National Development Plan 9 and 10, the Energy Master Plan 1994, and the Draft Energy Sector Policy (December 2008).

Vision 2016: This sets out a long-term vision of Botswana and recognizes the importance of energy sector. The document: (i) emphasizes the security of supply concerns and use of domestic resources through sustainable means and respecting environmental and social aspects; (ii) aims to promote new technologies for renewable energy, especially solar energy in respect of global concerns on climate change; (iii) underscores integration of Botswana into the regional initiatives such as the Southern Africa Power Pool; and (iv) underscores the need for cost effective provision of energy services, protecting rural and needy customers, etc; and (v) achieve 100 percent rural energy access.

NDP 9 and 10: These documents elaborate the *Vision 2016* objectives overall and confirm the Government's intention to support and finance the initiatives.

Draft National Energy Policy (2009): The Energy Affairs Division of MMEWR developed the draft policy document through stakeholder consultations which included public and private sectors as well as the public. This document brings together the policies from the various documents into one. The policy covers all aspects of energy sector including regulatory policies for the electricity, oil/gas and coal sectors, security of supply and diversification of sources, sustainable development and promotion of solar energy, protection of the poor and the needy, etc.

16. **Electricity tariffs**. MMEWR is responsible for setting and implementing tariff policy. The Minister approves tariffs proposed by BPC for various categories of customers. In line with the *BPC Act*, BPC bases its tariff proposals to realize a net income to achieve a "reasonable return." Tariffs have usually been adjusted annually (last one in April 2008) but the policy allows for adjustments at any time when justified. The tariff structure is simple with only eight customer categories with fixed and energy charges. The tariff levels are in line with service costs and do not entail cross subsidy between categories.

17. The substantial and inexpensive energy imports until recently have allowed BPC to realize profits and thus comply with its Act. However, Eskom has increased its price to BPC twice already and is expected to increase whenever such adjustments become effective in South Africa (see "Annex 10 – Financial Analysis" for details). In the 2008-09 financial year (ending March 31, 2009), BPC posted a net loss since BPC's own prices were not adjusted to fully reflect the higher cost of imports from Eskom and other SAPP sources (*e.g.*, Namibia).

18. While higher tariffs than current levels are inevitable to ensure BPC's financial viability, the following key shortcomings of the current tariff policy framework need to be addressed.

(i) Cost efficiency: BPC's costs need to be set in the "efficient domain" through a detailed study involving benchmarking to ensure fairness and promote competitiveness.

(ii) Energy conservation and efficiency: Tariff structure could to be modified to provide price signals that encourage conservation and efficiency (*e.g.*, through time of use tariffs).

(iii) Social impacts: There are no social tariffs at present, which could be a barrier for expanding access, especially in rural areas. Also, the connection charges are high (more than US$1,000 equivalent at present) and the current program of rural electrification (see separate section below) provides loans for connection charges at prime rate. Options such as lifeline tariffs, rural

electrification levy, etc., need to be examined to protect the poor from undue burden, which is also in line with the Government's objective of rural development and energy policy objectives.

(iv) Independent regulator: In addition to separation of policy making and regulatory functions, an independent regulator could ensure thorough review and monitoring of BPC performance, especially since substantial tariff increases are anticipated. Across SAPP, many countries have already established regulators independent of policy making.

19. Botswana would need to develop and implement a new tariff policy and establish an independent regulator with adequate staff and capacity. Technical assistance to the Government is included in the project for this purpose. Botswana can build on the Stone & Webster Study (paragraph 14) and the SAPP Secretariat initiative which conducted a review of tariffs and regulations in five countries[39] (South Africa, Lesotho, Mozambique, Zambia, and Zimbabwe) and intends to develop broad guidelines for member countries. Tariffs and average revenues vary considerably across SAPP: Zimbabwe, Zambia, South Africa, Mozambique, and Malawi are in the US¢1.3 to 3.7/kWh range; Namibia, Botswana, and Swaziland are in the US¢4.3 to 5.1/kWh range; Lesotho, Angola, and Tanzania are in the US¢6.1 to 9/kWh range.

20. **Electricity demand-supply**. The country's energy demand was about 2,937 GWh in 2008 (peak load of about 500 MW). The mining sector accounts for about 45 percent of the demand, the commercial sector about 23 percent and the residential sector about 23 percent and the government at about 9 percent.

Table 10: BPC sales by customer type

	2005	2006	2007	2008	2009	Growth rate
Sales (GWh)						
Mining	1,047	1,184	1,199	1,295	1,123	7.3%
Commercial	613	631	634	688	735	3.9%
Domestic	539	584	682	688	769	8.5%
Government	217	227	262	266	290	7.0%
Total	**2,416**	**2,626**	**2,777**	**2,937**	**2917**	**6.7%**
Supply (GWh)						
Own Generation	833	866	726	631	550	(8.8%)
Eskom / SAPP	1,898	2,050	2,394	2,585	2,749	10.9%
Total	**2,731**	**2,916**	**3,120**	**3,216**	**3,298**	**5.6%**
# of consumers	136,216	151,800	166,651	196,755	198,615	13%
Rural electrification	25%	31%	38%	41%	47%	

21. BPC projects electricity demand to grow at about 4 percent from 2009 onwards, compared to about 6.7 percent during the last five years. However, the supply outlook depends on how Botswana would be able to address the cuts in supplies from Eskom and SAPP due to acute energy shortages across the SAPP region.

Table 11: BPC's projected demand-supply outlook

In GWh	2010	2011	2012	2014	2016	2020	2026
Net Demand	3,179	3,319	3,465	3,777	4,117	4,890	6,065
Gross Supply Needed 1/	3,532	3,688	3,850	4,197	4,574	5,433	6,739
Imports from Eskom	1,826	1,176	421	0	0	0	0
Imports from SAPP	340	19	0	0	0	0	0

[39] *Study on Tariff Setting Principles and Issues Surrounding Tariffs and Electricity Pricing in Southern Africa,* April 2008.

In GWh	2010	2011	2012	2014	2016	2020	2026
Morupule A Plant	862	862	862	862	862	550	0
Contracted supply	3,028	2,057	1,283	862	862	0	0
Surplus / (Deficit)	(504)	(1,631)	(2,567)	(3,335)	(3,712)	(4,883)	(6,739)
Morupule B Planned			1,293	3,714	3,714	3,714	3,714
Energy Efficiency	200	300	400	400	400	400	400
Short-term diesel	304	1,180	874				
Mmamabula / other						1,457	2,000

1/: Assuming 10 percent system losses

Supply options

22. **Morupule A Power Station**. BPC's total installed generating capacity comes from the country's only power station, Morupule A (nominal capacity at 132 MW; 4 units of 33 MW). Presently, the only relatively certain power supplies are from the Morupule A Power Station and imports from Eskom of South Africa. Morupule A has a good history of operating reliably, but the plant is approximately twenty years old and has started showing signs of declining reliability and ability to operate at the rated maximum capacity. Forced outages have started to occur frequently, taking units out of operation for repair, and the maximum output of all four units was limited to 29.5 MW each during the peak season with the air cooling condenser. The recent addition of water spraying has restored the maximum output to 33 MW.

23. **Eskom imports**. Botswana, like several other countries in the sub-region, has until now relied on inexpensive, abundant, and reliable electricity from South Africa. But, South Africa and other countries in the sub-region have been experiencing severe shortages of power since end-2007 due to high growth and lagging investments in new capacity. South Africa began intermittent load-shedding in December 2007, a condition that is anticipated to worsen through the medium term until ample new generation capacity is built and commissioned. There is growing social and political pressure in South Africa to stop exports to other countries.

24. Import capacity from Eskom, is projected to be as follows: 328 MW for 2009, 250 MW for 2010, 150 MW for 2011-2012 and zero from 2013 onwards. Further, Eskom supply is to be terminated sooner than 2013 if the first unit of Morupule B becomes operational. Already, however, imports from Eskom have been, and are expected to continue to be, curtailed below the negotiated levels (350 MW for 2008 and 2009) because of inadequate supply and load-shedding in South Africa. Eskom has the right under its contract to cut up to 10 percent of the above levels during periods of load-shedding in South Africa. In general, imports from Eskom are no longer reliable; lack of supply is expected to get worse and prices are likely to increase substantially.

25. **Mozambique imports**. Until 2011, BPC also expects to purchase 50 MW of power from the Hydro Cahora Bassa power plant in Mozambique, wheeled through Zimbabwe, and smaller amounts from NamPower in Namibia. These are not reliable power supplies either as transmission constraints and availability from Hydro Cahora Bassa affect access to this power.

26. **Other SAPP imports**. South Africa's energy crisis has caused ripple effects in the rest of SAPP, which has limited available capacity (about 9,000 MW or 20 percent of SAPP total). Until new capacities and transmissions lines are built, supplies from these countries are not available. Most of these new capacities are feasible for large scale supplies to Eskom, where as Botswana's requirement are relatively small (around 500 MW). In the short- to medium-term, Botswana cannot rely on the rest of SAPP countries also.

27. **70 MW diesel plant lease**. BPC is in the process of leasing 70 MW of diesel capacity that will come on-line in May 2009 and will be used until December 2010. The plant will be located at Francistown where access to the transmission system is already available.

28. **250 MW dual-fuel IPP**. BPC has solicited offers for another 250 MW of generation (CBM and diesel) to cover the short-term supply-demand gap and provide intermediate peaking capacity in two phases. It is expected that 90 MW of dual-fuel generation (originally operated on diesel) will come on-line in January 2010 and another 160 MW of CBM-fired capacity will come on line when CBM becomes available. The 90 MW plant will be located close to the Orapa mine, where there is a substation and access to the transmission system. The CBM resource is not proven yet and the location for the 160 MW plant has not been selected.

29. **Mmamabula IPP**. The Mmamabula IPP project is a coal-to-power project in Botswana near the border with South Africa. Originally structured at 2,400 MW, given difficulties in arranging a turnkey contract and power sales at that size, the project was downsized to its current designed of 1,200 MW of capacity, of which the Mmamabula IPP expects to sell about 900 MW of its energy and capacity to Eskom and 300 MW to BPC. The project is being developed by CIC Energy Corp and International Power plc. These sponsors have engaged Shanghai Electric Power Generation Group under a turnkey contract for the power block, including supercritical boiler technology in a 2 x 600 MW configuration. The project will build a transmission system to connect with the Eskom system in South Africa, as well as construct a new substation on the proposed nearby Morupule-Isang 400 kV transmission line (Component 1(B), package EW2). The sponsors are in the process of arranging financing and power purchase contracts with Eskom and BPC. The Mmamabula IPP is highly risky until its financing and power sales packages are arranged. It is not expected to start operating earlier than 2014, possibly even later. BPC will re-sell any excess power it receives in the SAPP.

30. BPC has been actively and successfully pursuing other initiatives, including energy efficiency and conservation (DSM) campaigns such as encouraging the use of low energy light bulbs, turn off appliances when not in use, etc.

Box 3: Energy Efficiency and DSM

BPC has undertaken a well-funded campaign on energy conservation and efficiency. These include replacement of incandescent bulbs with CFLs, installation of smart meters, campaign for behavioral changes to conserve energy, etc. The pilot for replacing 100,000 CFLs is ongoing and BPC aims to reach 1 million CFLs as soon as feasible and estimates energy saving of about 20 to 30 MW when completed. BPC has allocated BWP 20 million for the CFL project. BPC has also awarded a contract for installing 65,000 smart meters in Gaborone and Francistown (two largest towns) at a cost of BWP 60 million. These meters allow for remote controlling and intended to shift use of appliances such as water heaters to off-peak times and estimates saving of about 25 to 35 MW by 2012. BPC intends to adopt time of day use and such other measures to promote energy efficiency and help peak load management. BPC is also discussing with industrial customers and mines measures for energy efficiency, load shifting, etc., in an effort to manage any load shedding in the most efficient manner possible and also encourage auto generation by these customers during the 2010-11 period when deep cuts in supply are already anticipated. The Bank will examine potential carbon finance support for BPC's energy efficiency measures through programmatic CDM approach, etc., and encourage further expansion of the program as feasible.

Rural electrification program

31. Rural electrification is a Government-funded program, which aims at promoting rural development and growth in Botswana. The program dates back to 1975 when the Government of Botswana, with assistance from the Swedish International Development Agency, embarked on the electrification of major villages, and appointed BPC as the main implementing agency. Under its long-term development strategy, *Vision 2016*, the Government has set a goal of 100 percent rural electrification by 2016. There are around 280 villages that have been electrified out of some 545 total villages identified.

As in the table below, the majority of the connections (around 95 percent) in the electrified villages are domestic, thus bringing an average rate of the rural access to electricity at 35 percent.

Table 12: Rural electrification by districts (March 2009 data)

No	District	No. of electrified villages	No. of households	No. of connections	Domestic connections	Rural access[1] (%)
1	Central	110	149,714	45,017	42,766	29
2	Chobe	12	5,567	2,406	2,286	41
3	Ghanzi	9	7,339	2,846	2,704	37
4	Kgalagadi	22	12,182	3,982	3,783	31
5	Kgatleng	21	27,241	11,723	11,137	41
6	Kweneng	22	67,508	20,915	19,869	29
7	Ngamiland	15	28,506	9,787	9,298	33
8	North East	30	16,209	5,151	4,893	30
9	Southern	35	46,181	12,890	12,246	27
10	South East	4	20,482	10,326	9,810	48
	Total	**280**	**380,929**	**125,043**	**118,791**	**35**

Source: BPC Rural Business Unit.
[1] Rural access is obtained by dividing domestic connections by number of households.

32. Currently 130 villages are undergoing the process of the electrification, planned to be concluded by 2010. Once completed, the number of electrified villages will reach to 366, or 67 percent of the total number of villages identified, and will remain constant for years to follow (see Table 13). It is expected that with the completion of 130 villages, the rural access rate will reach at 53 percent. While rural electrification rate will remain the same for few years, one of the main undertakings for that period will be to increase the rate of rural access by having more households connect to the grid network as well as expand the network throughout already electrified villages. The target rates of the rural access are shown in the table below.

Table 13: Rural access to electricity projected for period 2009-2013

	2009	2010	2011	2012	2013
No. of villages	298	366	366	366	366
Rural electrification[*] (%)	55	67	67	67	67
Rural access (%)	47	53	60	68	76

Source: Botswana Power Corporation, Rural Business Unit
[*] Rural Electrification is number of villages electrified divided by total number of villages (*i.e.*, 545).

33. **Cost of the program**. The rural electrification program covers the cost of constructing necessary infrastructure and extending national grid to the villages, however the responsibility for the cost of connecting a households to the grid lies with customers. The standard cost for connection is around BWP 8,000 (an equivalent of US$1,100). Customers are obliged to pay 5 percent of the connection cost upfront and for the remaining part they receive loan from the Government, payable over the period of fifteen years at prime interest rate. The connection and installation services include smart meters, which use prepaid cards for electricity consumption. The average electricity consumption per rural household is around 175 kWh/ month at cost of about BWP70.

34. Besides the efforts of extending the grid to the villages, the connection rate among households was lower than expected. One of the main reasons for this is high connection cost associated with it, but also the capacity offered by the grid very often exceeds the household needs. The only households that seem to be able to afford the grid connection electricity, are those who have other family members (*i.e.*, daughter or son) living in the urban areas, who subsidize the electricity costs for them.

35. In order to maintain the main aim of the program and ensure that the benefits of the program reach all villages and households equally, another off grid connection alternative was sought. As a response to this situation, the program chose to use solar power as a complementary source of electricity. To promote this alternative further, the Government, assisted by the United Nations Development Program and GEF, initiated a project titled Renewable Energy-based Rural Electrification, which aims to remove barriers to widespread use of solar photovoltaic electricity and low greenhouse gas (GHG) technologies to meet the basic electricity needs of individual households in terms of lighting, power for radio-cassette/TV and income-generating activities.[40] This five year project is targeting eighty-eight villages where rural households do not have access to electricity either due to lack of access to network or financial barriers. The roll out of initial connections is expected start during 2009.

36. **Funding for the program**. So far, the funding for the rural electrification program has been obtained for up to 2010 using various sources. However, the challenges remain for securing funding for the continuation of the program in the remaining 170 villages, so the electrification of all 545 villages can be achieved. The access to these villages is more difficult, thus associated with higher implementation cost. While extending the national grid to the villages is one part of the program, the rural electrification also includes network extension in the already electrified villages, to accommodate for the load growth and also increase the access to households. Villages in Botswana are often spread so when national grid is first extended to these villages, it may not cover the entire village. As shown in the table above, the current funding does cover the network extensions in twenty villages, however there are more villages that will need such a service in the future, for which the funding is lacking at the present.

Table 14: Electrification programs

Project	Cost	Financing
100 villages	US$89 million	Swedish and Norwegian governments
30 villages electrification	BWP 115 million	Government of Botswana
20 villages network extension	BWP 75 million	Government of Botswana
Renewable Energy-based Rural Electrification (Re-Botswana)	BWP 34 million	Botswana Government and GEF

Source: BPC and The Business Diary, January 2009 issue, p 24.

37. A continuing challenge faced by the BPC, as an implementing agency of the rural electrification program, is funding for the operation side of the program such as customer services, maintenance of the rural network, etc. The Government plans to set up a National Electrification Fund to support rural electrification, including covering BPC's costs of operations and maintenance through such mechanisms as a levy of about 5 thebe/kWh collected from customers.

Coal

38. Botswana has extensive geological resources of Bituminous B coal suitable for power generation. According to the Department of Geological Survey (DGS), (2007) "…Botswana is endowed with large coal deposits, in excess of 200 billion tons, despite the fact only a meager amount is being exploited for economic use. Qualitatively, Botswana coals are generally of high ash and moisture content, with medium calorific value …" Coal is overlain by >100 m of recent Kalahari sands, but otherwise has few surface obstructions (*i.e.*, buildings, infrastructure) that restrict access to mineral resources. At a basin-wide scale, mining of hard coal requires consideration of CBM and coal-mine methane (CMM) production. The regulatory framework for energy minerals is largely based on mineral development frameworks for diamond and metallic mineral mining. Some improvements would assist Botswana in regulation of

[40] UNDP Project Document, *Renewable Energy-Based Rural Electrification Program for Botswana.*

energy minerals whose production is expected to grow significantly, commensurate with basin-wide potential.[41]

39. **Current coal production**. Current coal production is from Botswana's one industrial-size commercial coal mine, MCL. The mine was commissioned in 1973 with an annual production of 140,000 tonnes per annum, which today produces ~900,000 tonnes per annum from an underground operation. MCL is a wholly owned subsidiary of the diamond mining company, Debswana Diamond Company (Pty) Ltd, which is owned fifty-fifty by the Government of Botswana and De Beers S.A. (Luxembourg), which in turn is 15 percent owned by the Government of Botswana. About 60 percent of MCL's production was sold to BPC as fuel for the Morupule A Power Station, 30 percent to other companies in Botswana, and 10 percent was exported to other markets in Southern Africa. The mine has since undergone recapitalization (2002) away from drill-and-shoot mining to a higher efficiency, single, continuous mining section. Today, MCL has two principal product lines:

- 600,000 tonnes per annum run-of-mine raw coal via an overland conveyor, including wash plant fines, meeting technical specifications to Morupule A power plant (BPC); and
- washed coal sales to Botswana Ash (Pty) Ltd (180,000 tonnes per annum), Bamangwato Concessions Ltd (120,000 tonnes per annum), and exports to Southern African Development Community (SADC) countries (about 70,000 tonnes per annum) via a low-water/zero-waste coal washing plant commissioned March 2008.

Table 15: Coal quality at MCL

Run-of-mine coal	Washed coal
CV = 23 MJ/kg	CV = 25-26 MJ/kg
Ash = 21%	Ash = 14%
Fixed carbon = 51%	NR
Volatiles = 23%	NR
Sulfur = <1%	NR[42]

40. The introduction of a coal washing plant in 2008 at MCL opens new opportunities for standard, uniform coal products that can potentially service a variety of end-use markets. Overall, the potential for Botswana to realize significant growth on coal lies in the export of washed coal, coal-to-power, and possibly gas and liquid fuel derivatives. Mine expansion is predicated upon both Morupule B development and washed clean coal sales into SADC export markets (with the company emphasizing the latter). BPC's planned Morupule B 600 MW expansion in 2012-13 will demand an additional 2.6 million tonnes per annum coal to be met through expansion of the existing mine. Thereafter MCL faces alternative mining methods (a combined open-cut / underground) depending on total coal demand. MCL anticipates annual coal demand to increase closer to 10 million tonnes per annum, of which a significant percentage will be export washed, clean coal sales. With a lease area of 3,400 hectares underlain by four coal seams, lowest of which is 8.5-14 meters thick some 80 meters below surface, MCL has more than 5 billion tonnes of geological reserves available for expansion.

41. **Coal sector strategy**. Power deficits within the Southern Africa region and resulting proposed coal-to-power investment projects underscore the increased role of indigenous coal and CBM resources within Botswana's mining sector going forward. Overarching frameworks to regulate and govern this

[41] *Petroleum (Exploration and Production) Act* of 1981.

[42] CIC Energy Corp reports that at Mmamabula washing 60 percent of run-of-mine coal (1.8-2.3 percent nodular pyrite) and crushing to a 25 millimeter size fraction yields lower sulfur content (0.5-0.7 percent). Benefits are more sulfur removed, fewer fines into the wet circuit, and dryer coal. Additionally, lime used for desulfurization permits back-haul of 64,000 tonnes per annum to Lime Acres, South Africa, for cement manufacture.

industry will be challenging. Botswana has no formal national policy regarding coal and associated methane resources, but the Government's *Vision 2016* provides a clear articulation of overarching national objectives to which coal mining would contribute, including but not limited to the following:

- achieve a diversified economy in which mining and services are productive and a vital part of the economy.
- income is distributed equitably.
- civil society will play a full part in the development of the country alongside government.

42. Botswana has identified the need for a strategic coal development plan (Coal Roadmap) to ensure energy security, orderly development of resources for economic diversification, and to derive full benefit through the optimal use of coal resources. The roadmap has the following overarching considerations:

- Continued access to energy services and increased efficient use of energy resources are fundamental to Botswana sustaining current levels of economic development.
- Botswana has a desire to diversify to other mineral products, including coal, in advance of an expected decline in diamond output in 2020.
- Botswana has limited access to other indigenous fuels, faces expensive and scarce imports, and remains heavily dependent on coal and CBM.
- The long-run challenge for Botswana is to build an energy portfolio that permits transition towards a secure, affordable, low-carbon energy system without undermining economic and social development.
- Development to be achieved through primarily private sector, and public-private partnerships where necessary.

Box 4: Public-Private Partnership Framework

Presidential Directive Presidential Directive CAB 29 (b) of September 12, 2002 approved the use of public-private partnerships (PPP) for the delivery of infrastructure services, but Botswana has had only limited experience to date in actually procuring and undertaking PPP projects.

In order to encourage greater PPP activity, the Botswana Public Enterprises Evaluation and Privatization Agency (PEEPA) initiated, in 2005, the development of an implementation framework for PPPs, and engaged international consultants for this purpose. Drafts of the resulting policy recommendations have been published by PEEPA at http://www.gov.bw/index.php?option=com_content&task=view&id=66&Itemid=92. Currently, the Government is considering these recommendations which, if accepted, would require amendments to existing procurement legislation and the establishment of new institutional arrangements, including a PPP Unit within PEEPA.

In general, the recommendations proposed by PEEPA would seem to be consistent with good international practice in regard to PPP legislative, institutional and policy arrangements. Botswana is a common law country, and although most common law jurisdictions (including the United Kingdom and Australia) have chosen not to adopt PPP-specific legislation, some such jurisdictions (including South Africa and, recently, California) do have legislation explicitly designed to facilitate PPP projects. As for the institutional and policy aspects of the proposed framework, additional work may be required on certain elements of the recommendations, especially in regard to risk allocation principles and the treatment of unsolicited proposals.

The TA component under the project would include capacity building for the MMEWR in regard to future PPPs, especially in connection with the development of Botswana's CBM resources. The Terms of Reference for the consultants who will be engaged in providing such capacity building will take cognizance of, and provide input for, the development of Botswana's overall PPP implementation framework as may be requested.

Policy issues

43. The ***Vision for Coal*** (along with CBM—see below) will require coordination at two levels:

- Macro high-level policy decisions regarding alternative strategies to stimulate coal and/or coal-to-power development and exports via the provision of ancillary infrastructure, and the stimulation of horizontal and vertical linkages.
- Sector Policy ministerial decisions covering, *inter alia*, mechanisms for equitable benefits sharing, community development around mines, employment and training skills, encouraging gender equalities, and the fostering of local small-to-medium enterprises.

44. The coal sector road map could emerge through a series of strategic actions that will cumulate to form the foundation for a more comprehensive coal sector policy (Vision) over a course of 18-24 months, supported by consultation with a diverse stakeholder group and early implementation of key actions.

45. The *Mines and Minerals Act* (Chapter 66:01LRO 1/2002), provides regulation on key elements that would underpin a national minerals policy. In this regard, the *Mines and Minerals Act* (1999) is a comprehensive, high-quality legal instrument encouraging good industry practices. Additional requirements relating to formal mine closure planning (in contrast to current decommissioning and reclamation requirements) would benefit the Government.

Regulatory and institutional issues

46. Regulatory and institutional issues to be addressed include coal licensing, redress of inactive licenses and competitive bidding for new exploration and development licenses; institutional strengthening and capacity building for coal administrative units; improving staff retention; building capacity for economic analysis and projections; and regional dialogue to facilitate exports. According to DGS and Department of Mines, the following are key inter-related licensing issues:

- Inactivity (only about 19,000 square km are considered active by DGS out of a total of 87,000 square km presently licensed) on most coal and CBM license holdings, a result of a "first-come / first-served" open mineral access that allowed speculators to acquire mineral rights with low carrying cost and non-compliance on investment commitments.
- DGS has only partially enforced compliance with only some revocation of inactive licenses.
- Unusually large mineral license areas for prospecting licenses which have a duration (including extensions) of seven years total during which a 50 percent area-reduction is mandated after three years of exploration (with additional surrender of a further 50 percent of land following two two-year extensions); but to which industry is reticent to comply given open-mineral access to speculators on the surrendered land.
- Transition from Prospecting to Production licenses without provision for an exploration license.
- Surrender or revocation of license areas after seven years for which an auction process would be more appropriate than "first-come / first-served."

47. The Ministry plans to improve licensing by bringing into compliance those license holdings that have become inactive or have otherwise failed to meet full regulatory compliance. Mineral areas not currently under license would be held for issuance until a new licensing system. In the longer term, staffing issues continue to impede improved administrative efficiencies given high staff turnover and a deficit of skills related to coal development.

Coal-bed methane

48. As coal mining progresses to greater depth within a sedimentary basin, consideration of CBM and CMM and associated brackish / potable water byproducts, becomes a principal concern. Geological investigations have confirmed the potential for productive CBM within central portions of the Karoo sedimentary basin at greater stratigraphic depths.[43] [44] [45] [46] Understanding of the full CBM potential is

[43] *The Petroleum Prospects of Botswana*, Geological Survey Department, 1984.

based, in-part, on geological analog analysis where gas maturation increases with depth in-board to the center of basins where structural dislocations that occur along basin margins are less common. Both MCL and CIC report a moderate degree of structural dislocation along the eastern margin of the Karoo basin.

49. Subject to further exploration, domestic hydrocarbons may complement coal-to-power development strategies. However, deeper exploration in the Karoo is complicated by recent Kalahari sands, averaging >100 meters in thickness, and covering 80 percent of prospective terrains. As such, deep basin CBM exploration is reliant on geophysical surveys to identify broad prospective areas followed by step-out drilling. In early basin exploration, there is a geological learning that takes place through an iterative process often across a successive number of plays and players. This is high-cost, time intensive exploration to which Botswana is in the early stage of learning. Effective early stage gas industry development is complex and requires integration and coordination across a value chain. Consistent, coordinated policy and regulation is necessary to optimize exploration and production activity and establish a new natural gas industry.

50. **CBM—natural gas sector policy**. Very little policy work has been done regarding the development and use of CBM. Needs are both in the upstream (exploration and production) and downstream (transmission, distribution, and sales) sectors. Policy issues that need to be resolved include:

- Government priority for development of CBM versus other minerals and hydrocarbons.
- Development of health, safety, and environmental (HSE) regulation and enforcement with particular attention to produced water issues associated with CBM development.
- Granting of export rights versus retaining call on production for internal needs. Government role in developing export alternatives and enabling export infrastructure.
- Ownership and regulation of, and access to, downstream natural gas transmission and distribution systems including gas aggregation. Role of government or a public-private partnership (PPP) to serve as aggregator/purchaser and market developer for natural gas.
- How to create economic linkages that incentivize development of industries that utilize natural gas. Prioritization of natural gas end use and internal pricing mechanisms, if any, for different categories of use.
- How best to strengthen natural gas technical, commercial, and regulatory capacity with the Government (DGS, MMEWR, and potential new independent regulatory authority).

51. **CBM—institutional considerations**. Licenses to explore for and delineate CBM reserves have been issued on a "first come-first served" basis as "Prospecting Licenses" under the *Mines and Minerals Act*. In most cases these licenses include prospecting for both coal and CBM, but not other conventional forms of oil and gas (petroleum). The current practice sub-optimizes CBM and petroleum exploration as follows:

- Current 3-2-2 licenses require 50 percent area relinquishments after three and five years. CBM development timeline and need for large operational footprint does not match current terms causing developers to seek much larger original license areas than they can reasonably manage.
- Current process to issue license as requested should be reconsidered. Alternative to pre-qualify bidders and hold organized competitive auctions would improve the quality of CBM development activity.

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[44] Beginning with a 1961 reconnaissance by Standard Vacuum Oil Company focused on the Karoo Supergroup it was concluded that the Dwyka and Ecca strata contain source, reservoir, and trap rocks for the accumulation of hydrocarbons.

[45] Shell Botswana 1977 identified stratigraphy in the Kalahari and Okavango areas as being sufficiently thick (>2,500 meters) for oil/gas maturity.

[46] Both Kalahari Gas and Sabre reported intersections of CBM-bearing strata, principally below a basalt marker horizon ~ 400 meters depth.

- Current tax/royalty fiscal system does not economically incentivize CBM operations that have elongated pilot and early production de-watering phases. Consideration should be given to developing a production sharing contract under the *Petroleum (E&P) Act*.
- Current system will place CBM exploration and production activities in conflict with traditional oil and gas exploration and production in areas where both may exist. In fact, several petroleum licenses have been sought over CBM prospect license areas. Consideration should be given to include CBM and traditional petroleum exploration and production together under the *Petroleum Act*.

52. As with the coal licenses, the Ministry intends to impose a moratorium on the issuance of further licenses (including requests for conventional oil and gas licenses). In addition, lands recovered through relinquishment enforcement are to be banked until new licensing systems are put in place, and natural gas capacity is built within DGS and MMEWR.

53. **CBM—resource analysis**. The identification of Botswana's significant coal resources led to a study by DGS to assess the potential reserves of CBM in country.[47] This study estimated that approximate 60 TCF of methane was held "in place" within the coal and 136 TCF of additional gas was contained in associated carbonaceous shale. Of this, DGS estimated that 15-20 percent of the gas could be commercial developed (30-40 TCF). Methane to Markets Partnership confirmed this estimate in its 2007 CMM Overview.

54. If proven commercial, this magnitude of gas reserves would be considerable, providing abundant daily delivery of methane to fuel Botswana's power needs, establish gas-based industry and support substantial gas exports. However, the development efforts of CBM resources in other major coal basins (US, Australia) have been of limited success, or have been very disappointing (Poland, Germany, China, and others). It is rare that a CBM development end in complete failure (*i.e.*, even disappointing investments produce enough methane for some local use), but equally rare are developments that fully reach initial expectations or support very large-scale export developments such as ocean-borne LNG for Europe or Asia.

55. Large-scale development of CBM in other countries has been hampered by several technical obstacles to production. The "host" coal seam must be of sufficient thickness and at a particular range of depth to be prospective. The challenge is to identify areas with natural fractures for permeability, and other favorable reservoir properties. Methane often has migrated out of coal-beds that are too shallow. When too deep, the coal may be too compacted to allow gas to flow to the production well bore. In addition the reservoir generally contains a large amount of water that must be removed before the methane can be expected to flow. This may take several years and if not removed properly can inhibit the flow of the methane gas throughout the life of the well.

[47] CBM Exploration Study (GC 154) 2003.

Box 5: Global Lessons from Development of Coal-bed Methane

Recent successes and announcements to develop CBM resources in North America and Australia have prompted renewed interest and expectations to exploit these resources globally. However, development of CBM projects is extremely technically and commercially complex, and efforts to commercially produce CBM in other countries—China, Columbia, India, Hungary, Germany, Poland, South Africa and the UK—have been disappointing. The critical success factors to CBM development in North America and Australia are noteworthy for Botswana. It is rare that a CBM development end in complete failure (*i.e.*, even disappointing investments produce enough methane for some local use), but equally rare are developments that fully reach initial expectations.

Critical success factor 1: good resource
The production of commercial quantities of methane (natural gas) from coal-beds is dependent on many factors. The primary factor is the rank (maturity) of the coal. Generally, late sub-bituminous and early bituminous coals are believed most prospective for CBM. Coals too shallow are likely to have lost their methane. Coals too deep are under much pressure which reduces permeability by closing the natural gas migration structure (cleats) within the coal seam. Therefore, while substantial gas "reserves in place" may be reported for a project or field, only a small fraction of these resources are likely to be commercially viable.

Water content must be manageable. CBM reservoirs generally contain a large amount of water that must be removed before the methane can be expected to flow. This may take several months to years and if not removed properly can inhibit the flow of the methane gas throughout the life of the well. The amount of water, the cost of treating and disposing of this water, and the delay to first gas production will dramatically affect development feasibility. The quality of CBM resource remains to be examined and verified in Botswana.

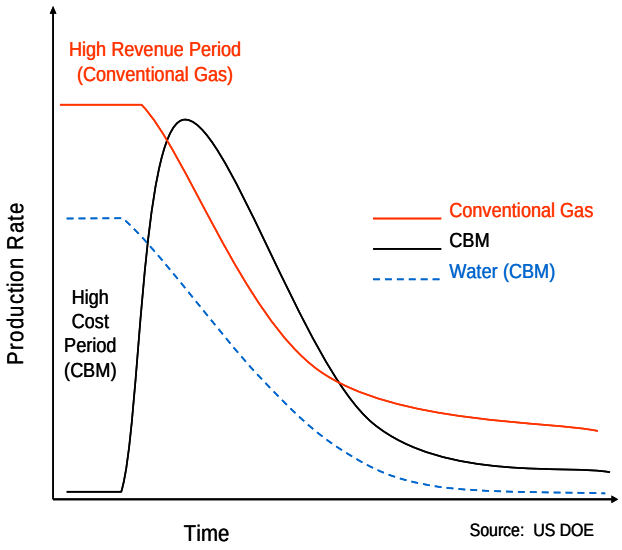
Critical success factor 2: infrastructure availability
CBM wells each produce very small quantities of gas which decline fairly rapidly. In addition, a CBM well may "water up" if shut in, causing a renewed de-watering delay to gas production. These issues require two primary industry infrastructure requirements.

First, the availability of several hundred drilling rigs and experienced drilling companies to drill up to 5,000-10,000 wells, over time, to fully develop the prospect.

Secondly, pipeline infrastructure must be available to carry initially small volumes of gas (to avoid the problems of shutting in wells). It generally takes over a decade for a CBM development to reach full production potential. During this period, costs are high to continuously drill new wells and de-water the coal seams, while CBM production and associated revenues are low (see illustration for comparison of CBM and conventional natural gas well production profiles). Therefore CBM development that must also add pipeline investment is even more likely to be sub-economic. If adequate resource for commercialization is proven, then infrastructure would need to be developed.

Critical success factor 3: strong investment conditions
The availability of industry infrastructure is critical to providing ample, affordable development labor and equipment. In addition, there must be a reliable gas market based on global energy market prices to mitigate take and price risk. The Government also may play a role in establishing a strong development environment with reasonable and transparent fiscal regimes and special investment incentives if necessary.

Successful developments
Based on the above Critical Success Factors, commercial CBM developments have occurred in very few locations. The follow discusses some of the particular reasons CBM has worked in the US and Australia.



United States: CBM production has been an important component of total US natural gas supply for decades. US CBM production began in the San Juan basin in northwest New Mexico. This basin represents near technical perfection for CBM. The gas content per tonne of coal is very high, and the water content is very low. In addition the coal is deposited in thick seams in an "over-pressured" zone which allows the CBM to be produced without any artificial lift system. Prior to the discovery of this resource, the basin was producing large amounts of conventional gas and so ample infrastructure was in place to transport the gas to markets. Other more challenging CBM basins have since been developed in the US. Early efforts were enabled by special drilling tax incentives; availability of affordable surplus drilling rigs; and access to pipeline infrastructure. More recent developments were incentivized by relatively high natural gas prices.

Australia: Although Australia's CBM industry has received a large amount of favorable publicity, its current scope remains fairly small and ambitious plans to rapidly expand CBM developments are likely to be delayed as long as the global economic crisis persists. Australia's moderately successful program has been hard fought. Several hundred million dollars have been invested in the development of CBM which began in earnest, in 1995. However, it took over a decade before significant quantities (10 billion cubic meters per year) of CBM added to Queensland and New South Wales gas supply. Like the US, CBM developments were aided by government incentives and availability of existing gas infrastructure. In addition, natural gas is in undersupply in the region and additional supplies have many opportunities to displace higher cost industrial fuels.

56. Thus while Botswana, may have a substantial amount of CBM reserves "in place," it is not known if CBM will be a niche play or a major element of the country's future economy. Without significantly more scientific analysis, and pilot project testing, it is difficult to know how much of these reserves can be physically and commercially produced and at what price.

57. It is proposed that as a key starting point a Resource Assessment be undertaken to determine the true potential of this resource. This assessment would utilize results of existing studies, available empirical data and CBM analogs from successful and unsuccessful developments in other coal basins to:

- Map the location of probable exploitable coal reserves based on industry established limits (coal thickness, depth etc.);
- Develop estimates of total economically recoverable reserves and daily production quantities versus a range of natural gas prices;
- Provide high level comparison of Botswana CBM to other CBM developments; and
- Propose possible natural gas transmission infrastructure program to service CBM development. Analysis would consider development of infrastructure as part of a larger, rail and power energy corridor.

Concentrating solar power

58. Botswana is blessed with ample solar radiation. With some of the highest constant irradiation levels in the world at an average annual direct normal irradiation (DNI) of 2250-3000 kWh/m^2/year, Botswana offers promising potential for harnessing solar energy. About 4-5 different technologies are available for CSP, though the trough and tower are the most widely deployed. Currently, there are about 430 MW operational capacity, mostly in the USA; and about 380 MW of additional capacity is expected to be in operation over the next two years, mostly in Spain. These projects, location and size are shown in Tables 16 and 17 below.

Table 16: Currently operational CSP projects

Name	Location	Capacity (MW)	Configuration	Promoter/owner	Operational date
SEGS1	California	13.8	Trough	Sunray Energy	1985
SEGS2	California	30	Trough	Sunray Energy	1986
SEGS3	California	30	Trough	Florida Power & Light	1987
SEGS4	California	30	Trough	Florida Power & Light	1987
SEGS6	California	30	Trough	Florida Power & Light	1989
SEGS8	California	80	Trough	Florida Power & Light	1990
SEGS9	California	80	Trough	Florida Power & Light	1991
Saguaro	Arizona	1	Trough	Aciona	2006
PS10	Spain	11	Power Tower	Abengoa Solar	2006
Nevada Solar One	Nevada	64	Trough	Aciona	2007
Andasol 1	Spain	50	Trough	Solar Millenium	2008
Kimberlina	California	5	Fresnel collector	Ausra	2008
Liddle Power Stn.	Australia	5	Fresnel collector	Ausra	2008
Total		**429.8**			

Table 17: CSP projects expected to be in operation in the next two years

Name	Location	Capacity (MW)	Configuration	Promoter/owner
PS20	Spain	20	Tower	Abengoa
Solar Tres	Spain	15	Tower	Sener
Solnova 1	Spain	50	Trough	Abengoa
Solnova 3	Spain	50	Trough	Abengoa
Extresol 1	Spain	50	Trough	Cobra ACS
Andasol 2	Spain	50	Trough	Solar Millenium
Andasol 3	Spain	50	Trough	Solar Millenium
Algeria Hybrid ISCC Plant	Algeria	25	Trough	NEAL
ISCC Power Project	Morocco	20	Trough	ONE/GEF
Solar Thermal Power Plant	Egypt	20	Trough	NREA/GEF
Hybrid CSP	Mexico	31	Trough	CFE/GEF
Total		**381**		

Source: Compiled by project team from various sources

59. For the installation of a utility-scale CSP plant, the required technical criteria are:

- High solar insolation, above 2,200 kWh/m^2/year or so;
- Availability of a high voltage grid line (minimum 132 kV) with adequate capacity for evacuation of the electricity from the plant;
- Connection to a grid with adequate capacity to buffer for possible fluctuations in the generation of the solar plant; and
- Adequate water for the process of steam generation.

The plant site has to be close to accessible roads and other infrastructure. Based on prefeasibility study carried out by Fichtner Solar GmbH (December 2008), five potentially viable sites for a CSP plant were examined. These sites are: Selibe-Phikwe, Serowe, Lethakane, Maun, and Jwaneng. All these sites show favorable DNI exceeding 2,200 kWh/m^2/year. Of these sites, Jwaneng has shown the best characteristics, with proximity to the grid, a demand center of a mine and higher solar insolation in the summer months. However, all these five sites will need to be evaluated again for proper identification of the most suitable site.

60. High initial capital costs and unproven storage technology are still significant barriers for adoption of solar thermal technology, requiring large subsidies to overcome the difference with conventional fossil fired power. Various estimates range the overnight costs between US$4,000 and 6,000 per kW. Further, the low capacity factor for solar power results in large per unit prices of electricity. Most projections present prices of power from solar thermal at around US¢22-29/kWh currently, with expectations of costs reducing to US¢15-20/kWh (2006 prices). Some PPAs are reported at an even lower price of US¢10-15/kWh, reflecting the subsidies. With potential carbon finance and other international support (*e.g.*, Clean Technology Fund), CSP could be promoted in Botswana. This can also be facilitated by feed-in tariffs for CSPs announced recently by South Africa, though the applicability to cross border installations remains to be confirmed. The project would provide TA for a bankable feasibility study for CSP in Botswana.

Carbon sequestration

61. One issue is raised for further consideration by the Government: the potential re-use of coal / CBM bearing strata for storage of gases and other waste products from power generation. A focus of the mission was on water resources for clean coal technologies, specifically waters produced as a result of CBM production, waters used for large-scale coal washing and the potential for future carbon capture and storage in saline aquifers.

62. Shallow (~100 m) brackish aquifers are intersected in CBM bore holes in the central portion of the Karoo basin; and in (but not limited to) Morupule A / B and Mmamabula well fields in the eastern portions of the Karoo basin. These relatively shallow subsurface waters are shared between coal preparation, power generation and agricultural / livestock end-uses. The Mmamabula IPP EIA deems them "sufficient" in volume for current activities and forward-looking low-water power generation. However, water allocation to coal mining and coal washing should be clearly defined.

63. Deeper subsurface flow, is characterized as being below a marker horizon (a regional basalt flow) ~350 to 400 meters depth, moving from the southwest towards the northeast of the country. The hydro-geologic model is limited by little sub-surface data and there remains uncertainty as to the salinity of the water across the basin, and the influence of the faulting observed from coal exploration. Likely topics for policy consideration include regulation of waters produced from CBM, consumptive water use in coal washing and power generation, and the storage of GHGs in depleted water aquifers or saline aquifers.

Box 6: The Current Worldwide Developments and Approaches of CCS

Carbon sequestration is currently underway in the following places:

(i) **Sleipner, Norway**-1million tonnes CO_2/ year, longest running CCS plant since 1996, strips CO_2 from natural gas and stores it in a saline reservoir. Has excellent conditions for storage
(ii) **Salah, Algeria**- ~1 to 1.2 million tonnes CO_2/ year, CO_2 stripped from natural gas.
(iii) **Weyburn, Canada**– ~1.7 million tonnes CO_2/ year, coal gasification plant in Beulah, USA, provides CO_2 for storage in Canada for EOR.
(iv) **Otway Basin, Australia**– An experimental plant of 50,000 tonnes a year, operational since April 2008, strips CO_2 from natural gas.
(v) **Schwartzepumpe, Germany** – 30 MW demonstration plant, first plant to capture CO_2 from combustion of coal and store it underground. Will be scaled up over time to 1,000 MW.
Several (12-16) new industrial sized plants are proposed in Europe for the 2010 to 2016 period, with various configurations and financing systems.

Issues surrounding CCS
1. **Cost**: High costs of CCS per tonne are a serious challenge to its deployment in the short term. The large share of the costs is incurred during the capture stage. A more energy efficient capture technology is currently at an experimental stage and not expected to be commercially available in the next five years.

2. **Legal and Regulatory Issues**: Due to the nature of the technology, deployment of CCS at a large scale across many countries will require a well-defined regulatory structure
3. **Long-term risk assumption**: Many CCS bodies have taken a position favoring governments to assume long-term risk liability but consensus has yet to be reached on the best model of this risk transfer.
4. **Inadequate geological and geophysical data in most countries**: Since there was no need for carbon storage earlier, the geological and geophysical data that would be required for a storage project has never been collected in most countries.
5. **Public awareness issues**: CCS is not expected to be an easy sell to communities. It will take concentrated education and awareness efforts to make local communities comfortable with having huge amounts of buoyant gas underground in the proximity of their homes and farms.

International efforts

Various international efforts like the Carbon Sequestration Leadership Forum, the Asia-Pacific Partnership, Australia's Cooperative Research Center on Greenhouse Technologies, and the International Energy Agency GHG program have been engaging technological and policy leaders from across the developing and industrialized nations to further the CCS agenda, so as to remove barriers to adoption of CCS. These initiatives have been part of the United Nations Framework Convention on Climate Change (UNFCCC) efforts, as well as independent of them. The Australian government has recently announced the setting up of its 'Global Carbon Capture and Storage Institute,' which perform the following functions: Support R&D on critical path to achieve demonstration projects and commercial-scale deployment of CCS; leverage current information base to facilitate information sharing; analyze regulatory/economic framework to support projects and accelerate deployment of twenty demonstration projects through advice, expert support, and coordination. South Africa has established a CCS Center to support information dissemination and promote CCS in the region.

Water resources

64. Botswana is an extremely water-scarce country with a relatively vast and generally flat land surface approximating 584,000 square km. According to the *World Atlas of Desertification*, ninety-one percent of the country is semi-arid while the remaining nine percent is arid.[48] Botswana has an estimated total surface runoff around 705 million cubic meters per annum and groundwater resources that are virtually non-renewable. Thus, the current population pressure on water in Botswana is estimated to be around two thousand people per million cubic meters per annum, and is estimated to increase to five thousand people per million cubic meters per annum by the year 2020. A flow of six hundred people per million cubic meters per annum is the level of population pressure on water where water stress can be expected, illustrating that Botswana is one of the world's most water-stressed countries.

65. Taking into consideration all the water scarcity indicators above, water is the most precious natural resource in Botswana. In fact, the *Botswana National Conservation Strategy* recognizes the dependency of all sustainable development in Botswana upon water resources, and accordingly accepts the need to pay priority attention to this scarce resource.

Limestone resources

66. Botswana has substantial known limestone resources, a necessary feedstock for coal-fired power generation. The deposits are generally in the form of calcite which is low quality (60 percent calcium) and so far have not been economic to develop. Although it is low quality it should be good enough for a CFB boiler to remove SO_2 in the boiler. If BPC is able to use domestic sources of limestone, it will not have to import limestone for the Morupule B Power Station.

[48] This aridity zones are based on an aridity index derived from the ratio of mean annual precipitation to mean annual potential evapotranspiration. Arid zones have an aridity index of 0.05 to 0.20, while semi-arid zones have an aridity index of 0.20 to 0.50.

Box 7: Carbon Finance Support

Pilot Program Idea for the Carbon Partnership Facility

Background

Across SAPP, coal has dominated the power generation and distribution systems, and there is a continued high demand for coal-fired electricity generation. Botswana, like other countries in the sub-region, had relied on inexpensive, abundant, and reliable electricity from South Africa. In 2007, Botswana imported about 410 MW from Eskom, while its own small 25-year old coal power plant (Morupule A, 4x33 MW) provided about 20 percent.

Immediate increased energy supply solutions are relatively few and Botswana will likely turn to high-cost imported diesel fuel for power generation using leased portable units for its needs in the next few years. The challenge for countries within the SAPP will be to transition towards a secure, affordable, low-carbon energy system without undermining economic and social development.[49] Carbon finance has an opportunity to play a key role in helping to play a role in financing Botswana's future energy development strategy.

Low-carbon energy development in Botswana

Botswana has identified the need for a strategic coal development plan to ensure energy security, orderly development of resources with due recognition for environmental and social considerations, and to derive full benefit through the optimal use of coal resources. The World Bank is assisting the Government to develop a "coal sector road map," which will include consideration of two important policy dimensions that encourage (a) interventions that lead to clean coal outcomes including coal-by-wire for nearby markets and (b) development of an energy portfolio consisting of mutually complementary energy resources.[50]

Program 1: BPC has begun a campaign to reduce energy consumption through conservation and energy efficiency. The campaign urges customers to adopt simple practices (*e.g.*, switching to CFLs, turning off faucets when not needed, etc.) to reduce their own consumption and save on energy costs. BPC also plans to target mines and industries to promote energy efficiency, and aims to achieve up to 15 percent reduction in peak energy demand (about 50 MW).

Program 2: Basin-wide mining of coal requires consideration of CBM and CMM production. An important element would include a possible program that accesses carbon finance resources to enable and encourage the development of power sources from coal-bed-methane resources. In the future, should Botswana explore carbon storage opportunities, one option would be to sequester gases in deep coal seams or CBM horizons, with preference given to locally sourced CO_2 in proximity to the storage strata.

Program 3: Botswana's desire to promote CSP (beginning with a 50 MW capacity) could attract carbon finance support. The Bank will assist Botswana with mobilizing such resources following completion of a detailed feasibility study under the project.

Program 4: Proposed solutions to the energy crisis call for substantial investment in power generating capacity, boosting regional power trade, and improving the performance of utilities. The proposed private sector projects, including the Mmamabula IPP, will have an export-oriented focus to supply SAPP.

[49] Including South Africa, Sub-Saharan Africa accounts for under 5 percent of worldwide coal production and consumption.

[50] A balanced energy portfolio approach supports fuel switching as cleaner, affordable energy resources become available. Increasing efficiencies, fuel switching and appropriate technology choices facilitate a flexible developmental framework through which low-carbon energy strategies deliver both environmental and economic benefits under specific conditions. Employing a portfolio of energy resources enhances energy security, supports optimal fuel selection, increased efficiencies, and the offers a full range of technology choices. Within a portfolio approach, the deployment of each energy resource is in consideration of acceptable tradeoffs among (a) overall lower cost energy; (b) security of supply going forward; (c) demand and system scale and requirements; (d) environmental, social, and economic impacts; and (e) resource sufficiency.

ATTACHMENT 1: THE SOUTHERN AFRICA POWER POOL

67. Botswana is part of SAPP, which includes twelve countries of the sub-region, nine of which are interconnected. The Botswana power grid is connected to the South Africa and Zimbabwe grids via a 400 kV interconnector through Phokoje Substation and 3 x 132 kV lines provide additional interconnection with South Africa. The Botswana grid comprises of 200 km of 400 kV lines, 1,254 km of 220 kV lines, 1,569 km of 132 kV lines, 1 x 400 kV substation, 7 x 220 kV substations, and 18 x 132 kV substations.

68. Nine of the twelve countries in SAPP have been experiencing energy shortages, some more than the others, caused by shortages in South Africa. The situation can be seen through the supply and demand balance for 2007 in SAPP as shown below.

SAPP - Existing Installed Capacity (MW)

		Coal	Gas	Thermal Subtotal	Hydro	Nuclear	Total	% of Total by country	Available Capacity	Net Peak Deman	Surplus/ (Deficit)	Reserve Margin (%)
BPC	**Botswana**	132		132			**132**	0.26%	**120**	**563**	(443)	n.a.
EdM	**Mozambique**		64	64	2157		**2221**	4.36%	**2075**	**537**	1538	286%
ENE	**Angola 1/**		275	275	474		**749**	1.47%	**590**	**897**	(307)	n.a.
ESCOM	**Malawi 1/**			0	245		**245**	0.48%	**240**	**268**	(28)	n.a.
Eskom	**South Africa**	35625	342	35967	2061	1800	**39828**	78.26%	**36208**	**36720**	(512)	n.a.
LEC	**Lesotho**			0	72		**72**	0.14%	**70**	**130**	(60)	n.a.
NamPower	**Namibia**	108	24	132	240		**372**	0.73%	**370**	**474**	(104)	n.a.
SEB	**Swaziland**			0	42		**42**	0.08%	**40**	**204**	(164)	n.a.
SNEL	**DRC**			0	2442		**2442**	4.80%	**1170**	**1075**	95	9%
TANESCO	**Tanzania 1/**		563	563	561		**1124**	2.21%	**1024**	**772**	252	33%
ZESCO	**Zambia**		10	10	1752		**1762**	3.46%	**1630**	**1643**	(13)	n.a.
ZESA	**Zimbabwe**	1155		1155	750		**1905**	3.74%	**1825**	**2186**	(361)	n.a.
	Total (MW)	**37020**	**1278**	**38298**	**10796**	**1800**	**50894**	**100%**	**45362**	**45469**	(107)	
	% of Total by fuel type	72.7%	2.5%	75.3%	21.2%	3.5%	100.0%					
	CO2 (Mt)	219.70	1.75	**221.45**								

1/: Not interconnected with SAPP

69. The main reasons for the crisis are attributed to the following:

(i) **South Africa has dominant and contagion effect on the rest of SAPP**. South Africa is the dominant part of the SAPP, accounting for nearly 78 percent of the capacity and about 85 percent of energy generation and a net exporter to key countries (Botswana, Namibia). South Africa's troubles with generating adequate power quickly spread and affected the SAPP countries.

(ii) **Demand far exceeds available capacity**. New capacities were not added in the last decade while the demand grew, straining the older units whose reliability decreased at the same time. The growing demand exceeded available capacity and eroded the reserve margins[51]. South Africa's available capacity was unreliable due to increased and forced maintenance and also non-availability of adequate coal at some major plants. South Africa hence suffered a shortfall of about 7,000 MW (or 20 percent of peak demand) which forced load shedding, blackouts, and

[51] Reserve margin is the excess capacity over peak demand at any time; normal limits are at least 10%, but often higher (15% and above) in systems with older units and/or when there are more large size units, such as in Eskom.

curtailed exports. Eskom is unlikely to sustain exports to SAPP countries; over the short- to medium-term (through 2015), countries currently importing from Eskom (mainly Botswana, and also Namibia) will need secure sources of power to replace the declining (and soon to stop) supplies from Eskom.

(iii) **The rest of SAPP is too small to handle the solutions alone**. The available capacity in the rest of SAPP (about 9,000 MW) is not sufficient to cover such short-fall and the transmission system and links are not adequate or flexible to handle shifts of large amounts and directions of power flows. South Africa's energy crisis caused ripple effects in the SAPP, especially in Botswana and Namibia.

(iv) **Power trade is small**. More than 95 percent of the energy in the SAPP network is consumed within the producing countries and the trade / exports are relatively small. Net exports (excess over imports) by Eskom were slightly over 1,000 MW (~2 percent), mostly to Botswana, Namibia, Zimbabwe, Swaziland, and Lesotho, based on bilateral contracts. A further small portion of energy was traded in the short-term market operated by SAPP—about 377 GWh, compared with a demand of 1,118 GWh in 2007 (as reported by SAPP).

SAPP generation expansion plan to 2025

70. The demand forecasts for the SAPP countries (2008-25) indicate growth at an average annual rate of about 2.9 percent, which is the similar to the historical rate of about 2.8 percent growth during (1998-2006). The profile of demand in South Africa, Botswana, and other parts of SAPP are as below.

Table 18: (Cumulative MW; includes reserve margin)

Year	SAPP	Eskom	All Others	Botswana
2008	50,894	39,828	11,066	510
2010	54,874	43,962	10,912	815
2015	64,060	50,676	13,384	1,026
2020	71,621	55,479	16,142	1,309
2025	78,063	59,415	18,648	1,407

Source: Compiled from Nexant Report, Oct 2007

71. The SAPP system optimization plan prepared by SAPP consultants (Nexant, USA) indicates that about 39,000 MW of additional capacities are needed across SAPP through 2025, of which 22,000 MW (or 56 percent) would be needed in South Africa alone. A part of these new additions will replace about 12,000 MW of old units, especially coal power plants. The specific projects were selected through an optimization model from 93 power plant candidates under consideration by the SAPP utilities, as well as about 90 transmission links and interconnections associated with specific generation projects. Of the 39,000 MW new additions through 2025, 28,000 MW would be thermal and 11,000 MW hydro, requiring 11 new transmission interconnections. Morupule B is part of the SAPP optimal expansion plan.

Table 19: SAPP base case expansion plan to 2025

MW	Thermal	Hydro	Total
SAPP	**28,000**	**11,000**	**39,000**
to 2015	15,500	6,000	21,500
2016-2025	12,500	5,000	17,500
South Africa	**18,800**	**3,300**	**22,100**
to 2015	9,200	2,300	11,500
2016-2025	9,600	1,000	10,600

72. The SAPP priority expansion plan through 2015 by type and advanced stages of preparation is shown below.

Table 20: SAPP priority generation projects through 2015

		Coal	Gas	Thermal subtotal	Hydro	Nuclear	Total
Botswana 2/	Morupule B	600		1800			**1800**
	Mmamabula	1200					
Mozambique	Temane		450	1650			**1650**
	Moatize	1200					
Angola 1/	New hydro			288	520		**868**
	Rehab				60		
	Gas		288				
Malawi 1/	Kapachira upgrade				64		**104**
	Tedzari rehab				40		
South Africa 2/	Various gas		2760	9160			**11491**
	Various coal	6400					
	Pumped storage				2331		
Lesotho 2/	Muela II				110		**110**
Namibia 2/	Ruacan upgrade			1200	85		**1285**
	Walvis Bay	400					
	Kudu gas		800				
Swaziland	Maguba				20		**20**
DRC	Inga rehab				910		**1128**
	Various rehab				218		
Tanzania 1/	Kiwira, others	500		500			**500**
Zambia	Ithazi Thezi				120		**1280**
	Lower Kafue Gorge				800		
	Kariba North Extn.				360		
Zimbabwe	Hwange rehab Ext	1000		1000			**1300**
	Kariba South Extn.				300		
Total (MW)		**11300**	**4298**	**15598**	**5938**		**21536**

1/ Not interconnected with SAPP
2/ Investment grade countries

73. The SAPP expansion plan contemplates expanding hydropower capacity from 21 percent now to 26 percent by 2025, and reducing coal power plants from 73 percent now to 67 percent by 2025 (see charts below). While coal-based power continues to be significant due to the region's abundant and already being exploited coal in South Africa,[52] the contemplated expansion plan improves SAPP's CO_2 intensity through a gradual reduction. This is achieved by a combination of increased share of hydropower plants and improved efficiency of coal power plants through infusion of new and better technologies.

74. An alternative scenario shows that hydropower may be increased to 16,500 MW by 2025 with a corresponding further reduction in thermal capacity. However, this scenario involves higher risks and uncertainties:

(i) The investments in coal power plants in South Africa and Botswana of about 8,500 MW combined, are shifted to non-investment grade countries (DRC, Malawi, Mozambique, Zimbabwe) raising financing risks and uncertainties. It is also predicated on Eskom providing

[52] South Africa is the sixth largest producer of coal globally and already has nearly 90 percent of its installed power generation capacity using coal.

PPA guarantees to these projects, which is unclear at best. Eskom is also aiming for at least 85 percent of its power needs to be met from sources within South Africa, which limits scope for large scale projects for exports to South Africa from the rest of SAPP.

(ii) The plan requires about 50 more transmission interconnections, most of which to be completed by 2015, including the long line from DRC to South Africa to support the 3,500 MW Inga 3 project. Since transmission lines are associated investments to power plants, this assumes the same risks as those of power plants for financing and timeliness.

Chart 1: Generation technology share (2007)

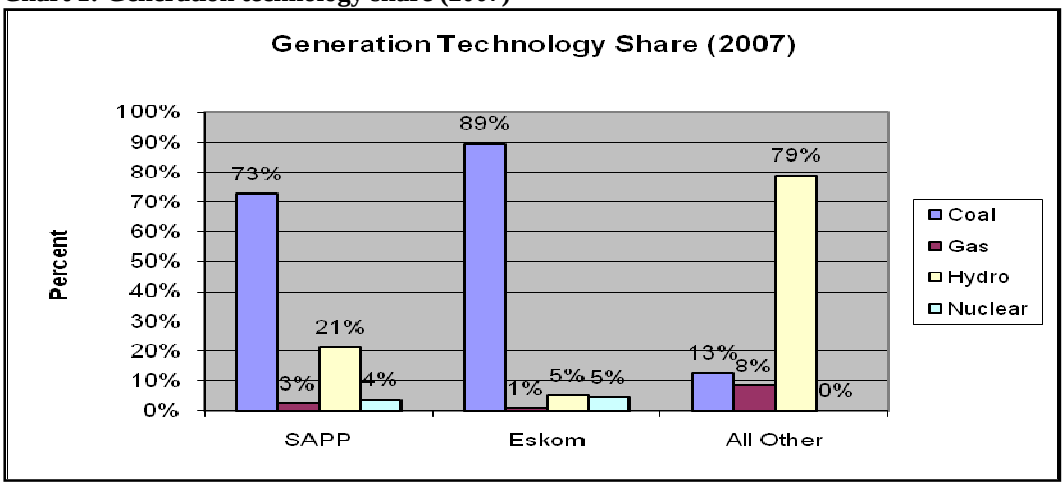
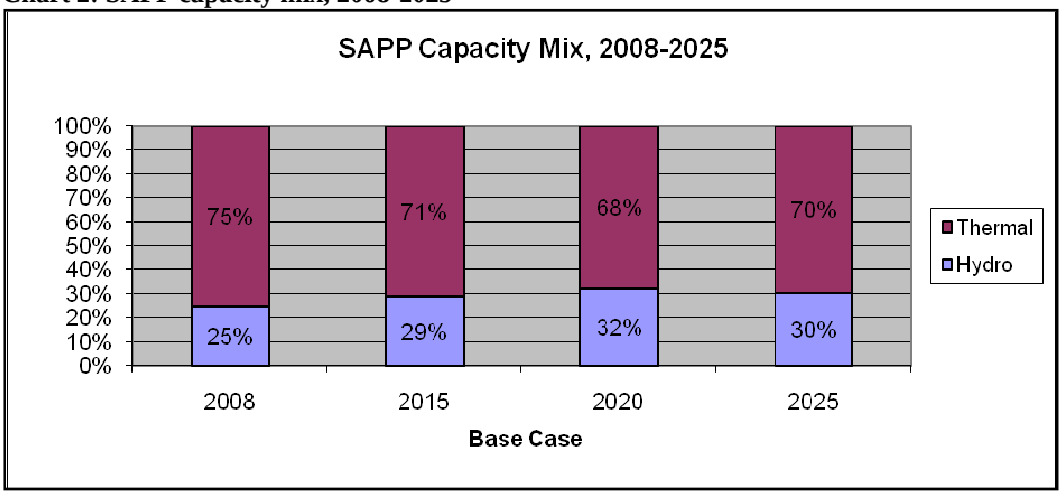


Chart 2: SAPP capacity mix, 2008-2025



75. While pre-2015 generation investments are likely to be along the base case scenario, it is possible to shift the post-2015 investments to align with alternative case scenario with more hydro and hence further lower CO_2 intensity of SAPP. The SAPP region has one of the largest hydropower potential in the continent in DRC (estimated at 40,000 MW). The region also has solar energy potential. South Africa has the fifth largest reserves of world's uranium. Gas reserves are limited, but Botswana is deemed to have a very large reserve of CBM (about 190 TCF). Therefore, it is expected that the share of fossil fuels in the energy mix would decline over time in preference for renewable energy. South Africa has announced feed-in tariffs to promote renewable energy from wind, solar, hydro, etc., and also intends to expand nuclear power capacity over the long-term to reduce CO_2 emissions. Botswana is also aiming to exploit its CBM and also promote CSP in its Kalahari deserts.

ATTACHMENT 2: POWER GENERATION OPTIONS FOR BOTSWANA

Table 21: Power Generation Options

Supply option	Size (MW)	Capacity factor	Capital costs ($/kW)	Est. cost cents/kWh	Remarks
Emergency and Short-term Options					
a) Oil-fired diesel	5 (1-40)	Up to 80%	800 (500-1200)	24	Efficiency: 38% HHVnet ; Oil difficult to obtain and expensive
b) Oil-fired OCGT	25 (2-150)	10-20 (up to 50%)	890 (400-1000)	25	Efficiency: 37% HHVnet; Oil difficult to obtain and expensive
c) Oil-fired CCGT	140 (50-800)	50-60 (up to 90%)	1,240	20	Efficiency: 50% HHVnet; Oil difficult to obtain and expensive
Long-term Options					
d) CBM	Similar w/ above options	Similar w/ above options	Similar w/ above options	7 - 22 (based on $5 to $20 per gigajoule (GJ))	No adequate data to determine CBM fuel price. Assumed price (US$5/GJ) is likely to be low; CBM resource uncertain; may require up to three years or more to be developed; is a good long-term option.
e) Solar	10-50	15-25%	2,450	17 - 19	Max size plant in operation: 30 MW Capital costs are likely to be much higher; requires 600 acres/100 MW; prices could become competitive in future and thus a good long-term option.
f) Solar with storage	Up to 200	Up to 50%	5,000 to 6,000	13 +	Max size plant in operation (64 MW) started June 2007; capital costs are likely to be much higher; requires 700 acres/100 MW; molten salt storage is not fully proven yet and not commercially available.
g) Morupule B	4X150	Up to 90%	1,200	4.5 to 6	No need for mining expansion; possibility for negotiating lower coal price than BWP 250/tonne proposed by MCL.

Notes on options:

a) Diesel engines are widely used worldwide firing all grades of oil (heavy oil to light distillate). While the availability and capacity factor could be up to 80 percent, diesel engines are used mostly as peaking plants because of the high cost of fuel relative to alternatives. For the case of Botswana, diesel is considered as a peaking option with 20 percent capacity factor; the resulting production cost of electricity at US$23.56/GJ diesel price (equivalent to US$114/barrel of oil) is US¢24/kWh.
b) Oil also could be used in an open cycle gas turbine (OCGT) plant with similar results as the diesel engine (US¢25/kWh).
c) Combined cycle (CCGT) plants using oil have higher efficiency and higher costs than open cycle and results in US¢20/kWh at the US$23.56/GJ diesel price.

d) CBM can be burned in the same plants as oil (namely: diesel engines, open and combined cycle plants) with approximately similar efficiency. Considering the uncertainty associated with the available CBM resource, the rate at which it can be produced in the near term (next 2-3 years) and the production costs, a range was established defined by the estimated productions costs of US$5/GJ (as the lower end) and US$20/GJ as the upper end corresponding to the fuel price parity of oil. This CBM price range results in electricity production costs of US¢7-22/kWh.

e) Solar thermal technology without storage is commercially available but its capacity factor (affected by the availability of the sun) is very low (typically 15-25 percent) to be considered for a base loaded application which is needed presently in Botswana. If the capacity factor was acceptable, the resulting cost of electricity is estimated at US¢17-19/kWh.

f) Solar thermal with storage is in early commercial stage with one 64 MW plant in operation since June 2007. The increased capacity factor to 40-50 percent due to the storage improves its economics (estimated production cost at US¢13/kWh) but the storage component is yet to be proven and there is uncertainty regarding the capital costs of the technology and the ability to achieve the projected capacity factor. Even at 50 percent maximum capacity factor, this option will not satisfy Botswana's present power requirement needs which call for a base-loaded plant able to operate in the 70-80 percent capacity factor range.

g) The technology selected for Morupule B, CFB is a recently developed technology, first commercialized in the 1980s and 1990s aimed at reducing local and regional pollution (SO_2 and NOx emissions). Also, it is more suitable for low-grade fuels. In the case of Morupule, this means that it can utilize coal cleaning wastes from the neighboring mine. If such a fuel were to be used in a traditional PC plant, the combustion efficiency would be lower (possibly 92-96 percent vs. 99+ percent for CFB) resulting in higher coal consumption per unit of electricity produced.

Table 22: CO_2 evolution with options and measures (tonnes/MWh)

CO_2/MWh Evolution with Options and Measures								
Capacity (MW)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Morupule B	530	530	530	530	530	530	530	530
CBM				50	100	100	200	200
CSP								50
Total	**530**	**530**	**530**	**580**	**630**	**630**	**730**	**780**
Energy efficiency	50	50	50	50	50	50	50	50
CCS								150
Energy (GWh)								
Morupule B	4179	4179	4179	4179	4179	4179	4179	4179
CBM				350	701	701	1402	1402
CSP								219
Total	**4179**	**4179**	**4179**	**4529**	**4879**	**4879**	**5580**	**5799**
Energy efficiency	394	394	394	394	394	394	394	394
CCS								591
CO_2 emissions (M tonnes)								
Morupule B	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
CBM				0.16	0.32	0.32	0.63	0.63
CSP								0
Total	4.60	4.60	4.60	4.75	4.91	4.91	5.23	5.23
Adjustment for EE	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
Adjustment for CCS								-0.65
Total after adjustment	4.40	4.40	4.40	4.56	4.71	4.71	5.03	4.38
Emission factor (tonnes/MWh)	**1.05**	**1.05**	**1.05**	**1.01**	**0.97**	**0.97**	**0.90**	**0.76**
Gap from benchmark 1/	0.15	0.15	0.15	0.11	0.07	0.07	0.00	-0.14

1/: Benchmark is supercritical coal plant at 0.9 tonnes of CO_2 per MWh.

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

The Government and BPC have limited experience working with other bilateral or multilateral agencies and the last Bank engagement was about 20 years ago. The Danish International Development Agency (DANIDA), the bilateral arms of the Swedish and Norwegian Governments, the UNDP and GEF has been involved in supporting the Government's rural electrification program. Local industry has been supported under these collaboration, especially for construction and related activities associated with rural electrification. Other than some delays, these programs are satisfactory.

The USAID has also provided assistance to the Government for supporting the Mmamabula IPP project, mainly through engaging legal and financial consultants for advice and capacity building.

Annex 3: Results Framework and Monitoring

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Table 23: Results Framework

Project Development Objective	The objectives of the project are to support Botswana in: (i) developing reliable and affordable supply of electricity for energy security; (ii) promoting alternative energy resources for low-carbon growth; and (iii) building its institutional capacity in the energy sector.	
PDO Outcome	**Outcome Indicators**	**Use of Results Information**
Improved domestic generation and transmission capacity	Domestic electricity generation as percent of peak demand	Level of energy supply security
Improved prospect for low-carbon growth strategy	Potential reduction in CO_2 emissions	Climate change mitigation support
Improved regulatory capacity	Regulatory agency issuing decisions	Benchmark against best practice
Intermediate Results by Component	**Results Indicators**	**Use of Results Information**
Component A(1): The Morupule B Power Station		
Increased domestic electricity generation	Domestic electricity generation capacity (MW) and availability factor as % of peak demand	Gauging energy security
Component A(2): Transmission System		
Improved transmission capacity	New transmission lines (km) and additional transmission capacity (MW)	Transmission readiness to evacuate power from new units
Component A(3): Water Supply System		
Sustainable water supply to coal mine and power station	Water pipeline capacity (million m^3)	Water availability
Component B: Alternative Energy Development		
Low-carbon energy alternatives	Low-carbon growth strategy formulated CBM production license(s) issued CSP/CCS implementation issues deliberated	Potential CTF support, carbon finance, etc.
Component C: Institutional and Capacity Building		
Improved capacity and performance of entities in the energy sector	Electricity tariff policy adopted Regulatory agency defined Emissions controlled	Protection of poor and rural electrification support Air quality compliance

Table 24: Arrangements for results monitoring

		Target Values					Data Collection and Reporting		
Project Outcome Indicators	**Baseline**	**2009**	**2010**	**2011**	**2012**	**2013**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Domestic Capacity (MW) As % of peak demand	90 18	90 18	160 30	160 29	390 67	620 102	Annual	BPC Annual report	BPC
Functioning energy regulatory agency, scope, staff, resources	None			Dec.			Semiannual	Consultants reports	MMEWR
Low-carbon growth strategy CBM utilization for energy CSP project CCS Pilot project	None None None None		Dec	 Dec	 Jun Dec		Semiannual	Consultant reports Project report	MMEWR
Intermediate Outcome Indicators									
<u>Power Station Component A(1)</u> Test runs of units 1 to 4 Commissioning of units 1 to 4	 Nil Nil			 1	 2-4 1-3	 4	Semiannual	Project report	BPC
<u>Transmission Component A(2)</u> Isang 400/220 kV substation Two new 400kV lines: 500 MW Morupule-Phokoje (km) 500 MW Isang-Morupule (km)	 None None None		 20 30	 82 100	 Dec 102 215		Semiannual	Project report	BPC
<u>Water Supply Component A(3)</u> New Paje to Morupule (2 m^3) Spur line from MCL to Morupule B (2 m^3)	 None NSC to MCL			 June	 June		Semiannual	Project report	BPC
<u>Alternative Energy Development Component (B)</u> Low carbon strategy formulated CBM production license(s) issued CSP/CCS implementation issues deliberated	 None TBC None		 Dec	 Dec	 Jun		Semiannual	Consultant reports and project reports	MMEWR
<u>Institution and Capacity Building Component (C)</u> Elec. tariff policy adopted Regulatory agency defined Air quality measurements	 Needs revision None Occasional			 Jun Jun Dec	 Jun		Semiannual	Project report Air quality monitoring report	MMEWR BPC and MMEWR

Annex 4: Detailed Project Description

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

1. The proposed project has three main components and two associated infrastructure elements.

Component A- Morupule generation expansion: This component includes three distinct and integral infrastructure subcomponents as follows:

Component A(1)-Morupule B Power Station (estimated cost US$1,211.3 million, including taxes and duties of US$138 million) involves construction of a 600 MW (4 x 150 MW) coal-fired power station, adjacent to the existing Morupule A Power Station near Palapye, in the eastern part of the country. The scope includes, *inter alia*: (a) coal conveyor, coal yard, coal crushers, and coal preparation equipment, (b) limestone preparation and feed systems, (c) ash disposal and handling system, (d) circulating fluidized bed (CFB) boilers with associated particulate removal equipment, (e) steam turbines and generators, (f) fans and air cooled condensers, (g) switchyard, (h) balance of plant; and (i) start up fuel for testing and commissioning.

Component A(2)-transmission system (estimated cost US$275.2 million, including taxes and duties of US$36 million) involves construction , supply and installation of: (a) Morupule–Phokoje 400 kV transmission line (102 kilometer (km) and associated equipment; (b) Morupule-Isang 400 kV transmission line (215 km) and associated equipment; (c) 3x315 MVA 400/220 kV transformers; (d) 400/220 kV substation at Isang and associated works; (e) reactive power compensation equipment; and (f) automatic generation control (AGC) equipment, software, and associated installation.

Component A(3)-water supply system (estimated cost US$53.0 million, including taxes and duties of US$6.1 million) involves construction of: (a) pipeline from the new Paje well field to the Morupule B Power Station (80 km) for backup supply; (b) power supply line for the new Paje well field; and (c) an extension pipeline from the MCL reservoir to the Morupule B Power Station (5 km) for the main water supply.

Component B-alternative energy development: This component (to be implemented by MMEWR and estimated cost US$6.8 million, including taxes) will support diversification of Botswana's economy through a low-carbon growth strategy. Given Botswana's energy endowment, its cleaner fuel options are to develop coal-bed methane and to explore solar thermal, while examining prospects for carbon capture and storage as a means to mitigate climate change impacts.

Component B(1)-A low-carbon strategy study for growth and long-term mitigation options for Botswana will analyze and recommend actions on: (i) demand side interventions including energy conservation and energy efficiency across the economy; and (ii) supply side, in which Botswana becomes a net exporter of energy while South Africa becomes an importer, adoption of low-carbon practices, transition to cleaner burning fuels (e.g. CBM, CSP) and CCS.

Component B(2)-A bankable feasibility study for a commercial scale CSP, including implementation approach and funding mobilization assistance;

Component B(3)-A development strategy for the efficient use and supply of CBM, with some reinforcing actions on coal, whose activities include: (i) frameworks for strategic development and efficient resource use; (ii) regulatory reforms and institutional strengthening, (iii) institutional reforms and capacity building**;** and (iii) resource assessment of CBM with cross support to carbon capture and storage.

Component B(4)-A pilot carbon capture and storage study to assess the opportunities for CCS in Botswana, and to make recommendations as to the legal and regulatory environment necessary to take full advantage of those opportunities.

Component C-institution and capacity building: This component (estimated cost US$13.9 million, including taxes) covers project implementation assistance, institutional and capacity building for BPC and the Ministry of Minerals, Energy, and Water Resources (MMEWR) as follows:

Component C(1) For BPC (power plant and transmission): (a) transmission system harmonic study; (b) transmission control area establishment; (c) technical assistance for transmission system operations; (d) air quality monitoring and management; (e) training and workshops for Project Management Unit (PMU) staff; and (f) project management and supervision.

Component C(2) For MMEWR (sector development): (a) interim tariff policy study; (b) tariff policy and regulatory agency for the power sector, and associated capacity building; (c) design and implementation of a communications program; and (d) training for safeguards monitoring and management.

Associated infrastructure. Beyond the scope of the project are two elements of associated infrastructure: (1) MCL is undertaking an expansion of their underground coal mine, which also supplies coal to the Morupule A Power Station, for the dual purposes of supplying coal to (i) the proposed Morupule B Power Station and (ii) the export market; and (2) MCL has constructed a twenty-two kilometer underground water pipeline from NSC for the dual purposes of supplying water to (i) the Morupule Colliery and (ii) the proposed Morupule B Power Station. Both of these undertakings also serve other customers, not just BPC or the project. Given their importance to the project, however, EIAs for both have been included in the project documentation.

Component A: Morupule Generation Expansion

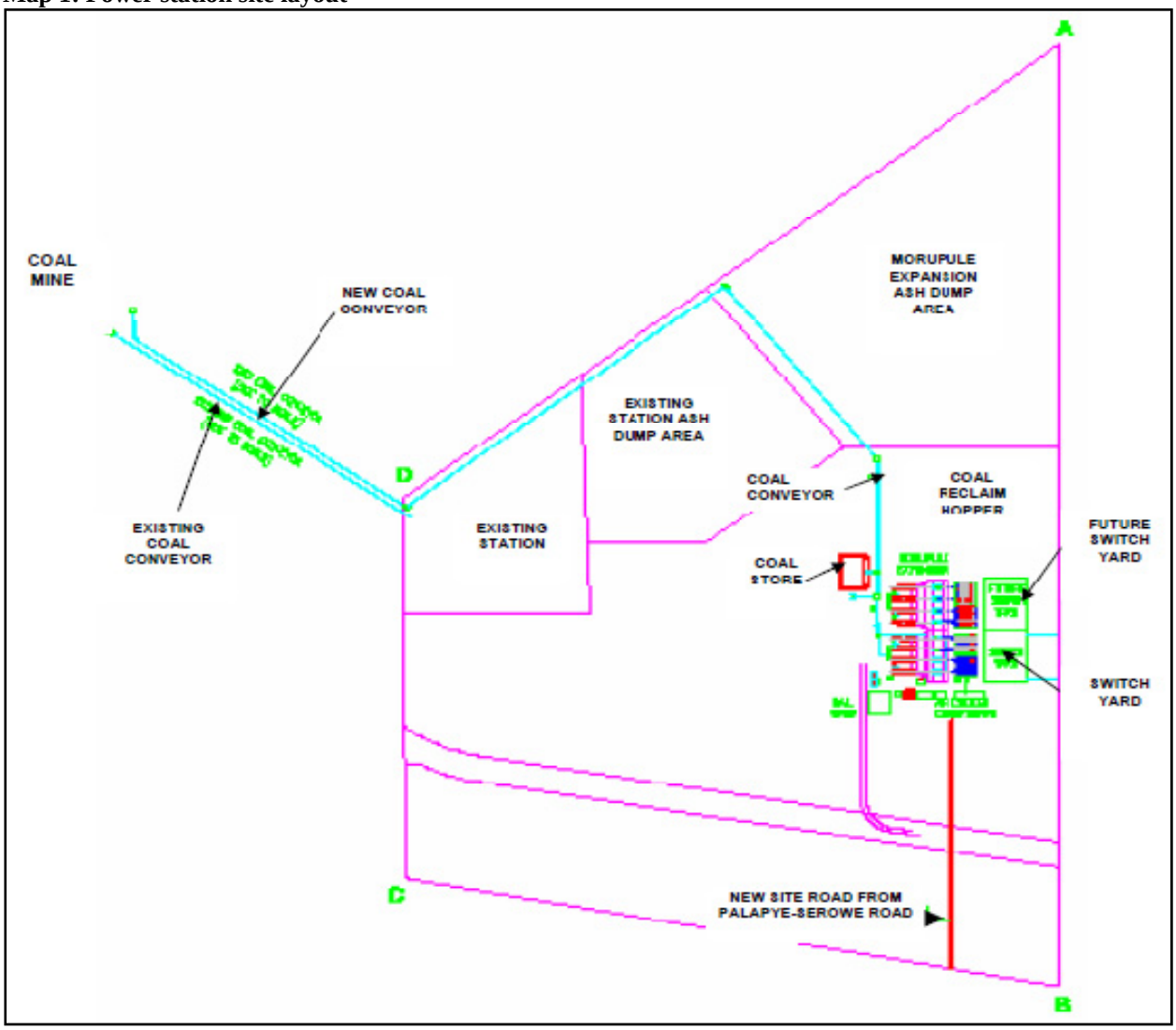
Component A(1)-The Morupule B Power Station

2. The Morupule B Power Station will be located adjacent to the existing Morupule A Power Station in the township of Palapye, in the eastern part of the country. The site is owned by BPC. The proposed Morupule B Power Station consists of four 150-MW units, each capable of producing 131.38 MW (net). The plant utilizes a boiler, steam turbine, and electric generator, as well as auxiliary equipment such as coal handling, limestone handling, and ash transport/ disposal. The boiler utilizes CFB combustion technology, a state-of-the-art technology capable of reducing acid-rain pollutants (SO_2 and NOx emissions). The CFB boiler is designed to burn coal from the Morupule Colliery; sulfur content of the coal ranges from 0.9 to 2.1 percent, while the heating value is expected to be 21-23 MJ/kg. The average unit heat rate warranty is 12,025 kJ/kWh and unit limestone consumption 3.8 kilograms/second (13.6 tonnes/hour). The CFB boilers and control equipment are to be designed to satisfy World Bank Environmental Guidelines, with guaranteed emissions: (i) particulates: < 50 milligrams per normal cubic meter (mg/Nm^3); (ii) SO_2 < 455 mg/Nm^3; (iii) NOx < 750 mg/Nm^3. CFB is flexible, allowing a broad range of coal quality to be burned, a feature which could reduce the plant operating cost if lower quality, lower cost coal becomes available. The CFB boilers will be manufactured in China under license from AE&E Lintjes GmbH (Germany).[53] A sketch of proposed power station and its associated infrastructure at Morupule site is shown below.

[53] AE&E Lentjes GmbH (Germany) is 99 percent owned by Austrian Energy & Environment AG & Co KG**,** a wholly owned subsidiary of A-TEC Industries AG (Austria).

3. **EPC Contract**. In accordance with Botswana law, BPC solicited international competitive bids to execute the entire works for the design, engineering, procurement, construction, and start-up of the Morupule B Power Station on a turnkey basis. (See "Annex 8—Procurement Arrangements" for more information on procurement of the EPC Contract.) The EPC Contract was awarded to CNEEC-SBW. (See "Annex 6—Implementation Arrangements" for more information on CNEEC-SBW). The EPC Contract is based on FIDIC[54] terms and conditions governed under laws and regulations of Botswana. The EPC Contractor is committed to the following schedule for commissioning from Notice to Proceed: Unit 1: 33 months; Unit 2: 36 months; Unit 3: 39 months; Unit 4: 42 months.

Map 1: Power station site layout



Source: EIA for Morupule B Power Station, Chapter 4, p 4-10

4. **Power station construction management and supervision**. BPC will have a project management team dedicated to the Morupule B project (see "Annex 6—Implementation Arrangements" for details). BPC has appointed Fichtner GmbH & Co. KG, Germany, as its "owner engineer" for the

[54] Fédération internationale des ingénieurs-conseils (International Federation of Consulting Engineers).

power station. The contract includes procurement, design and site supervision phases for a period of six years ending in October 2012, for a total value of Euro 3.43 million (excluding all taxes). Procurement phase of the contract has been completed with the signing of the EPC Contract. Due to some delays in the procurement phase, BPC intends to extend Fichtner's contract by two years to cover the defects notification period of the EPC Contractor. Fichtner's scope of work as owners engineer is summarized in "Annex 6—Implementation Arrangements."

5. **Operations and maintenance**. BPC will eventually operate and maintain the power station. As an option under the EPC Contract, BPC intends to jointly operate and maintain the power station with the EPC Contractor during the initial two years after commissioning. BPC is currently reviewing a draft contract with CNEEC-SBW for the O&M support. BPC staff will be trained by the EPC Contractor, both on- and off-site, in various technical, operational, and maintenance aspects of the new power station. As skills are transferred, the role of the EPC Contractor will be phased out.

6. **Water requirements**. The design calls for air-cooled condensers to minimize the need for water. Water consumption for blow-down, cooling various components of the plant, dust suppression, the ash disposal site, and miscellaneous uses (*e.g.*, fire fighting, landscaping, and potable water) is estimated to be 1.5 million cubic meters per year. This compares favorably with other power stations without air-cooled condensers, a comparably size of which would consume about 3.5 million cubic meters per year. The EPC Contract includes water pre-treatment facilities to de-mineralize the water procured for the power station.

7. **Coal supply**. Coal will be supplied by MCL, which is currently also supplying about 650,000 tons per year for Morupule A power station. Morupule B is estimated to require an additional 3 million tons per annum. MCL is undertaking a major upgrading program. In 2004, MCL introduced two modern continuous miners plus shuttle cars for coal transport to the conveyor belt. A new coal washery was inaugurated in 2008 which processes up to one million tons per year of coal. The low CV product will be combined with run-of-mine coal for the fuel supply for the Morupule B Power Station. MCL will add two more continuous miners, upgrade conveyor systems, and develop two new ventilation shafts which, together with other underground and surface mining improvements will enable production from the existing shaft to expand from nearly one million tons per year to four million tons per year by 2012 to meet the increased demand from the Morupule B Power Station. Following the expansion of production to four million tons per year, a second phase is planned which will involve the construction of an additional shaft that could increase production to as much as twelve million tons per year by 2015, with new washery capacity so that as much as half of the production could be washed.

8. BPC and MCL have an existing coal supply contract that was re-negotiated in 2004 and took effect on January 1, 2005 with the coal price based on an agreed base price and a sliding scale adjustment for quantity shipped and indexed for inflation. There are also certain coal quality penalties if agreed specifications are not met. MCL production costs are considered competitive compared with other Southern Africa operations. Under a memorandum of understanding signed between MCL and BPC on May 8, 2009, the revised price is set at BWP 122.68/tonne effective on July 1, 2009 for supply to Morupule A. BPC and MCL are presently negotiating a new contract which will take effect when the first unit at Morupule B is commissioned (in 2012). MCL proposes to continue with contract based on tonnage, while BPC is aiming for a CV-based one. Further, regarding price, the parties have agreed on open-book approach where BPC would pay an agreed rate of return on MCL's investments and have the opportunity to audit MCL's costs for the purpose. BPC has engaged a coal specialist to help with finalizing the contract terms; BPC indicates that consensus towards a combination of tonnage and CV bases for coal in the new contract is emerging. CFB boilers can use coal of varying quality and CV.

9. **Limestone supply**. The limestone specification for the Morupule B Power Station is based on high quality imported limestone from South Africa. However, the CFB boilers are capable of using lower

grade limestone as well. If and when local sources of limestone, which are lower grade, are developed and available, significant cost reductions should be possible.

10. **Technology alternatives**. For unit size of 150 MW, coal power technologies include the standard conventional PC and CFB types. The CFB is more advanced than the PC; it can burn coal of varying quality, burn different types of fuel with minimal design changes, controls SOx emissions without requiring FGD, requires minimal amount of water. BPC would need support for operating the CFB plant during initial years. Supercritical technology would have reduced CO_2 emissions by about 15-20 percent compared to either PC or CFB, but would require unit size of at least 500 MW each which would be too large for Botswana's system and beyond the capabilities of BPC to construct and operate the same.

11. The Government and BPC share the global concerns of climate change mitigation and are examining options for utilizing new technologies to reduce the country's carbon footprint.[55] In addition to energy conservation and efficiency efforts, new technology options include: (i) commercialization of CBM, which could be used more broadly than just power generation; (ii) building a commercial-scale CSP plant in Botswana, for which a pre-feasibility study has been completed; and (iii) pilot project for CCS. Support for examining these options is included under the project (see TA component below).

Component A(2)—Transmission System

12. The Botswana power grid is connected to the South African and Zimbabwe grids via a 400 kV interconnector through Phokoje Substation and 3 x 132 kV lines provide additional interconnection with South Africa. The Botswana grid comprises of 200 km of 400 kV lines, 1,254 km of 220 kV lines, 1,569 km of 132 kV lines, 1 x 400 kV substation, 7 x 220 kV substations, and 18 x 132 kV substations.

13. A *10-Year Transmission Development Study* was conducted in 2006/7 to guide on transmission investments for the period 2007-2016 which covered the integration of new power plants, Morupule B Phases 1 & 2 (600 MW each), Mmamabula IPP (2,400 MW), and other facets of the transmission network. The project covers the transmission infrastructure required for integration of Morupule B Phase 1 (600 MW) power station to the transmission grid.

14. The criterion used in the *10-Year Transmission Development Study* for integration of generation power plants is based on the South African Grid Code which stipulates the following for generation sources of less than 1,000 MW:

- with all transmission lines healthy, it shall be possible to transmit all the power generated from the power plant for all system loading conditions;
- system stability shall be maintained during single phase faults; and
- connection shall be effected with a minimum of two transmission lines

15. The following options were considered for evacuation of power from the planned Morupule B phase 1 (600 MW) power station to the load centers: **Option 1:** integration through a 220 kV transmission system; **Option 2:** integration through a 400 kV transmission system. The studies indicated that Morupule B cannot be integrated at 220 kV due to instability problems and higher cost. Option 1 (connection at 220 kV) was thus discarded and Option 2 which entails connection at 400 kV voltage level was adopted.

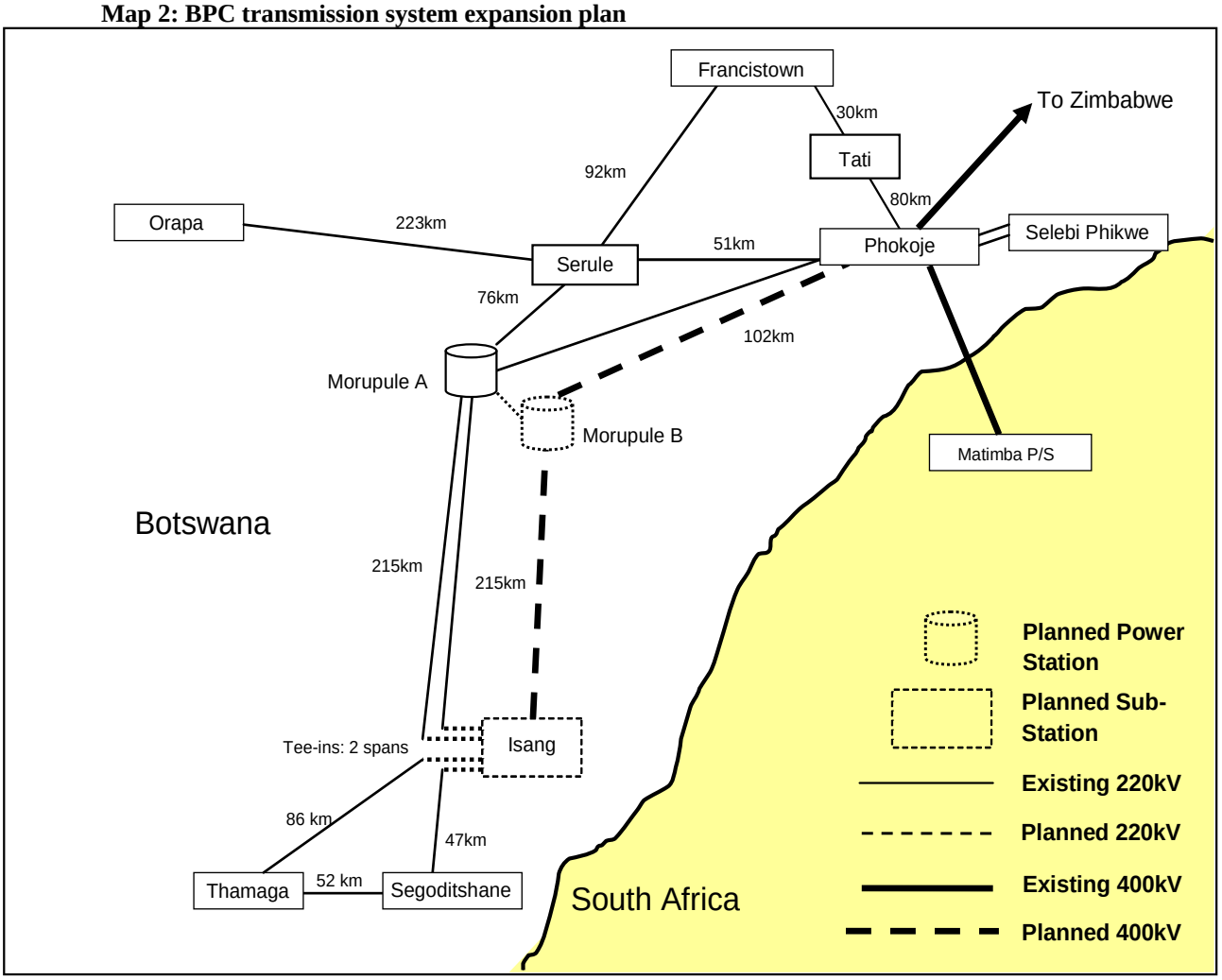
16. Further to the *10-Year Transmission Development Study*, additional studies were conducted to verify the optimum 400 kV transmission configuration for evacuation of power from Morupule B Phase 1 (600 MW) power station to ensure that the N-1 criterion is met for the system to withstand single contingencies on the main 400 kV system connecting the power plant to the grid.

[55] Botswana is a net sink for greenhouse gases and the Morupule B project would reduce it from the current negative 29.4 million tonnes of carbon dioxide per year to about negative 26.4 million tonnes of carbon dioxide per year when it is fully operational at 600 MW in 2013.

17. The following transmission investments, to evacuate power from Morupule B Phase1 power station, were confirmed adequate and optimal and also meets the required N-1 criterion.

- One 400 kV, 105 km overhead transmission line from the planned Morupule B Phase 1 power station to the existing 400/220 Phokoje Substation plus a 400-kV line bay at Phokoje Substation, plus a new transformer (315 MVA; 400/220 kV) intertie bay in Morupule B and 220 kV lines deviation (3 km). Included is an optical ground wire cable (OPGW) for optic fiber telecommunication facilities.
- A new 400/220 kV substation (2x315 MVA transformers) at Isang, located about 40 km from Gaborone plus 220 kV lines tee-ins at Isang Substation.
- One 400 kV, 240 km overhead transmission line from the planned Morupule B Phase 1 power station to the new 400/220 kV Isang Substation Included is an OPGW for optic fiber telecommunication facilities.
- Reactive power compensation equipment to be installed at Isang Substation, Morupule B Substation, and Phokoje Substation for secure transfer of up to 530 MW to either Phokoje or Isang after loss of any one of the 400 kV transmission lines connecting the power plant to the grid.

Map 2: BPC transmission system expansion plan



18. BPC has engaged three technical consultants (Merz and McLellan Botswana (Pty) Ltd (South Africa), Parsons Brinckerhoff Inc (US), and Trans-Africa Projects/KEC International Ltd (South Africa/India) consortium) to assist in the development of the transmission system and substation. The consultants will, *inter alia*, prepare bidding packages, evaluate bids, and supervise construction.

19. The above transmission lines and substations investments will be packaged and competitively tendered (see "Annex 8—Procurement Arrangements") and financed as follows (World Bank financed packages are shown in bold and AfDB financed packages are shown in italics):

(EW1) A(2)(a): 400 kV transmission line from Morupule B Power Station to Phokoje Substation (102 km). This subcomponent will also include a 400 kV line bay at Phokoje Substation; a 315 MVA transformer intertie bay at Morupule B; 220 kV lines deviation (5 km) near the existing Morupule A power station, and installation of OPGW and associated communication equipment. The estimated cost of this sub-component is US$51.77 million, including US$6.75 million in taxes and duties. The World Bank will finance this subcomponent, net of taxes and duties.

(EW2) A(2)(b): 400 kV transmission line from Morupule B Power Station to Isang Substation (215 km). This subcomponent will include the installation of OPGW and associated communication equipment. The estimated cost of this sub-component is US$82.58 million, including US$10.77 million in taxes and duties. AfDB proposes to finance this subcomponent, net of taxes and duties.

(EW3) A(2)(c): Three 315 MVA, 400/220 kV transformers (two to be installed at Isang Substation and one at Morupule B Power Station). The estimated cost of this subcomponent is US$35.4 million, including US$4.62 million in taxes and duties. The World Bank will finance this subcomponent net of taxes and duties. During the installation of these transformers, proper implementation coordination will need to be secured with the implementation of subcomponents (EW1) and (EW4).

(EW4) A(2)(d): A new 400/220 kV substation (2x315 MVA transformers) at Isang, located about 40 km from Gaborone. This subcomponent will include 220 kV lines tee-ins at the Isang Substation. The estimated cost of this component is US$80.11 million, including US$10.45 million in taxes and duties. AfDB proposes to finance this subcomponent, net of taxes and duties.

(EW5) A(2)(e): Reactive power compensation equipment to be installed at Isang, Morupule-B and Phokoje Substations. The exact reactive power compensation requirements will be confirmed following completion of the power system analysis. The estimated cost of this subcomponent is US$23.81 million, including US$3.11 million in taxes and duties. AfDB proposes to finance this subcomponent, net of taxes and duties.

(EW6) A(2)(f): Purchase of hardware and software and establishment of an AGC. The estimated cost of this subcomponent is US$1.6 million, including US$0.21 million in taxes and duties. The World Bank will finance this subcomponent, net of taxes and duties.

20. BPC proposes to establish its own Control Area to enable it to meet its electricity trade and system operations obligations in SAPP. The main obligations are: (a) control of tie line flows power interchange; (b) participating in frequency control; (c) management of inadvertent energy; and (d) protecting sensitive trading and market information. Under the TA component (see below), a study will be carried out to assess the existing hardware and software and develop specifications, cost estimate, and implementation schedule for the purchase of an appropriate AGC scheme based on the existing hardware and software in the control center.

Component A(3)—Water Supply System

21. The water requirement for the Morupule B Power Station (approximately 1.5 million cubic meters per year) will be met mainly through the NSC and a new well field development west of Paje for backup. Even though WUC expects the NSC will be sufficient for both Morupule A and B, if the

reliability of water supply from NSC becomes an issue, the well field may be required as a backup. The use of water from water wells or NSC will require investment in pre-treatment facilities at the Morupule B Power Station to remove organic material before demineralization; these facilities are included in the EPC Contract (Component A(1)).

22. MCL has completed construction of a 22-km long underground water spur line from NSC (Morupule node) to the Morupule Colliery which is designed to draw about 2.5 million cubic meters annually from NSC, of which 1.5 million would be to supply the Morupule B Power Station; this 22-km spur pipeline is considered "associated infrastructure" because it serve other customers. BPC and MCL have signed a preliminary agreement on May 8, 2009, under which: (a) BPC has paid to MCL about US$7 million for a 50 percent joint ownership with MCL in the spur line from NSC; (b) MCL will make water available to BPC for Morupule B needs, while BPC will provide the water from the new Paje well field to MCL should water supply from NSC experience difficulties; and (c) MCL and BPC will together ensure proper maintenance and operation of shared facilities. BPC's proposal for direct agreement with WUC, instead of with MCL, for water supply and maintenance of the spur line are yet to be finalized. WUC has quoted a price of BWP 5.70 per cubic meter (at 50 percent of the long-range marginal cost) for raw water to BPC.

23. The backup water supply system scope involves construction of water gathering system, power supply, pumping station and reservoir at the new Paje well field, and 80 km pipeline to the Morupule B Power Station. The estimated cost for this scope is about BWP 424 million (about US$53 million), which is proposed to be financed by the World Bank under the project, included in packages WS1, WS2 and WS3. BPC will also construct the extension line from the MCL water reservoir to the Morupule B water reservoir (about 5 km), which will be financed by the World Bank under the project, included in package WS3. BPC has completed an EIA for the new Paje well field and has engaged a consultant (Ecosurv) to prepare an EMP, under terms of reference cleared by the DEA, which is expected to be completed by December 2009. BPC has hired technical consultants to prepare complete design, technical specifications, and tender documents.

Component B: Alternative energy development

This component will help prepare alternative energy projects, including appropriate enabling frameworks, and also initiate implementation. This component is expected to generate investments of about US$200 million for a 50 MW CSP, about US$150-250 million for a pilot CCS project and US$25-100 million for 50-200 MW CBM power plants.

Component B(1): ***Developing a low-carbon growth strategy (US$0.5 million)*****.** A low-carbon energy strategy entails both demand side and supply side interventions. On the demand side, energy conservation and efficient use across the economy will continue to be foremost in reducing GHGs. On the supply side, even though Botswana is a relatively small economy, it is poised to become a net exporter of energy while South Africa will become an importer and could have a demonstrative impact on other countries in the region to adopt similar strategies for mitigating climate change. Given Botswana's energy endowment, its options mainly are to develop coal, coal-bed methane and to explore solar thermal, while examining prospects for carbon capture and storage as a means to mitigate climate change impacts. As such, Botswana is in need of a lower carbon energy strategy both for its own consumption and supplying the region. Such a plan would be guided by three overarching principles: (a) the need for increased energy security for Botswana and the regional power pool, (b) increased energy access using all feasible technologies, and (c) economic diversification for growth and poverty alleviation.

Component B(2): Feasibility study for CPS ***(US$1.0 million)***. Botswana, blessed with substantial solar energy and interested to diversify its energy supply sources and reduce its carbon footprint in the future, commissioned a pre-feasibility study to assess the potential for installing CSP plants. The

pre-feasibility study was completed in late-2008 and recommended that CSP plants up to 200 MWs could be installed in Botswana. The purpose of this follow on task is the following: (a) identify the most promising location for a CSP plant; (b) identify the most appropriate CSP technology(ies) (trough, tower, or Fresnel); (c) select the most appropriate CSP plant size; (d) prepare financial and economic analysis for consideration by investors and financiers, including potential support such as carbon finance, etc.; (e) define a suitable approach to finance, procure, install and operate a commercial scale CSP in Botswana; and (f) assist with mobilizing financing from various sources including CTF, carbon finance, etc., and initiating implementation.

Component B(3): *Coal/CBM strategy development (US$4.0 million)*. The scope includes four aspects: (a) frameworks for strategy development, supporting Botswana's transition to a cleaner CBM by creating the policies and frameworks for development; (b) regulatory reforms to support effective administration of CBM and coal production including strengthening licensing practices and systems; updating mineral tax and royalty regimes; estimating economic linkages; and institutional strengthening; (c) institutional reforms and capacity building within MMEWR to ensure efficient regulatory oversight; and (d) CBM resource assessment to prepare databases, maps, etc., to support the overall the strategy.

Component B(4): Carbon capture and storage (CCS) / *Feasibility study for a pilot CCS (US$1.0 million)*. The purpose of the proposed study is to assess the opportunities for CCS in Botswana, and to make recommendations as to the legal and regulatory environment necessary to take full advantage of those opportunities. Some analytical work has already been done in regard to the issue of CCS development in Botswana. In September 2007, the Energy Research Center of the Netherlands sponsored a workshop in Gaborone on *Advancing CCS and CDM in Africa*.[56] In addition, the sponsors of the Mmamabula IPP have appointed Environmental Resource Management to undertake a CCS study as part of a package of environmental studies for that project. Further, a number of discussions have taken place between the Government and the sponsors of the Secunda–Kalahari Pilot Project concerning the CCS implications of that proposed project. In view of these proposed projects, and given the rising international concern over climate change, the Government wishes to examine various strategies to mitigate CO_2 emissions. CCS is considered as one of the most important options for reducing atmospheric anthropogenic CO_2 emissions. The purpose of the proposed feasibility study is to assess the opportunities for CCS in Botswana, including an in-depth examination of the proposals under consideration and make recommendations on the legal and regulatory environment necessary to address underlying concerns and/or issues and identify a pilot CCS project.

Component C: Institutional and Capacity Building

24. This technical assistance (TA) component includes assistance needed for BPC to implement the project as well as the Government (MMEWR) to strengthen capacity in several areas. The objectives for each of the TA sub-component are summarized below; broader scope of work follows in the attachment.

25. **TA to BPC:** The TA needs of BPC cover the following aspects:

C(1)(a) **Transmission system harmonic study (US$1.21 million)**. Based on the *10-Year Transmission Development Study* (2007), a comprehensive transmission system harmonic study be conducted to improve quality of supply in the network.

C(1)(b) **Transmission control area establishment (US$0.97 million)**. Currently the BPC system is under the Control Area of Eskom, the South African power utility. Control area services of the

[56] The record of that workshop is available at the following web site. http://endaenergie.files.wordpress.com/2008/03/ecn_rapport.pdf.

BPC system are being provided under a contract with Eskom. As the Corporation will be phasing out imports from Eskom in 2012, and will also be hosting IPP power plants with cross border transactions, it is necessary for BPC to establish an own control area to enable BPC to meet its operational and power trade obligations in the SAPP.

C(1)(c) **Transmission system operations training (US$0.91 million)**. BPC staff involved in transmission system management will require training to ensure smooth operation and coordination with Eskom and SAPP control centers.

C(1)(d) **Air quality monitoring and management (US$0.5 million)**. This includes SOx emissions and air quality measurement equipment, software and training. BPC will use this to properly measure the current SOx emissions at Morupule A and hence determine suitable remedial measures (*e.g.*, FDG retrofitting) to ensure that air quality meets national standards and overall emissions are in line with World Bank guidelines.

C(1)(e) **Project management and training (US$7.2 million)**. BPC has already hired several consultants to provide implementation and supervision support for the power station and transmission system, including EMPs for the remaining parts of the project components (see "Annex 6—Implementation Arrangements"). BPC will be funding US$7.0 million of this subcomponent for contracts procured under BPC procurement policies. BPC will be hiring new staff for the PMU and intends to ensure relevant training and skills enhancement related to the project. The Bank will be funding US$0.2 million for training and workshops to BPC staff in the PMU.

26. **TA to MMEWR:** The TA needs of MMEWR cover the following aspects:

C(2)(a) **Interim tariff policy study (US$0.5 million) financed by the Government**: The objective of the interim tariff policy review is to provide recommendations to the Government on the adjustments to electricity tariffs after examining various options and considerations, including lifeline tariffs for the poor. The options to examine are the waiver of value added tax, administration of the national electricity fund for rural electrification, emergency power financial support, periodic adjustments, etc. This review will inform the follow on long-term tariff policy study for the sector (see C2(ii) below).

C(2)(b) **Electricity tariff study and regulatory agency development (US$1.5 million)**. This would build upon the power sector recommendations in the 2005 PPIAF-funded Stone & Webster Report on *Regulatory Reforms for Infrastructure and Utilities Sectors in Botswana*, which recommendations have now been accepted by the Government (see "Annex 1—Country and Sector Background"). Specifically, consultants would be retained to assist with the establishment of an independent electricity regulator, and the development of new tariff-setting arrangements to be implemented by that regulator. The design of the new regulator may be such as to allow for the possibility of expanding the scope of the regulator's jurisdiction in the future to include responsibility for the water sector.

C(2)(c) **Communications and consultations support (US$0.5 million)**. This includes the following: (i) help build capacity, in form of a fully trained team, to implement a sophisticated communication program and develop it further; (ii) assist with the development of a comprehensive communication program in support of energy policy, that shall include, among other things, the creation of a platform for dialogue on energy between the Government and local civil society as well as a an international outreach campaign on the issue of access to energy and the environment; and (iii) assist the Ministry carry out stakeholder consultations around its large energy initiatives and helping it implement the transparency measures necessary to earn public trust, such as safeguards.

C(2)(d) **Capacity building for safeguards monitoring (US$0.3 million)**. Morupule B is the first large scale coal-power project in Botswana and other projects such as the Mmamabula IPP are

expected to follow. DWMPC is responsible for monitoring compliance of installations with national and stipulated standards. DWMPC has identified the need to enhance capacity of its staff to carry out these tasks effectively and efficiently. It proposes to train five engineers and technicians to also develop new emission standards as necessary through stakeholder consultations. The purpose of the TA is to provide this training, along with familiarization visits to select administrations in other countries in the region, the EU and the USA. This TA will coordinate with BPC's air quality monitoring TA for purpose of training with equipment, software and hardware. The training will also include communication and consultation with stakeholders.

Box 8: Improving Communication for Effective Consultations

The challenges faced by Botswana in the energy sector require a substantial effort to build consensus, address climate change concerns and mobilize public support at the local, national and international levels. Botswana has recognized that lack of a systematic and coherent communication mechanism to support its public policies has often placed the Government of Botswana on the defensive, having to counter negative campaigns and redress misperceptions. The considerable communication effort that had to be undertaken to clarify the legitimate origin of Botswana's diamonds and differentiate them from conflict diamonds from other African countries is just one example. Through the proposed project, the Bank will help Government to promote a dialogue on energy issues and engage with the stakeholders at all levels.

The World Bank organized a training workshop during project preparation targeted at all relevant communication officers in the various ministries related directly or indirectly to the project (Energy, Environment, Finance, Health, Transport, etc.). In recent months, the Government has also received assistance to formulate a communication strategy to be implemented during the lifetime of the project. The strategy aims at carrying out the following interventions at four levels: i) *Local*: Maintaining the channels for ongoing communication with the project, building on the consultations undertaken for the environment and social assessments; ii) *National*: Fostering a national dialogue on energy and expanding the mechanisms to listen to relevant stakeholders to understand their views and concerns on the energy crisis and explain to them and to the public at large the various measures that are being planned to address the crisis, as well as the environmental and social safeguards being followed (see Annex 12); *Regional*: positioning Botswana as an engaged player in the SADC region, willing to contribute to solutions that are beneficiary to all members; *International*: Addressing the scrutiny from media and civil society that ensues when pursuing large coal to power projects, in particular in light of global concerns regarding climate change. This scrutiny will, on the other hand, be an opportunity to show that Botswana can successfully undertake this kind of projects and properly address the environmental, social and governance concerns that may arise.

Starting in 2008, the Government has taken steps to improve the role of communication. It has established communication offices in each line Ministry; decreed the creation of the Botswana Government Communication and Information System, a formal professional network made up of representatives from all of the ministries and managed by the Office of the President; and have publicized Government activities through the Office of the President electronic newsletter. The project provides TA to the Government to implement the above strategy, and build the skills and institutional set-up for communication function beyond the life of the project.

Attachment

Summary Scope of Work for TA Components

B(1)— LOW-CARBON ENERGY STRATEGY DEVELOPMENT FOR BOTSWANA

The purpose of the proposed study is to assess the opportunities for CCS in Botswana, and to make recommendations as to the legal and regulatory environment necessary to take full advantage of those opportunities.

Background

A low-carbon energy strategy entails both demand side and supply side interventions. On the demand side, energy conservation and efficient use across the economy will continue to be foremost in reducing GHGs. On the supply side, even though Botswana is a relatively small economy, it is poised to become a net exporter of energy while South Africa will become an importer and could have a demonstrative impact on other countries in the region to adopt similar strategies for mitigating climate change. Given Botswana's energy endowment, its options mainly are to develop coal, coal-bed methane and to explore solar thermal, while examining prospects for carbon capture and storage as a means to mitigate climate change impacts. As such, Botswana is in need of a lower carbon energy strategy both for its own consumption and supplying the region. Such a plan would be guided by three overarching principles: (a) the need for increased energy security for Botswana and the regional power pool, (b) increased energy access using all feasible technologies, and (c) economic diversification for growth and poverty alleviation.

Scope of Work

The scope of work includes the following broad tasks:

- Based on available data, review Botswana's GHG sources and sinks and identify energy and CO2 intensive sectors and industries for potential long term mitigation options
- Review low-carbon growth strategies of select countries, including South Africa, and identify the relevant elements for Botswana
- Based on development plans, develop a long term mitigation scenario, focussing on energy sector in particular, and identify the key areas for medium- and short-term interventions supprting low-carbon growth strategy for Botswana. Review the available pre- and feasibility studies for various energy projects, including CSP, CCS, etc., and examine the long-term national and regional impacts
- Examine coal use in the SAPP and identify the strategic approaches for minimizing impacts, e.g. replacing old plants with new supercritical technologies, IGCC and coal gasification options, CBM, CCS, etc., and define Botswana's role
- Examine EE and DSM opportunities in key sectors and recommend approaches for implementing measures, including how CDM and carbon finance support could be mobilized. Identify barriers for large scale deployment of EE and DSM programs and approaches to overcoming them, provide training and assistance to the DNA staff in developing national scale plans for expanding EE and DSM campaigns and accessing carbon finance
- Review with MMEWR and DEA and other stakeholders the study findings and recommendations and assist with incorporating the agreed aspects and recommendations into the draft energy policy
- Conduct a workshop to exchange and disseminate results and recommendations of the study, including participants from the SAPP

The consultants will prepare task reports as defined and a final comprehensive report at the end of the assignment.

B(2)—FEASIBILITY STUDY FOR CSP PLANT

The current worldwide developments and approaches of CSP

In recent years, interest in CSP plants has increased driven mainly by two factors: (a) renewed public and government acceptance of renewable energy as an immediate and crucial solution to climate change and (b) indicative decreasing prices of the CSP technology. As a result, several CSP plants have been commissioned and more are planned in many countries.

CSP in Botswana

Botswana, blessed with substantial solar energy and interested to diversify its energy supply sources and reduce its carbon footprint in the future, commissioned a pre-feasibility study to assess the potential for installing CSP plants. The pre-feasibility study was completed in early 2009 and recommended that CSP plants up to 200 MWs could be installed in Botswana.

Objectives

The purpose of this consultancy is to prepare a CSP project for implementation in Botswana. Project preparation includes: (a) identification of the most promising location for a CSP plant; (b) selection of the most appropriate CSP technology to be used (trough, tower, or Fresnel); (c) select the most appropriate CSP plant size; and (d) develop the design specifications in preparation for procurement.

Technology options

All CSP options concentrate the solar radiation onto a small aperture which heats up a thermal fluid. Then, this fluid converts the heat into electricity through a heat engine or steam turbine. So far, the following variations and configurations of CSP technology have been used.

TROUGH CONFIGURATION—Trough systems consist of a solar field in the shape of a parabolic trough that concentrates the sun's heat on to a medium like oil, molten salt or pressurized water, which then is run through a heat engine or steam turbine after heat exchanger (when necessary) to convert the heat into electricity. Trough configuration is currently the most widely used across the world, with the most currently operating and under construction plants. The largest plant made with this configuration is of 80 MW, with a total of around 400 MW under operation. Another 500 MW or so of capacity is under construction across the world.[57] Trough plants can be designed to track the sun on one or two axes, affecting the duration that power can be produced. Two axes systems can track the sun for longer, though at a higher initial capital cost.

TOWER CONFIGURATION—Tower configuration plants have a large central tower on which sun's energy is concentrated from an encircling solar heliostat field. This technology has been demonstrated several times, including recently in Spain, but is less widely used than trough configurations. It can provide the highest efficiency in conversion, since very high temperatures can be reached with higher cost due to more complicated tracking system.

LINEAR FRESNEL REFLECTOR (LFR**)**—LFR configuration uses Fresnel reflectors to concentrate the energy and then uses a heat engine or steam turbine, much like trough mirror based systems.

DISH-ENGINE—Dish engine configuration combines large parabolic dishes for the solar field with heat engines to produce power. These are mostly built in modular sizes of around 15-50 kW and a plant can be scaled up easily by just adding more dishes. This configuration is still in pre-commercial stage, though it provides promise for small power installations. These systems have been tried are demonstration projects in California but are the furthest behind all other configurations.

[57] These figures are not comparable to the same capacity of the fossil plants due to low capacity factor (maximum 25 percent) of the plant.

Task 1: Selection of project site and plant design

The Consultant will review the pre-feasibility study report carried out on behalf of BPC. Also, the Consultant will collect all relevant data from international experience (CSP site and operating experience) and Botswana's potential CSP plant sites. Criteria used for the site screening will include but not limited to available solar energy (throughout the year), proximity to an existing transmission line adequate to accommodate the plant's power generation and suitability of the site in terms of permits, water access, available roads, etc. One of these sites will be selected as most attractive.

The most appropriate CSP technology will be selected based on the readiness of the three technological options (trough, tower, or Fresnel), the technology-related risks, the cost-effectiveness, and the suitability for Botswana (especially with regard to the country's climate (*e.g.*, sand impact in the desert) and the ability of the local industry and the human resources to support the utilization of CSP). Worldwide experience will be taken into account especially on the new CSP facilities utilizing the tower or Fresnel technologies which seem promising and are expected to gain significant experience in the coming months. Finally, the optimum plant size will be selected in the 20-200 MW range. The size selection will be based on factors such as:

- Ability to finance a CSP project;
- Modularization of the technology;
- Largest available plant using the same CSP technology; and
- Limitation imposed by the site, etc.

The final criteria are to be developed after consultation with Botswana Government agencies and other participating organizations.

Task 2: Design and cost estimate of CSP plant

The Consultant will develop a detailed design for the CSP plant including of conceptual drawings, design of critical components, plant layout, etc. Also, the Consultant will develop a cost estimate for procuring and installing the CSP plant.

Task 3: Economic and financial analyses

The Consultant will carry out economic and financial analyses including sensitivity studies addressing the main uncertainties associated with the project. Particular emphasis will be placed on the available financing options including carbon finance and Clean Technology Fund. Carbon financing would require estimation of the avoided CO_2 emissions as a result of the Clean Technology Fund project. Recommendations will be made regarding the most attractive financing options. Also, a road-map will be developed on how this project should be implemented.

Task 4: Implementation approach

The Consultant will develop a detailed implementation approach (i.e. procurement, financing, construction, operation, etc.), carry out road shows with investors and potential financiers, prepare appropriate design specifications set to be included in bid documents for procurement of a CSP plant.

Outputs

Prepare a final report documenting the four tasks of the study. The design specifications will be provided as a stand-alone annex of the report.

B(3)— COAL/CBM DEVELOPMENT STRATEGY

Background

The Botswana Government is in need of technical assistance to strengthen the enabling policy, legal, and regulatory frameworks conducive to new investments in the coal, CBM, and power sector. This will assist the Government in attracting qualified private investors to develop coal and CBM deposits and to build new capacity for coal thermal power generation, guided by high standards of environmental and social sustainability. Key areas of assistance include (a) strengthening the policy, legal, and regulatory framework, (b) improving licensing of coal and CBM exploration and development, (c) institutional strengthening, and (d) coal and CBM resource assessment.

Task A: Frameworks for strategy development

Key activities include:

- coal and CBM development strategies.
  - analyze development options including coal exports, coal-based power exports, CBM for power, and CBM for other uses.
- updating the tax and royalty regime for coal and CBM.
  - analyze regimes and practices in other coal exporting and gas producing countries.
- an infrastructure provision strategy for coal and CBM.
  - PPP strategy; and
  - implementing regulations and new laws as needed.
- economic linkages for coal and CBM development.
  - identify potential skills development opportunities;
  - local development linkages; and
  - coal and CBM development corridors.
- preparing a gas transmission and distribution strategy.
  - help develop ownership, aggregation, access, and tariff arrangements for development of open-access gas pipeline transport system.
- assessing the long-term potential for coal and CBM development.
  - prepare an assessment of coal products and derivatives (gas and liquids); and
  - downstream gas-related industries (*i.e.*, fertilizers).
- preparing an environmental protection and social mitigation strategy for coal and CBM.
  - develop HIV/AIDs protection and treatment strategies;
  - prepare a form of RPF for coal and CBM developments; and
  - utilize the results of the RESA.

Task A.1 - Prepare coal and CBM development strategies

Prepare a coal and CBM development strategies based on resource assessment (Task D below) and concurrent dialogue regarding potential shared use infrastructure. The communications and consultation strategy would be implemented by MMEWR on an on-going basis and would also be expanded to include communities at sites where coal, CBM and associated power or pipeline, rail, power transmission and other infrastructure development are developed.

A.1.1 Coal-specific work will include:

- analysis of coal products and derivatives (including coal to gas / liquids).

A.1.2. CBM-specific work will include:

- analysis of CBM approach and experiences in other countries under way;
- analysis of access and tariff arrangements for open gas pipe-line transport;

- an industry-led workshop to discuss options for gas transmission / distribution ownership / aggregation;
- developing policy (should none exist) relating to priority of use of gas; domestic and export gas pricing; and
- options for pipeline infrastructure, tariffs, and access.

Task A.2 - Updating the tax and royalty regime for coal and CBM

A.2.1 Analytical work

A review of Government receipts from coal and CBM production and (if feasible) power generation in other major coal producing and exporting countries (in particular Australia, Canada, Indonesia, South Africa and the USA) to see how Botswana's take compares with these countries. The work shall include development of financial and economic models of coal and CBM production and any associated power generation in order to examine: (a) Government receipts (in terms of both taxes and royalties), (b) overall economic costs and benefits and value added to Botswana (including giving consideration to possible environmental and social costs and benefits at both the local and regional air shed and water basin levels) of different coal and CBM for different development options including, (c) sales to power companies for domestic power generation, (d) coal sales to non- power users, (e) coal, and in the longer term possible CBM exports, and (f) coal and CBM sales for power generation for export (*i.e.*, coal and CBM "by wire" versus by rail or pipeline).

The models will consider the extent to which and under what conditions, if any, coal and CBM contract prices should require regulatory approval or not in the same way that power prices require regulatory approval. The models shall also consider both the fiscal receipts from the coal mine or CBM production unit and from the power plant.

An assessment shall also be undertaken of any additional capacity needed by the Botswana Unified Revenue Service to assess and audit tax returns from coal and CBM companies especially regarding basing product prices on arms length or transactions prices and regarding inter-affiliate transactions. In this regard, consideration will be given to Botswana participating in the Extractive Industries Transparency Initiative.

The recommendations would be finalized on completion of consultations with license holders and other interested parties. Basic fiscal and royalty terms and conditions would be set in the law (with additional payments resulting from competitive bidding documented in contractual agreements) and any recommendations needed to change the present fiscal and royalty regime would be prepared and finalized. The financial models would be used to test alternative formulations for rate of return rent capture mechanisms.

A.2.2 Amending laws and regulations

- Prepare amendments to the Mines and Minerals Act (for royalties) or to the tax law (for taxes) and associated enabling regulations.

Task A.3 - Prepare an infrastructure provision strategy for coal and CBM

Prepare a PPP strategy plus implementing regulations and new laws as needed.

A.3.1 Determining rail and other infrastructure needs for coal or CBM exports

A.3.2 Determining ownership policy towards coal and CBM production and rail and other infrastructure needs for coal or CBM exports

- Review the results of the Government's present approach of taking up to 15 percent in new mining operations on a paid in basis and determine whether this or some other policy will apply to (i) coal mining; (ii) CBM production; (iii) coal-related and CBM-related

infrastructure and then to develop indicative estimates of the likely amounts needed in the next ten years.

- Analyze whether or not the Government would be responsible for mobilizing a share of project debt consistent with its equity stake.

A.3.3. Examining possible infrastructure provision approaches for different coal and CBM development options

Task A.4. Prepare economic linkages for coal and CBM development

Analyze potential linkages from coal / CBM development by considering:

- coal and CBM resource corridors (using resource assessment Task D below) , to assess horizontal / vertical linkages that might be result for be fostered by resource development
- define strategies to stimulate local economic linkages within these resource corridors
- identify potential skills development opportunities associated with the development of these economic linkages

Task A.5. Prepare a gas transmission and distribution strategy

Using the results of Task A.3.3., above (examining possible infrastructure provision approaches for different coal and CBM development options) develop

- ownership, aggregation, access, and tariff arrangements for development of open-access gas pipeline transport system; and
- prepare a gas transmission and distribution strategy.

Task A.6 Prepare an environmental protection and social mitigation strategy for coal and CBM

Identify measures to minimize GHG emissions, analyze water sources, and develop HIV/AIDS protection and treatment strategies, and a form of RPF for coal and CBM developments.

A.6.1 Determining the adequacy of present environmental laws and regulations for coal exploration and mining, CBM development and production and coal/CBM-fired power development and recommending improvements

- Review Botswana's environmental laws and regulations and provide an assessment of their adequacy for ensuring that each step of the coal and CBM chain take place in an environmentally and socially acceptable manner, namely:.
    - coal mining, beneficiation, storage, and transport;
    - CBM production and transmission;
    - power generation and transmission; and
    - coal consumption for non-power uses.
- Identify the environmental and social impacts of existing and expected future coal and CBM supply and use in Botswana, with special attention to the most vulnerable people, at
    - the local (including the influx of job seekers, HIV/Aids, community support and economic development programs, land rights and compensation, and RAPs and compensation);
    - regional (including any trans border air shed impacts of SOx and NOx emissions and water sources and use for coal beneficiation and power plant cooling; and
    - global levels (including greenhouse gas impacts) as relevant along the whole coal and CBM chain (including closure and post-closure).
- Assemble the various reviews that have taken place regarding Botswana's environmental laws and regulations and undertaking a "gaps analysis" to identify and undertake any additional work that may be needed.

- Identify priority improvements needed for Botswana's environmental laws and regulations to provide an acceptable level of environmental protection and social mitigation in line with good international practice and Botswana's particular characteristics.
- prepare an assessment of present benefit sharing arrangements (including not only financial transfers but also direct and indirect employment opportunities and spin off benefits, training opportunities, and provision of local services) and the extent to which the most vulnerable groups, women and youth share in the benefits training.
- examine what can be done to reduce GHG emissions by
    - improving coal combustion technologies include requirements for future power plants
    - undertaking a technical (including environmental assessment) of CCS technologies including developing data on potential storage options including obtaining information on possible carbon storage potential as part of the overall licensing process the need for geophysical sensing work by DGS the role of carbon credits.

Potential improvements would include, *inter alia*,

- the nature of environmental approvals needed when licenses are issued for coal prospecting, exploration and mining licenses and/or power generation and transmission, and
- procedures for monitoring environmental and social performance and impact mitigation and ensuring compliance with environmental and social requirements (including consultation processes) throughout the project life cycle (*i.e.*, during project preparation, approval, construction, operation, closure, and post-closure).

Task A.6.2 Preparing amendments to the environmental law and/or improvements to regulations
Following completion of and acceptance of the recommendations of Task 6.1, prepare amendments to the environmental law and associated enabling regulations.

Task B: Coal and CBM licensing

Improving licensing of Coal and CBM will help to (a) improve the compliance of prospecting license holders with license terms and conditions, such that there is a more dynamic exploration and development activity with regular turnover of inactive licenses, (b) facilitate design improvements to make the licensing system more suitable for coal and CBM, in line with international good practices, and (c) operationalize the new licensing system for coal and CBM such that the Government may undertake broader sector development activities around coal production and coal-to-power.

Task B.1 – Compliance review

Prepare a review of each coal and CBM prospecting license and document the following for each license so that DGS can make a determination as to which licenses should remain in force and which should be relinquished.

Task B.2 – Improving the coal and CBM licensing systems

B 2.1 Establishing licensing criteria for coal and CBM

Review coal and CBM licensing practices in other major coal producing and exporting countries (in particular Australia, Canada, Indonesia, South Africa, and the USA) and in CBM producing countries including: (a) how the size of license areas is determined, (b) what type of regulations are used for CBM exploration and development, (c) how prospecting/exploration licenses are converted into coal mining or CBM production licenses, and (d) where and under what conditions an auctioning process is used.

Propose new area criteria regarding the preferred size of the geographic area and expected reserves for both prospecting and mining licenses to (a) identify conditions under which an auction procedure could be used by the licensing authority to offer coal or CBM blocks for auction rather than letting interested

investors determine the size and location of the area to be licensed and (b) outline needed regulations for CBM exploration and development.

B.2.2 Determining key principles and practices for issuing/auctioning coal exploration and mining licenses and CBM exploration and production licenses

B.2.3 Design new procedures for issuing/auctioning coal exploration and mining licenses and CBM exploration and production licenses

Task B.3 – Preparing amendments to the Mines and Minerals Act and issuing new regulations

Prepare and enact amendments to the *Mines and Minerals Act* and to issue enabling regulations. The result of the task would be to draft (i) amendments to the *Mines and Minerals Act* to be submitted to Parliament; and (ii) to associated enabling regulations. The amendments to the law would be finalized and submitted to Parliament for enactment and the associated enabling regulations would be finalized and issued by executive order.

Task C: Institutional strengthening

Develop capacity to support integrated coal and CBM development and undertake a regional dialogue regarding cross border rail and other infrastructure development.

- Assess the needs of MMEWR and DGS regarding the right proposed structure and staffing capabilities to undertake their respective roles and responsibilities in an effective manner regarding
    - the administration, licensing, monitoring, and enforcement of laws and regulations for coal;
    - the administration, licensing, monitoring, and enforcement of laws and regulations for CBM;
    - geological data collection, reporting, and dissemination; and
    - needs for economic and financial forecasting capacity.
- Prepare an implementation plan for MMEWR to adequately addresses the needs of coal, CBM and associated power development.
- assess present arrangements for compiling and publishing available geological data and other related information on both coal and CBM.
- prepare a Skills Assessment and a Skills Need Assessment for the present and expected future coal development and associated power development capabilities within MMEWR.
- prepare a Skills Assessment and a Skills Need Assessment of the future expected CBM development and associated power development capabilities within MMEWR.
- prepare a Staffing Plan and a Staff Development Plan for MMEWR that will ensure that an adequate number of professional staff with the needed skills and capabilities will be in place to administer coal, CBM and associated power development throughout the project life cycle (*i.e.*, during project preparation, approval, construction, operation, closure, and post-closure).
- prepare a Skills Assessment, a Skills Need Assessment, a Staffing Plan, and a Staff Training Plan for DGS with a particular focus on CBM and coal-related skills.

Task D: Coal and CBM resource assessments

As a policy matter, the Botswana Government seeks to understand the underlying geological endowment (distribution and quantity / quality by area) together with the potential impact of improved infrastructure on potential coal / CBM supply. Globally, it is shown that the introduction of infrastructure has a catalytic effect in translating geologic resources into mineable reserves (economic translation). This task relates to the assessment of coal and potential CBM horizons with the objective of defining resource corridors linking multiple production sites and thereafter serving as a engine of regional economic development.

Task D.1 – Coal and CBM resource assessments

Prepare coal and CBM resource assessments to define high priority resource areas for infrastructure development strategies.

- Compile historical geological, geochemical and geophysical information and complement with recent industry-generated exploration results.
- Undertake geological analog analysis to infer resource potential in less explored areas using industry expert opinion and observations in analog areas.
- Define prospective areas for coal / CBM development based on geology.
- Overlay water resource information as thematic maps showing sensitive areas in consideration of coincident water resources; together with other potential "no go" areas.
- Overlay existing and possible infrastructure including roads, rail links, transmission lines, substations, existing and possible gas pipelines, and other ancillary infrastructure.
- Analyze all thematic maps to define priority areas as a combination of geology and infrastructure.
- Create final thematic maps for a second workshop with industry experts.
- Finalize maps for the Government and inform the ongoing development of the coal strategy.

Task D.2. Estimate potential supply

Using the above resource assessment estimates

- Estimate the expected potential supply of coal and CBM using existing technologies, expected prices and current or expected levels of exploration activity.
- Estimate the potential supply of coal and CBM given various infrastructure addition scenarios (see also Task B and PPP) and at different commodity prices.
- Estimate gross industry turnover, revenues to the Government (taxes, royalties, fees and duties), broader economic impacts including employment and vertical / horizontal linkages for various infrastructure addition scenarios and commodity prices.

Task D.3. Inform sector strategies with resource corridor analysis

Using the potential supply analysis, inform the coal / CBM sector strategies with cost / benefit estimates for various resource corridor public-private partnership investments.

B(4)—FEASIBILITY STUDY FOR PILOT CCS

Botswana, like several other countries in the Southern Africa sub-region, has historically relied on inexpensive, abundant, and reliable electricity from South Africa. The sub-region, including notably South Africa and other neighbors to Botswana, has been experiencing severe shortages of power since the end of 2007 due to high growth and lagging investments in new capacity. Energy security has emerged as the major national imperative for the Government of Botswana. Botswana's main energy resources are coal and CBM, and the Government is therefore considering a number of coal-fired power plant proposals and CBM pilot project proposals, including:

- **the proposed Morupule B project**, involving the establishment by BPC of a new coal-fired power plant alongside the existing Morupule A facility;
- **the planned Mmamabula IPP**, involving a new coal-fired power plant near the border with South Africa; and

- **the prospective Secunda–Kalahari Pilot Project,** involving the delivery of CO_2 by pipeline, from the SASOL Secunda synthetic fuel plant in South Africa to the Kalahari Gas Corporation CBM exploration area in Botswana, to enhance the production of CBM.

In view of these proposed projects, and given the rising international concern over climate change, the Government wishes to examine various strategies to mitigate CO_2 emissions. CCS is considered as one of the most important options for reducing atmospheric anthropogenic CO_2 emissions. Accordingly, the purpose of the proposed study is to assess the opportunities for CCS in Botswana, and to make recommendations as to the legal and regulatory environment necessary to take full advantage of those opportunities.

Some analytical work has already been done in regard to the issue of CCS development in Botswana. In September 2007, the Energy Research Center of the Netherlands sponsored a workshop in Gaborone on *Advancing CCS and CDM in Africa*. The record of that workshop is available at the following web site. http://endaenergie.files.wordpress.com/2008/03/ecn_rapport.pdf. In addition, the sponsors of the Mmamabula IPP have appointed the consulting firm of Environmental Resource Management to undertake a CCS study as part of a package of environmental studies for that project. Further, a number of discussions have taken place between the Government and the sponsors of the Secunda–Kalahari Pilot Project concerning the CCS implications of that proposed project.

Scope of work

(a) Building upon the work done to date by MMEWR and the Department of Meteorological Services in MEWT, the scope of work includes the following tasks:
(b) an analysis of the existing information possessed by MMEWR and MEWT respecting the potential for CCS projects in Botswana;
(c) a summary analysis of significant CCS demonstration projects in other jurisdictions and of the legal and regulatory arrangements in place in those jurisdictions to facilitate such projects;
(d) a summary analysis of international financial assistance programs currently available to support CCS projects in Botswana;
(e) an analysis of the economic and environmental costs and benefits of potential CCS projects in Botswana, including a strategy for addressing the issue of carbon credit financing;
(f) an analysis of the impact of utilizing Botswana's coal resources as a CCS host, including an assessment of the long-term implications for the future exploitation of coal resources;
(g) an analysis of the impact of potential CCS projects on energy resource development in Botswana and the Southern African region; and
(h) an analysis of the legislative and regulatory requirements necessary to facilitate CCS projects in Botswana.

An important aspect of the assignment will be training and capacity-building program on CCS issues for officials of MMEWR, MEWT, and BPC, including a workshop on the deliverables prepared by the Consultants.

C(1)(A)—TRANSMISSION SYSTEM HARMONICS STUDY

Background

In its thirty-seven years of existence, BPC developed from a small oil-fired power station in Gaborone, which was commissioned in 1970 and dismantled in 1989 to better and more efficient thermal power stations in Selebi-Phikwe and Morupule using locally mined coal. The Selebi-Phikwe power station has also been decommissioned leaving only the then more technologically advanced Morupule Power Station, which is adjacent to the colliery. The Morupule A Power Station provides approximately 20 percent of the country's power requirements while the remainder is imported, mostly from Eskom in South Africa.

BPC presently owns all of the electricity generation, transmission, and distribution assets in Botswana comprising of: (a) the Existing Morupule Power Station; and (b) the Botswana grid of 200 km of 400 kV lines, 1,254 km of 220 kV lines, 1,569 km of 132 kV lines, 1 x 400 kV substation, 7 x 220 kV Substations, and 18 x 132 kV substations. The transmission system suffers the effects of background harmonic contamination of the supply voltage on power equipment. These effects may range from computer system malfunctions to overloading and heating of power transformers.

Objectives

The main objective of the system harmonics study is to elaborate a report to determine the investment requirements in addressing the level of system harmonics in the power transmission system and to improve the quality of service. This will ensure that the power transmission and distribution networks deliver a supply voltage to customers that have acceptability low level of harmonics; utilities specify harmonic compatibility limits for large non-linear customer loads. This will also ensure that the supply voltage will always have a voltage contamination level that is within these distorted limits. Through this mechanism, a good quality of service may be guaranteed to all customers.

Scope of work

The system harmonics study shall include the following activities:

- Verify an rms computer system model of the network including all generators, loads, busses, transformers, shunt capacitors, shunt reactors, series reactors, harmonic filters, SVCs, etc.;
- Verify power factors on transmission and bulk distribution busses from MVA, MW, and/or MVAr data supplied from by BPC;
- If MVA, MW, and/or MVAr data is not available from the client, arrange for power measurements at transmission and bulk distribution busses over a two-week period;
- Provide an optimized power factor solution (shunt capacitor banks) based on measured power factors. Power factor to be improved to acceptable level;
- Run impedance versus frequency scans for all transmission and bulk distribution busbars (0 Hz to 1000 Hz) with and without proposed power factor correction equipment;
- Where impedances appear high especially at 150Hz, 250Hz, 350Hz, 4450Hz, 550Hz, and 650Hz frequencies;
    - Make enquiries regarding possible harmonics generating loads connected to these busses;
    - Undertake harmonics measurements using measurement equipment at these busses;
- On the basis of the load characteristics and harmonic measurements, propose harmonics filters where required according to SA NRS 048 standards;
- Ensure any switched shunt capacitor banks do not change the bus voltage by more than 3 percent (to comply with SA grid Code);
- Undertake a costing exercise of power factor and harmonic filter mitigation equipment;
- Make recommendations for the cost and implementation responsibility of the power factor or harmonic filter harmonic filter installations (*e.g.*, utility or customer) including specifications for the purchase of these equipment.

Duration

The implementation of the power system harmonics is anticipated to last for six months.

C(1)(B)—TRANSMISSION CONTROL AREA ESTABLISHMENT

Background

At the time of interconnecting the northern and the southern power systems through the 400 kV Matimba–Insukamini line, three Control Areas were formed in SAPP. The **Eskom Control Area** which

included BPC, NamPower, SEB, LEC and EDM; the single utility **ZESA Control Area** and the **ZESCo Control Area** which included SNEL of the DRC; these have been the only control areas operating in SAPP since then.

BPC chose to be hosted in the Eskom Control Area for economic and operational reasons. From an economic point of view BPC resolved that it was cheaper to run its only internal generating resource, Morupule A Power Station, base-loaded because it is the cheapest source of power. Operationally, BPC does not meet the SAPP minimum requirements of operating a Control Area in accordance with item 5.2 of the Agreement between Operating Members.

With power generation projects planned in the country at Mmamabula and Morupule, BPC needs to establish its own Control Area for sovereignty and efficient electricity trading purposes. As indicated above, BPC is under the ESKOM Control Area, which is also the host control area for NamPower (Namibia), SEB (Swaziland), LEC (Lesotho), and EDM (Mozambique). BPC pays for the Control Area services and charges as stipulated in the BPC–ESKOM Power Supply Agreement of 2007. In addition to phasing out imports by 2013, BPC anticipates to be hosting a number of IPP with cross-border transactions, the prospective IPPs being Mmamabula and Aviva at the moment. The BPC grid supports third party bilateral electricity trade transactions in the SAPP Bilateral Contracts Market and Short-Term Energy Market, which will soon be succeeded by the Day Ahead Market.

Objectives

Given the above developments, BPC would like to establish its own Control Area to enable it to meet its electricity trade and system operations obligations in SAPP. The main obligations being: (a) control of tie line flows (power interchange); (b) participating in frequency control; (c) management of inadvertent energy; and (d) protecting sensitive trading and market information.

Scope of work

The control area study shall carry out the following activities:

- Assess the existing hardware and software and develop specifications, cost estimate, and implementation schedule for the purchase of an appropriate Automatic Generation Control scheme based on the existing hardware and software in the Control Center, which was installed originally by the ABB of Sweden. The consultant should liaise with the SCADA supplier ABB, BPC transmission personnel (SCADA, Electricity Trading, Systems Operations, and Telecommunications), and Morupule B project team comprising Owner's Engineer and EPC Contractor;
- Determine the regulation, measurement, and telecommunication requirements;
- Develop and determine the AGC system parameters and settings for the equipment to be installed in the control center, Morupule B power plant, and in the system inter-tie transmission line;
- Analyze the existing SCADA as well as the associated data communication system in the power system to determine the necessary requirements and modifications need to establish the AGC as a new control area operator authority in SAPP;
- Determine the training requirements for BPC personnel in the operation of the AGC;
- Prepare the bid document including training for the direct purchase of AGC equipment to be installed and commissioned by the original supplier ABB. The preparation of the bid document should follow the World Bank Procurement Guidelines;
- Consultant will be responsible for the supervision for the implementation of the AGC.

Duration

The implementation of the control area is anticipated to last for eight months.

C(1)(C)—TRANSMISSION SYSTEM OPERATIONS CAPACITY BUILDING

Background

As an operating member of the SAPP, BPC is currently receiving control area services from the Eskom of South Africa under the BPC-Eskom Power Purchase Agreement which Agreement terminates in 2012. BPC needs to develop skills and capability to manage its network and system when Morupule B replaces Eskom supply. BPC will develop own control area and requires that its power system operators and electricity traders are trained in the operation of an interconnected power system and in particular control area operations. BPC will hire a training consultant firm to prepare and deliver the training as below.

Objectives

The objectives of the training are to: (i) train staff to the acceptable level of operating a control area in an interconnected system environment in SAPP; (ii) ensure a smooth and stable disengagement from the Eskom control area; (iii) fulfill its operating obligations as a control area operator in SAPP and adhere to performance criteria, standards and operating rules; and (iv) enhance electricity trading skills required for competitive import and export of electricity and associated ancillary services.

Activities

The training will include the following: (i) power system operators and electricity trader skills audit (observations, interviews etc); (ii) formulation of a training program to cover all relevant staff in system operations and electricity trading; and (iii) delivery of training and certification.

The training will cover, *inter alia*, control area concepts, area control error, AGC, ancillary services, short-term demand forecast, scheduling, economic dispatch, inadvertent energy management, and information exchange, etc. The training will be provided to BPC staff both onsite and at the trainers' facilities, and is proposed to include visits to select control centers.

C(1)(D)—AIR QUALITY MONITORING AND MANAGEMENT

Background

Botswana is situated in the centre of the Southern Africa plateau at a mean altitude of 1,000 meters above sea level. The majority of the country is flat with gentle undulations. The topography in the immediate vicinity of the Morupule A and the proposed Morupule B power stations is fairly flat. There are two towns located in close proximity to the proposed Morupule B Power Station. The town of Palapye is located approximately 5 km east-southeast of Morupule and Serowe town is situated 35 km to the northwest. The main activities in the power plant area are primarily agricultural, with the Morupule Colliery located approximately 5 km to the northwest of the power plant site.

Existing sources of pollution

The main sources of pollution within the region include the existing Morupule A Power Station and Morupule Colliery. In addition, agricultural activities, vehicle entrainment on unpaved roads, domestic fuel burning, and biomass burning add to particulate emissions. To a lesser extent, sources such as vehicle tailpipe emissions impact the proposed site and surrounding.

The air quality analysis completed for the EIA of the proposed Morupule B Power Station concluded as follows:

> Highest hourly SO_2 concentrations were screened against the EC standard (350 micrograms per cubic meter and exceeded at Palapye for all three stack heights (*i.e.*, 150m, 200m, and 300m). The number of hours exceeding the EC hourly standard at Palapye were 13 based on the 150 meter stack but reduced to 10 hours with the 200 meter

> stack and with the 300 meter stack down to 6 hours (EC allows 24 hours). SO_2 predicted ground level concentrations for highest daily averages showed compliance with the Botswana and WBG guidelines at Palapye and Serowe, but exceeded the WHO_IT2 guideline at Palapye. This was true for all three stack heights, with a marginal decrease between 150m and 300m…It should be noted that the existing Morupule Power Plant is the main contributing source of SO_2 ground level concentrations. SO_2 emissions from the current Morupule Power Plant comprise between 56 percent and 74 percent of the SO_2 concentrations predicted at Palapye, with the new Morupule B Power Plant making up the rest.

Available air quality data

DWMPC states that seventeen stations are "continuously measuring the levels of the different air pollutants" (Mmolawa, 2004). Francistown is indicated as the location of two of these stations where NOx and SOx are being measured. The Morupule Colliery is another site where SO_2 has been measured in the past. The locations chosen for the Francistown measurement sites (Blue Jacket Street in the city centre and the City Council depot in the industrial area) confirm that the intention of these stations is to measure pollution related to industry and traffic in urban areas. The diurnal variation in NOx values at the city centre station indicates a typical urban traffic-related pattern albeit at a relatively low level, with values of approximately 15-20 μg/m³ total NOx during the morning and afternoon traffic peak, and values below 5 μg/m³ in the early morning hours. Similarly, monthly averages of SO_2 range between 0 and 26 μg/m³, with the highest hourly value ever measured being 401 μg/m³.

The DWMPC ambient monitoring station located at the Morupule Colliery became operational in 1999 and measured SO_2, but has since been removed. A monitoring station is also located onsite at the Morupule Power Station monitoring SO_2 and PM_{10}. BPC plans to install a new SO_2 instrument adjacent to Kgaswe School, 1 km from the power plant, and has recently started to capture air quality data in digital format. Due to various technical difficulties experienced over the years with both the DWMPC and BPC instruments, the recorded data is not very comprehensive, ranging from 37 percent to 60 percent for the periods measured. Ambient SO_2 data was available from the DWMPC monitoring station for the second half of 1999 and 2001, and for the full year of 2000, 2005, and 2006.

The highest hourly SO_2 concentrations recorded were during the years 1999 and 2000 with a distinct decrease in the measured ground level concentrations during 2001, 2005, and 2006. The highest hourly concentrations measured every month exceeded the EC standard of 340 μg/m^3 during 1999 (June, September, and October) and 2000 (February and March). The highest daily average concentration measured over the entire period was 311 μg/m^3, exceeding the WBG guideline of 150 μg/m^3. On an annual average the concentrations varied over the years between 6.35 μg/m^3 (2005) and 20.5 μg/m^3 (1999). Only one month (June 2007) of PM_{10} ambient concentration data was available for analysis, although it is unclear if the recordings were for one hour twice daily. The concentrations were on average between 16.4 μg/m^3 and 27 μg/m^3.

Incomplete meteorological data is available from the meteorological station located at the Morupule Power Plant. Historical data for the months of November 1997, May 1998, August 2000, and May to June 2007 are available, since when the collection of meteorological data has become more consistent.

Research has been carried into the background ozone concentration over Southern Africa (Zunckel *et al*. 2004, van Tienhoven *et al*. 2006). Values were measured at a number of stations in South Africa, Namibia, and Botswana. Strong seasonal and diurnal variations occur—springtime maxima over Botswana are similar to those over the industrialized Highveld of South Africa at 40-60 μg/m^3 and this sometimes continues into early summer. These maxima are reached early in the day and may continue at high levels for up to 10 hours. It is thought that the seasonal maximum coincides with the spring growth in vegetation (with an increase in biogenic hydrocarbons as ozone precursors being emitted) and nitrogen emissions from soil wetting. Biomass burning during winter and early spring is probably also involved.

There is similar evidence that background levels for suspended particulate matter are high at certain times of the year, mainly due to biomass burning. During the SAFARI 2000 research project over Southern Africa, two flights through the atmospheric boundary layer over Botswana in August gave an average concentration of 139 µg/m^3, with a very clear biomass burning fingerprint in terms of the content of organic solids (47 percent) and semi-volatile organic compounds (33 percent) (Eatough *et al* 2003).

Objectives

(i) Establish an air quality monitoring network

Establish an air quality (**AQ**) monitoring network for judging compliance with national and international hourly, daily and annual average ambient air quality standards and guidelines for SO_2, NOx, particulate matter (PM, including PM_{10} and $PM_{2.5}$) and heavy metals,[58] within an estimated zone of potentially significant impact of emissions from Morupule A and B power plants, covering but not necessarily limited to the towns of Palapye and Serowe, and possibly Mahalapye. The AQ monitoring network should include stations for the capture of meteorological and background AQ data. The AQ network should start producing quality-assured data in 2009, and be designed to continue producing reliable data for the lifetime of the planned Morupule B power plant.

(ii) Provide recommendations for the management of emissions

An analysis of the sources contributing to AQ concerns around Morupule, and recommendations for joint operation of Morupule A and B in such a way as to meet BW, WB, and WHO AQ standards (including 24-hour, monthly, and annual standards).

(iii) Establish BPC capacity to manage the air quality monitoring network

Train and hand-over AQ network to BPC Environmental Unit at Morupule. Training BPC staff in the analysis and public dissemination of information based on the AQ data collected.

Tasks

- Detailed area survey to determine appropriate location for monitoring stations.
- Installation and calibration of monitoring stations, to meet internationally accepted performance standards (e.g. US Federal Reference Methods).
- Data collection over two year period, with quality assurance of data.
- Analysis of sources and recommendations for emissions control equipment and operating procedures at Morupule A and B power plants.
- Training and transfer of monitoring network, including maintenance, servicing, and recalibration plan for the instruments.

Duration

The duration of the contract is two and a half years, comprising (i) six months to install and calibrate the AQ network and (ii) eighteen to twenty-four months data collection and training of the BPC staff.

C(2)(B)—ELECTRICITY TARIFF STUDY AND REGULATORY AGENCY DEVELOPMENT

Background

The legal and regulatory frameworks for the power sector in Botswana are currently at a relatively basic level of development. The 1973 *Electricity Supply Act* and the 1993 *Electricity Supply Regulations* and

[58] Air quality guidelines and standards are issued by various countries and organizations for lead including the WHO, and there is also an increasing trend towards the specification of air quality limits for certain other metals, with limits published by the WHO for cadmium, manganese, mercury and vanadium. However, no air quality limits have been set for such metals in Botswana or by the World Bank to date.

Electricity Supply (Licensing) Regulations, provide that licenses for the generation and supply of electricity shall be issued by MMEWR. The 1970 *Botswana Power Corporation Act* allows the BPC to set its own tariffs, with the approval of the Minister of MMEWR, so as to achieve the financial objective of ensuring a "reasonable return" on the assets of BPC. More recently, the 2007 *Electricity Supply (Amendment) Act* removed previous restrictions on the issuance of new licenses, and authorized the Minister to license "independent producers and suppliers of electricity".

A considerable body of analytical work has previously been done in regard to potential reforms of the existing legal and regulatory framework. A notable document in this regard is the 2005 Stone & Webster Report on *Regulatory Reforms for Infrastructure and Utility Sectors in Botswana*, funded by PPIAF, administered by the World Bank. The Stone & Webster Report recommended the establishment of an independent electricity regulator, with the power to issue licenses and regulate tariffs, and the Government has determined that it now wishes to implement that recommendation.

Objective of the assignment

The key objectives of the assignment are to: (i) develop and propose a new electricity tariff policy; and (ii) develop the necessary legal and regulatory frameworks for establishing an independent electricity regulator, and develop new tariff-setting arrangements to be implemented by that regulator.

The design of the new regulator shall be such as to allow for the possibility of expanding the scope of the regulator's jurisdiction in the future to include responsibility for the natural gas and water sectors.

Scope of work

Building upon the work done by Stone & Webster, as set out in the 2005 Report on *Regulatory Reforms for Infrastructure and Utility Sectors in Botswana*, and subsequent work done by MMEWR and the Attorney-General's Chambers, the Consultants will undertake the following tasks:

(a) review the current tariff policy and identify the areas for strengthening, with particular considerations to social and competitive aspects
(b) examine options for addressing social and rural electrification programs (e.g. lifeline tariffs, rural levy, etc.) and recommend appropriate options for Botswana after examining the specific conditions in Botswana
(c) arrange and assist with consultation process with stakeholders on the options, proposals, etc., and ensure close coordination with communication program consultants
(d) prepare draft legislation for the new regulatory body;
(e) design the operating model of the new regulatory body—its organization and management structure, staffing requirements, skill requirements, job descriptions, training requirements, key processes, information requirements, systems requirements and its interfaces with external entities, such as regulated entities, government bodies, the media and the public (as noted above, the new regulatory body may subsequently also have responsibility for the regulation of the natural gas and water sectors and, accordingly, the operating model of the new regulatory model must be sufficiently flexible to permit this change to take place in the future);
(f) prepare draft procedures and operating manuals for the new regulatory body;
(g) develop an indicative budget for the new regulatory body, and recommendations on how this budget is to be funded;
(h) draft pro forma versions of the key documents to be issued by the new regulatory body, including licenses;
(i) develop tariff-setting methodologies for the new regulatory body, building upon the tariff studies done to date, so as to produce tariff designs compatible with current market arrangements; and
(j) provide initial training sessions, in respect of the above-noted materials, for the members of the new regulatory body and its staff, BPC, MMEWR, and other concerned officials.

An important aspect of the assignment will be a public awareness program. As part of this assignment, the Consultants will be expected to collaborate with the Government's Communications and Consultations Support Advisors in preparing information packets and participating in up to two public seminars on the proposed new electricity regulatory arrangements. During the course of the assignment, the Consultants shall also provide information packets for, and participate in, up to two public seminars on the proposed new electricity regulatory arrangements. It is considered critical to the success of the assignment that key stakeholders and the public at large be involved in the development of the new regulatory arrangements, and that they understand the intent of the legislation and the regulatory framework.

C(2)(C)—COMMUNICATIONS AND CONSULTATIONS SUPPORT

Background

The set of measures planned by the Government in the energy sector will benefit greatly from significant communication support. The challenges being addressed in this area—energy security in the country, a severe power crisis at the regional level, the need to diversify the country's economy and sustain growth, the use of coal as a potential energy resource, etc.—coupled with the issues that large projects of this nature bring about by themselves and the global concerns about climate change will require a comprehensive effort to communicate, build consensus, address concerns and mobilize public support at the local, national and international levels. This TA will do the following: i) help build capacity, in form of a fully trained team, to implement a sophisticated communication program and develop it further; ii) assist with the development of a comprehensive communication program in support of energy policy, that shall include, among other things, the creation of a platform for dialogue on energy between the Government and local civil society as well as a an international outreach campaign on the issue of access to energy and the environment; and iii) assist MMEWR carry out consultations around its large energy initiatives and helping it implement the transparency measures necessary to earn public trust. A Communication Firm will be recruited to assist MMEWR in accomplishing these goals.

Capacity building and training. A crucial goal of the Communication Firm is to prepare MMEWR communication staff (between two and four people) and the members of the Energy Communication Cluster (some twelve people) to carry out all communication functions by the end of its fifteen-month contract period. The Communication Firm will carry out specific training seminars for MMEWR staff and the Cluster and, as importantly, will work with them as one team to ensure that the combination of formal and on-the-job training enables them to effectively continue its communication function after the Communication Firm's departure. In addition to the communication staff, the firm will also identify technical people who ought to play a role in this undertaking, either as supervisors, "champions" or spokespeople, and provide suitable training for them as well.

Strategy design. The Communication Firm will be provided with the communication strategy currently being used by the Government. This document, together with the Consultant's own assessment during the first month on the ground, will be the basis for the elaboration of a comprehensive strategy and action plan to attain the objectives set forth in the matrix below. Debswana's experience in addressing the misperception of "conflict diamonds" should be studied, as well as the communication efforts, albeit limited, of the Ministries of Environment, Trade, Foreign Affairs, etc. The Communication Firm will also devise feedback mechanisms for ongoing improvement of the strategy and for ensuring that the messages developed are relevant to each target audience. By the end of its first month, the Communication Firm will present the strategy, action plan, and feedback mechanisms in an inception report to be approved by MMEWR. The strategy shall take into account the following:

> Local communication: The experience so far indicates that there has been regular and substantive communication between the Mmamabula and Morupule expansion projects and the local stakeholders. It will be important to ensure that communities continue to have proper venues for

ongoing communication with the projects, building on the consultations undertaken for the environment and social assessments.

National communication: With the exception of a workshop on January 26, 2009 organized by MMEWR to discuss coal, coal-bed methane and power development issues with interested parties, stakeholders at the national level have not yet been engaged by the Government in a dialogue around the pressing issues that affect the energy sector. The Government would greatly benefit from promoting consultation with relevant stakeholders—business community, national nongovernmental organizations (NGOs), opinion leaders, media, consumer groups, etc.—to understand their views and concerns on the energy crisis and explain to them and to the public at large the various measures that are being planned to address the crisis, as well as the environmental standards being observed. Such activity would also allow preparing the ground for events to come, as some of the consequences that might ensue from the current situation, like further black outs, tariff hikes or a possible stagnation of economic activity will need to be clearly spelled out.

Regional communication: It is foreseeable that in the immediate future the power crisis that affects the region will create some tensions among neighbors. Many in South Africa are already questioning the wisdom of continuing to export electricity to Botswana and other countries while their own is experiencing shortages. Botswana proactively position itself to respond to these concerns and to position itself as an engaged player in the SADC region, willing to contribute to solutions that are beneficiary to all. In addition, the Communication Firm should also help the Government to engage with officials responsible for coal development in neighboring countries (South Africa, Zimbabwe, Mozambique, etc.) and attempt to mobilize them to articulate a shared, coherent regional message on this issue

International communication: Large coal to power projects will surely attract attention of the media and civil society, in Africa and around the world, in particular in light of global concerns regarding climate change. In addition, partnering with the World Bank and other multilateral agencies will likely increase the level of scrutiny faced by the projects. This scrutiny will, on the other hand, be an opportunity to show to the world that Botswana can successfully undertake these kind of projects and properly address the environmental and governance concerns that may arise.

National dialogue on energy. The Communication Firm will bring together government stakeholders and civil society organizations to encourage the creation of a platform where energy issues can be discussed at the national level. The Communication Firm will recommend a suitable structure for this platform, identify the profile of participants and help outline topics for discussion. While the final format and content of this platform should be defined by the participants themselves, the Communication Firm will help MMEWR establish and manage this entire process.

Launch a general outreach campaign. The Communication Firm will assist MMEWR in developing an outreach campaign as a key element of the overall communications strategy. This will encompass a variety of activities, including

At the national level:

- Developing and producing a series of radio programs and newspaper/print media articles to educate the general public and specific audiences like businesspeople about the energy sector, its challenges, the Government's vision and proposed policies. The Communication Firm should explore the possibility of partnering with local stations in order to reduce costs and ensure the sustainability of the programming.
- Producing, as needed, public service announcements in support of specific policies.

- Collect testimonials of beneficiaries who illustrate the rationale for the Government's approach in this field.
- Documenting all the measures undertaken to mitigate the greenhouse gas emissions from coal.
- Encouraging media coverage of energy by arranging press events around newsworthy measures, providing journalists with background materials, facilitating access to relevant officials, etc.

At the international level:

- Mapping the various international stakeholders (NGOs, think tanks, media, academics, etc.) that follow events on Botswana, energy, environment, development and that could potentially be interested in Botswana's energy program.
- Identifying relevant venues (development forums, climate change events, gatherings of the UN and other international actors, etc.) where Botswana should proactively communicate its approach to energy and development.
- Identifying voices of Botswana NGOs, business community, academia that can participate in the international debate on access to energy in Africa and climate change and that could reinforce the Government's position vis-à-vis international audiences.
- Drafting and disseminating information materials, presentations, video footage, opinion pieces for Botswana officials and other public figures, etc.
- Organizing press tours to Botswana for relevant international media as well as visits by senior Government officials to key venues around the world to explain Botswana's energy program.

Help MMEWR, BPC, and CIC undertake consultations. When relevant, the Communication Firm shall assist BPC, MMEWR, and CIC with the stakeholder consultations around the large energy projects. Equally important, the Communication Firm shall put a documentation system in place whereby those consultations are duly recorded and archived. In addition, a procedure for providing feedback to those consulted shall be established so as to ensure that stakeholders can see the use Government has made of this exercise.

Transparency and internal communications. The Communication Firm will also work with MMEWR and other key staff in Government so as to ensure that a great level of openness and transparency regarding policies and specific projects in the energy sector is achieved. The Government already enjoys a high level of public trust and enhanced transparency will build on this trust. In addition, the Communication Firm will ensure that the right mechanisms are in place for effective internal communication. The Energy Communication Cluster will play a key role in this regard, but good internal communication is also necessary within ministries themselves and among officials of different ministries at the technical level. In addition, the Communication Firm should help MMEWR properly coordinate its communication efforts with other key stakeholders like CIC or BPC.

Build media understanding of energy issues. Many reporters covering the energy sector in Botswana have limited knowledge about it. Similarly, the ones reporting on climate change often have little knowledge about the topic. The Communication Firm will develop a training program for print, TV and radio journalists. Special attention shall be given to including journalists from throughout the country. On the one hand, regular workshops should be organized whereby a large number of journalists and editors will be acquainted with the basics of the energy sector and its implications for the economy. In parallel, a small group of some 10 "core" journalists will be identified to receive an ongoing and exhaustive training on energy reporting. By the end of this training, this group should have developed a thorough understanding of the sector as well as the necessary skills to cover its activities properly and in a way which is significant to the Botswana public.

C(2)(D)—CAPACITY BUILDING FOR SAFEGUARDS MONITORING

Background

DWMPC is the authority responsible for pollution control, including regulation and monitoring. Morupule B and other proposed projects will expand the scope of DWMPC's operation and intends to enhance the capacity of its staff in carrying out their responsibilities effectively and efficiently.

Scope

The scope of training includes air quality monitoring and emissions standards development. DWMPC proposes to train five engineers and technicians through one or both of: (i) on the job training by experts and consultants and (ii) attachment program to reputable institutions.

DWMPC also proposes to procure the necessary specialized monitoring equipment as below, either separately or as part of the training package: (i) online SO_2 emissions monitoring system per boiler; (ii) online particulate matter monitoring system; (iii) SO_2 ambient air quality analyzers; (iv) NOx ambient air quality analyzers; (v) carbon monoxide ambient air quality analyzer; (vi) calibration system; (vii) data logging system; (viii) wind speed / direction sensors; and (ix) portable caravans.

Emissions standards development

Currently, there are no emissions standards for the various air pollution sources in the country. In view of the considerable number of major sources existing and proposed, DWMPC intends to build capacity for developing and setting emission standards for coal-fired power generation plants. The following tasks are anticipated: (i) identify and engage experts on emissions standards development; (ii) literature review and benchmarking; (iii) stakeholder consultation, especially Botswana Bureau of Standards (BOBS); (iv) standards approval by BOBS; (v) inclusions of standards into the appropriate statutes; and (vi) emissions standards for coal-fired power generation plants.

Annex 5: Project Costs

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Table 25: Project costs and financing (in US$ million)

	Project Costs	Financing				
Ref. 1/	**Project Component**	**Cost**	**ICBC**	**BPC/GOB**	**IBRD**	**AfDB**
	Component A: Morupule Generation Expansion (BPC)					
	Component A(1)—Power Station	**1,211.3**	**825.0**	**346.0**		**40.3**
A(1)(a-h)	EPC Contract	968.0	825.0	143.0 [2]		
A(1)(i)	Startup fuel	35.0				35.0
	Other costs	17.0		17.0		
	Contingencies	53.3		48.0		5.3
	Taxes and duties	138.0		138.0		
	Component A(2)—Transmission	**275.3**		**35.9**	**77.2**	**162.2**
A(2)(a)	Morupule – Phokoje 400kV line and associated eqpt.	39.1			39.1	
A(2)(b)	Morupule-Isang 400kV line and associated eqpt.	62.4				62.4
A(2)(c)	3x400/220 kV transformers	26.8			26.8	
A(2)(d)	Isang 400/220 kV Substation and associated works	60.6				60.6
A(2)(e)	Reactive compensation equipment	18.0				18.0
A(2)(f)	AGC hardware/software installation	1.2			1.2	
	Contingencies	31.3			10.1	21.2
	Taxes and duties	35.9		35.9 [3]		
	Component A(3)—Water Supply	**53.0**		**6.1**	**46.9**	
A(3)(a)	Paje to Morupule B pipeline	30.5			30.5	
A(3)(b)	Power supply to Paje well field	9.2			9.2	
A(3)(c)	MCL to Morupule B	2.9			2.9	
	Contingencies	4.3			4.3	
	Taxes and duties	6.1		6.1 [3]		
	TOTAL - Component A	**1,539.6**	**825.0**	**388.0**	**124.1**	**202.5**
	Component B: Alternative Energy Development (MMEWR)					
B(1)	Low-carbon growth strategy study	0.5			0.5	
B(2)	Preparation of CSP project	1.0			1.0	
B(3)	Coal/CBM strategy development	4.0			4.0	
B(4)	CCS pilot feasibility study	1.0			1.0	
	Taxes	0.3		0.3 [3]		
	TOTAL - Component B	**6.8**		**0.3**	**6.5**	
	Continued on next page					

Ref. 1/	Project Costs Project Component	Financing Cost	ICBC	BPC/GOB	IBRD	AfDB
	Component C: Institutional and Capacity Building					
	Component C(1)—BPC	**10.8**		**7.3**	**3.5**	
C(1)(a)	Transmission system harmonic study	1.1			1.1	
C(1)(b)	Transmission system control area establishment	0.9			0.9	
C(1)(c)	Transmission system operations capacity building	0.8			0.8	
C(1)(d)	Air quality monitoring and management	0.5			0.5	
C(1)(e)	Training and workshops for PMU	0.2			0.2	
C(1)(f)	Project management consultants	7.0		7.0		
	Taxes	0.3		0.3 [3]		
	Component C(2)—MMEWR	**3.1**		**0.8**	**2.3**	
C(2)(a)	Interim tariff policy review	0.5		0.5		
C(2)(b)	Electricity tariff policy and regulation	1.5			1.5	
C(3)(c)	Communications program	0.5			0.5	
C(2)(d)	Safeguards monitoring training	0.3			0.3	
	Taxes	0.3		0.3 [3]		
	TOTAL - Component C	**13.9**		**8.1**	**5.8**	
	Total baseline cost	**1290.5**	**825.0**	**167.5**	**122.0**	**176.0**
	Total contingencies	**88.9**	**0**	**48.0**	**14.4**	**26.5**
	Taxes and duties 4/	**180.9**	**0**	**180.9**		**0**
	Interest during construction	**102.0**		**102.0**		
	Total Financing	**1662.3**	**825.0**	**498.4**	**136.4**	**202.5**

Notes: (1) Reference corresponds to component description in Section II(C) and Annex 4
(2) Government has disbursed to BPC BWP 1.5 billion in late-2008 towards advance payment for the EPC Contract
(3) To be paid by BPC/Government on IBRD and AfDB financed procurement

Annex 6: Implementation Arrangements

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

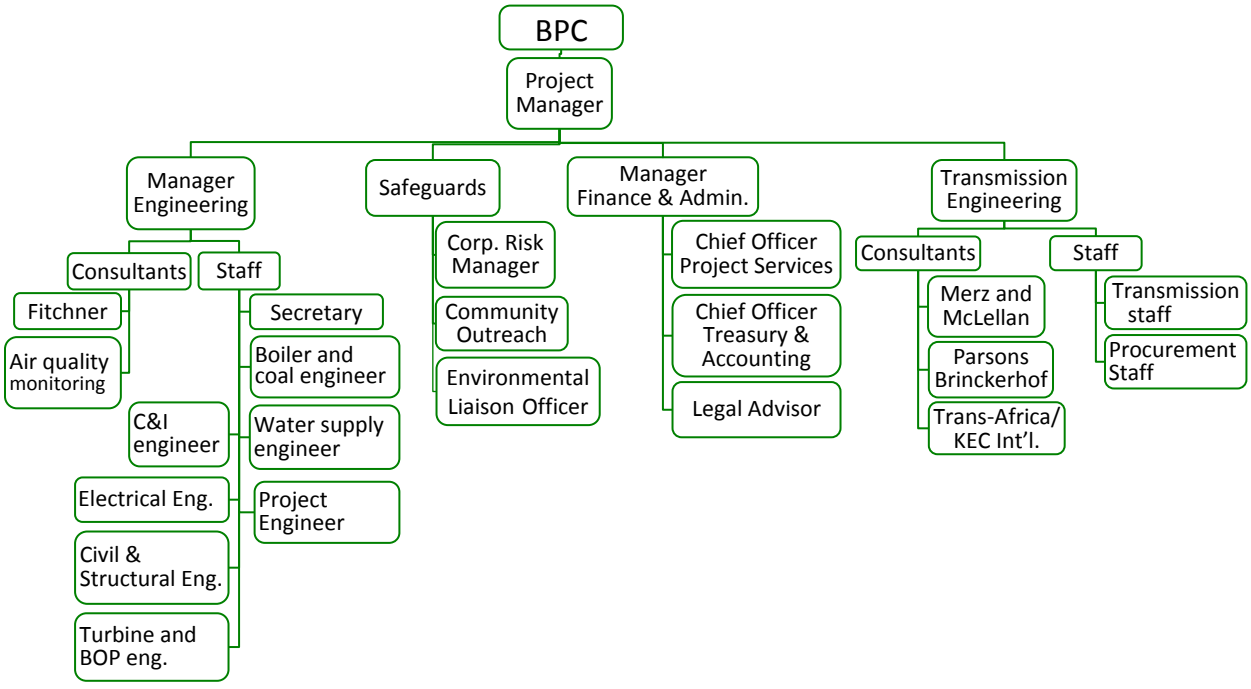
Introduction and background

1. The project is on a fast track for start of construction due to the potential for serious under-supply in the near term. Emergency supply measures are being made ready for use during the construction period of the project. As these emergency supplies are costly, the timely completion of the project is crucial for Botswana. The implementation is based on the World Bank guidelines, Equator Principles, and other best practices in environmental and social responsibility and good governance.

2. The Morupule B power project is complex and requires continuous attention by various parts of the Government and BPC. Day-to-day project implementation responsibility rests with BPC and MMEWR, in coordination with MFDP, MEWT, and other parts/agencies of the Government. BPC will implement all parts except the sector development TA, which will be the responsibility of MMEWR. BPC will be responsible for all procurement under the project and ensuring timely conclusion of agreements with MCL for coal supply, with MCL and WUC for water supply and imports of limestone for power plant.

BPC implementation arrangements

3. BPC has set up a PMU and designated a Director level person as Project Manager to oversee and coordinate four functional units reporting to him. The four functional units are: power plant, transmission, administration and finance and safeguards (see chart), headed by the Engineering Manager, Transmission Director, and Manager Finance and Administration, respectively; The Project Manager directly oversees the safeguards unit. Several existing staff of BPC have been seconded to the PMU in a matrix structure of responsibilities additional staff are to be hired to support various functions.



Morupule B Power Station and water supply system (Components A(1) and A(3))

4. The Engineering Manager, assisted by staff and consultants, will be responsible for overseeing the physical construction and commissioning of the power station (Component A(1)) and water supply system (Component A(3)). In addition, he will be responsible for ensuring coordination of all aspects of construction and commissioning, including timely finalization of coal, water, and limestone supply contracts. The manager will be supported by six engineers as well as consultants.

5. **Power plant construction**. A consortium led by CNEEC will be responsible for power plant design, engineering, procurement, construction, and start-up.

Table 26: CNEEC experience in select thermal power plants

Name of plant	Location	Size of units	Year of completion
Co-gen Power plant for Hegang Mining Area	Heilongjiang	1 x 25 MW	1989
Zhangjiang	Jiangsu	2 x 125 MW	1998
Shanghai WEI-GANG BFG Power Project		1 x 50 MW	2000
Pitu Java Bart Indramayu	Indonesia	3 x 330 MW	In progress
Awar-Awar	Indonesia	2 x 350 MW	In progress
Sabah	Malaysia	4 x 85 MW	In progress
Banjarsari	Indonesia	2 x 135 MW	In progress
Azerbaijan (rehabilitation project)	Azerbaijan	7 x 300 MW	In progress
Sabah Combined Cycle power plant	Malaysia	190 MW	In progress

Source: BPC

6. **Construction supervision and management**. Power plant construction and site supervision will be supported by owner's engineer consultant, Fichtner GmbH of Germany, who will be stationed at Morupule site. Fichtner will be responsible for assisting with the following key tasks: (i) site supervision and administration; (ii) basic and final design review; (iii) control of design and modifications; (iv) control and monitoring of construction schedule; (v) control of commissioning activities; (vi) managing payments to contractor; (vii) review of as built drawings; (viii) progress reporting; (ix) training and know-how transfer to BPC staff; and (x) advice on disputes. Fichtner will develop a detailed project management system for schedule monitoring, performance and material monitoring, etc., and a construction management manual covering field/site issues, management, administration, etc. Fichtner will be responsible for site quality control, day-to-day contract administration and related functions and prepare monthly progress reports and maintain site activity log and reports. Fichtner will review and advise BPC on all subcontractor proposals from EPC Contractor. Fichtner will also review payment requests by the EPC Contractor and certify payments based on works completed and equipment delivered, etc. as per contract terms and conditions.

7. **Water**. WUC has allocated about 2.5 million cubic meters annually for the MCL and BPC from the NSC, of which BPC requires about 1.5 million cubic meters per year. The water engineer in the PMU will be responsible for all aspects related to supply of water for use during construction and operation of the power station. This involves managing the procurement and construction of the extension pipeline from MCL reservoir to the Morupule B site, finalizing agreements for supply and billing arrangements with WUC and MCL, and procurement and construction of the backup water supply system from the new Paje well field (see "Annex 4—Detailed Project Description"). The water engineer will also oversee the EPC Contractor who will be responsible for building water pre-treatment facility before use in the power station.

8. **Coal**. MCL, which is supplying coal to Morupule A plant, will also provide the fuel for Morupule B. The boiler and coal engineer in the PMU, along with the coal specialist consultant, will be responsible for supporting BPC management in finalizing the coal supply agreement between BPC and MCL. The

boiler and coal engineer will also be responsible for managing all aspects related to coal aspects, including oversight of the EPC Contractor who will be responsible for constructing a complete coal handling system, including a conveyor from the MCL mine to coal yard at Morupule B site.

9. **Limestone**. Limestone of high quality will be imported from South Africa via rail, which is closely situated for delivery to plant site. The logistics engineer in this unit will be responsible for finalizing agreements for supply, transportation and delivery at site for limestone. The EPC Contractor will be responsible for building a complete limestone handling and feeding system, including crushers.

Transmission system and related TA (Components A(2) and C(1))

10. The transmission engineering unit will be responsible for procurement, construction and commissioning of transmission lines, substation and necessary institutional set-up and capacity building for transmission system management, including dispatch control. The transmission system management unit is headed by a Director and will be assisted by four staff and several consultants. This unit will be responsible for ensuring coordination of AfDB- and IBRD-funded subcomponents, including safeguards matters with the assistance of the Safeguards unit.

11. This unit will be suitably supported by the Projects and Technical Services Division in procurement and contracting. The Projects and Technical Services division has a Head of Division and three staff members. BPC will recruit two additional engineers to strengthen the capacity of the Projects and Technical Services division, who will also be seconded to the PMU. BPC has engaged three technical consultants—Merz and McLellan Botswana Ltd (South Africa), Parsons Brinckerhoff Inc (US), and Trans-Africa Projects[59]/KEC International Ltd (South Africa/India consortium)—to assist in the design, development, and construction of the transmission system and substation. The consultants will, *inter alia*, help BPC prepare bidding packages, conduct procurement, evaluate bids, and supervise construction.

Safeguards monitoring and management

12. The safeguards unit will be responsible for all aspects related to environmental and social safeguards under the project, including communications and consultations with stakeholders and project affected people. The Manager of Corporate Risk will also oversee safety and health issues. The Environmental Liaison Officer will be responsible for environmental issues and assist the Corporate Risk Manager.

13. This unit will also be responsible for ensuring that all contractors and sub-contractors follow the stipulated safeguards requirements and conform to applicable policies under the project. Contractors will be responsible for complying with the EMP. This will include monitoring and enforcing the EMPs through consultants for transmission and water components and directly for power station component. If any resettlement or social issues are involved, BPC will be responsible for implementing the associated RAP before authorizing contractors to commence construction. Accordingly, this unit will be responsible for ensuring that: (i) approved EMPs are included in the bidding documents; and (ii) applicable RAPs are fully implemented by BPC before start of construction by contractors.

14. The Community Outreach function is carried out by the Environmental Liaison Officer who is responsible for social safeguards aspects covering resettlement, community outreach, and consultations, HIV/AIDS prevention programs, liaison with local and national authorities to handle social matters and facilitation of community dialog to promote harmony. In view of foreign workers expected at the site, language and cultural sensitivities will be an important concern. In this regard, this unit will work closely with the "Reference Group" set up by the Government (see below). The Bank will encourage adoption of the Debswana social and HIV/AIDS prevention model by BPC, and also provide support through the Botswana National HIV/AIDS Prevention and Support Project approved by the Board in 2008.

[59] A fifty-fifty joint venture between Fluor South Africa Pty Ltd (US) and Eskom Holdings (South Africa)

15. This unit will also be responsible for coordinating the installation of the emission monitoring and management system for Morupule A power station. The unit will also assist in the implementation and subsequent activities related to monitoring and remedial measures.

Finance and administration

16. This unit will provide services to all units of the PMU and liaise with BPC corporate units as required. The chief officer for project services will be responsible for managing all service requests and ensuring timely support and disposal. The chief officer for treasury and accounting will maintain all project accounts and process payments to contractors under the project. The legal advisors are the firm of Collins Newman & Co with Denton Wilde Sapte LLP, who are retained for the duration of construction to provide legal advisory services as required and represent BPC.

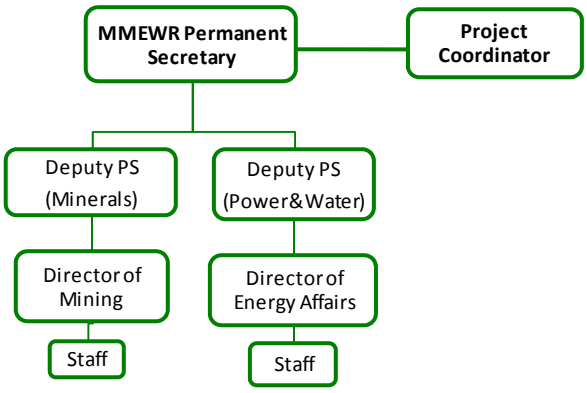
Reference Groups

17. The Government has set up Reference Groups at local and central government levels. The local stakeholder Reference Group is chaired by the District Commissioner or the District Council Secretary and comprises ex-officio members from the various local authorities, such as, the Ministry of Health, MEWT, Labor Board, Tribal Secretary, District Lands Officer, Planner, Development Officer, Water Engineer, Roads Engineer, Education Officer, HIV/AIDS Coordinator, etc. The local Reference Group will function till end-2013.

18. The central Reference Group is chaired by the Deputy Permanent Secretary (Water and Energy) and includes representatives from BPC, WUC, Botswana Railways, and several Ministries to monitor the project, especially the power station part and recommend suitable actions by concerned officials to ensure timely and smooth implementation of the project.

Alternative energy development and sector development TA (Components B and C(2))

19. For the sector development TA, MMEWR has designated the Permanent Secretary to oversee and manage the implementation. The Permanent Secretary will be supported by two Deputy Permanent Secretaries and their department staff (see chart).



20. The Deputy Permanent Secretary (Water & Energy) will oversee the implementation of: (i) tariff policy and regulatory agency development; (ii) communications program; and (iii) feasibility studies for CSP and CCS. He will also assist with provision of training to MEWT staff on safeguards monitoring. The Deputy Permanent Secretary (Minerals) will oversee the implementation of the coal/CBM strategy.

21. The Director of Energy Affairs Division will be responsible for supervising: (i) the Electricity Tariff Policy Study and Regulatory Agency set-up and capacity building and (ii) the communications program. The ad hoc team from BPC and MMEWR which supervised the pre-feasibility study for the CSP plant will also assist with supervising the bankable feasibility studies for CSP and CCS under the

direction of the Deputy Permanent Secretary (Water and Energy). DWMPC will ensure timely implementation of safeguards training part in consultation with the Deputy Permanent Secretary (Water and Energy). The Director of Mines will be responsible for supervising and implementing the TA related to coal/CBM strategy under the direction of the Deputy Permanent Secretary (Minerals).

22. The PMU will provide assistance to MMEWR for procurement and contracting of above TA subcomponents, while supervision responsibility would be as described above. The relevant implementing units in MMEWR will be responsible for preparing and finalizing the terms of reference for their respective TA parts, in consultation with the World Bank. The PMU will be responsible for preparing the RFP, conducting the procurement, and processing payments to consultants. As regards proposals evaluation and selection of consultants, the appropriate unit in MMEWR will work jointly with the PMU and will also be responsible for ensuring coordination with the PMU during the entire procurement and selection process.

Project coordination

23. The project is complex and requires attention of various parts of the Government and BPC to ensure smooth and timely implementation. International experience indicates that there are potential risks of delays, conflicts resulting in public and stakeholder anger, bad press, etc., which should be anticipated and managed before they occur as much as possible. The substantial financial support from and through the Government (about US$850 million) would also entail frequent briefings to Ministers, the Cabinet, and Parliament. Continual oversight and coordination by a dedicated high-level and experienced executive will be necessary and also helps mitigate the reputational risks to the BPC, the Government and the World Bank. The Government will appoint a high level executive as Project Coordinator, under terms of reference satisfactory to the Bank, within three months of effectiveness of the IBRD Loan.

Monitoring and evaluation of outcomes/results

24. The Project Coordinator will be responsible for coordination and monitoring of complete project progress and performance and the preparation of relevant reports. The Project Coordinator will facilitate coordination between BPC and MMEWR and such other agencies as required (*e.g.*, MFDP) and also be a focal point for the World Bank's supervision and other discussions of the project. The Project Coordinator will also organize regular and ad hoc meetings of implementing units (BPC, MMEWR) and attend Reference Group meetings.

25. The key indicators to be monitored and used in assessing project progress and evaluation of outcomes are described in "Annex 3—Results Framework and Monitoring." Specific data for gathering and reporting, including responsibility thereof, have been confirmed and agreed with BPC and the Government. A mid-term review would be carried out within approximately twenty-four months from effectiveness of the project.

Bank supervision plan and implementation support

26. The Bank supervision will be suitably matched to meet the requirements and the complex issues to be addressed under the project. The focus will be on anticipating and managing risks impacting on the project. Specifically, (a) fiscal risks from continuing impact of economic crisis and power plant construction schedule will be critical during the first two years, and (b) progress of alternative energy projects, local and regional air quality and water issues will gain critical importance in the subsequent period.

27. The supervision will be intensive in the early years when most risks are expected to surface, and also include field-based supervision as required. Procurement, monitoring and evaluation, and financial management workshops will be conducted early after effectiveness. The Bank team will be adequately staffed with required expertise, drawing from various parts of the Bank, as was done for preparing the project (see "Annex 13—Project Preparation and Supervision"). Power plant related matters will be given

priority in the early period of implementation and transmission part is being handled through advance procurement. At least three to four supervision missions will be undertaken during the initial years and include also safeguards and fiduciary staff.

28. The planned supervision missions and skill mix during the implementation are as below:

Table 27: Supervision plan

Planned Date	Main Activities	Skill Requirement
11/2009	Project Launch Workshop: Review implementation plan, conduct training / workshop for PMU staff and consultants on procurement, FMS, Disbursements, M&E and reporting aspects	TTL, Procurement Specialist, FMS, Disbursement Officer, M&E Specialist
2/2010	Supervision Mission: Review overall project progress focusing on power plant, transformer procurement, TA tasks, safeguards, interim tariff policy discussions, macro and financial risks review	TTL, Power Engineers, Country Economist, Safeguards Specialists, Tariffs and Regulatory Specialist, Communication Specialist
6/2010	Supervision Mission: Review overall project progress including air quality monitoring of Morupule A, design of Morupule B power station, transmission line procurement, RAPs, preparation for second phase of RESA, tariff policy and low-carbon growth studies, CBM strategy study, CSP feasibility study, HIV/AIDS aspects, macro review	TTL, Power Engineer, Environmental and Social Specialist, Tariff and Regulatory Specialist, CBM and CSP Specialists, HIV/AIDS Project Specialist, Country Economist
10/2010	Supervision Mission: Review overall progress including water pipeline procurement, tariff policy, regulatory framework, energy efficiency and CDM development, low-carbon growth strategy review, transmission control area establishment, MCL coal mining expansion work, BPC audit, procurement plan, rural access aspects, communications strategy	TTL, Power Engineers, Mining Specialist, Tariffs and Regulatory Specialist, Energy Efficiency and Carbon Finance, FMS, Procurement Specialist, Communication Specialist. Country Economist as required
02/2011	Supervision Mission: Review overall progress including preparation for test run of unit 1 of Morupule B, transformer and transmission line construction, MCL-Morupule B water pipeline construction, air quality monitoring of Morupule A, preparation for regulatory agency establishment, CCS feasibility study, CBM progress, safeguards capacity building TA	TTL, Power Engineers, Mining / CCS / CBM Specialists, Safeguards Specialists, Regulatory Specialist. Country Economist as required
06/2011	Supervision Mission: Review overall progress including test run results of unit 1, preparation for unit 2 test run, ash dam safety and design review, Isang substation procurement, pest management plan, procurement for Paje-Morupule water pipeline construction, CSP feasibility study and next steps, HIV/AIDS aspects, communications strategy outcomes	TTL, Power Engineer, Environmental Specialist, CSP Specialist, Carbon Finance and CTF Specialist, HIV/AIDS Project Specialist, Communication Specialist
11/2011	Supervision Mission and Mid-Term Review: Review of MTR report and overall progress on all components, including regulatory agency functioning,	TTL, Power Engineer, Regulatory Specialist, CBM and CCS Specialists, FMS, Procurement Specialist, Safeguards

Planned Date	Main Activities	Skill Requirement
	test run results for unit 1, CCS feasibility study draft report, CBM development, power plant, transmission and water pipeline construction progress, procurement plan, HIV/AIDS aspects, BPC audit, RAPs, rural access aspects, RESA second phase draft review	Specialists, HIV/AIDS Project Specialist. Country Economist as needed
04/2012	Supervision Mission: Review of overall progress including CBM and CSP next steps, CCS feasibility study review, air quality monitoring results and recommendations for Morupule A and test run results for Morupule B, combined operations of A and B and options for environmental controls, next steps on RESA second phase outcomes	TTL, Power Engineer, Environmental Specialist, CBM, CSP and CCS Specialists, Carbon Finance and CTF Specialist
10/2012	Supervision Mission: Review of overall progress including commissioning of Morupule B units 1 and 2, AGC systems and dispatch control systems, Morupule A ash diversion plans and environmental control measures, low-carbon growth strategy review, BPC Audit, tariffs and rural access aspects, procurement plan, CBM, CSP and CCS next steps	TTL, Power Engineer, Environmental Specialist, Tariffs / Regulatory Specialist, FMS, Procurement Specialist, CBM / CSP / CCS Specialists, Carbon Finance and CTF Specialist
04/2013	Supervision Mission: Review of overall progress including commissioning of units 3 and 4 of Morupule B, O&M preparedness, TA outcomes and next steps for CBM, CSP and CCS	TTL, Power Engineer, CBM / CSP / CCS Specialists
11/2013	Supervision and ICR Mission: Review of overall progress and preparation for project completion and report, low-carbon growth strategy review, review of CSP and CCS projects status and next steps. Assess project performance, results, outcomes, developmental etc., compared with the plan and discuss with the client the sustainability aspects for successful operation and development of energy sector in Botswana and its contribution to the regional energy development.	TTL, Power Engineer, CSP / CCS Specialists, Safeguards Specialists

29. Supervision missions will be coordinated and conducted jointly with AfDB whenever possible. Also, ICBC will be encouraged to participate in supervision missions. Staff in local and regional field offices will be included on priority to ensure improved responsiveness to the client.

30. Based on the above supervision plan, the Bank's supervision budget during FY10-14 is estimated as shown below:

FY10: US$250,000
FY11: US$350,000
FY12: US$350,000
FY13: US$300,000
FY14: US$200,000
Total: US$1,450,000

Annex 7: Financial Management and Disbursement Arrangements

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

1. The Bank conducted an FM assessment of BPC as required by the Bank's policy on Financial Management, OP 10.02, and in accordance with the provisions of the *Financial Management Practices in World Bank-Financed Investment Operations* dated November 3, 2005. BPC is the implementing agency for the proposed Morupule B project. The main objective of the assessment, which included a review of the budgeting, accounting, internal controls, flow of funds, financial reporting, auditing arrangements at BPC, and completion of FM assessment questionnaire by some officials of the agency, was to ensure that acceptable financial management arrangements are in place for the implementation of the project.

Acceptable FM arrangements ensure that:

- funds are used for the intended purposes in an efficient and economical way,
- all transactions and balances are correctly recorded to support preparation of regular and reliable financial statements that are subject to auditing arrangements acceptable to the Bank, and
- internal controls are considered capable of safeguarding the entity's assets.

2. BPC and the Government through MMEWR will implement the project, with BPC's Corporate Finance unit responsible for the FM aspects of the project implementation. BPC, established in June 1970, is wholly owned by the Government and dominates the electricity sector by owning substantially all of the electricity generation, transmission, and distribution assets in Botswana.

3. BPC's audited financial statements are acceptable to the Bank without a requirement for a separate audit report for the project, as described in paragraph 42.

4. The governance and accountability arrangements in place at BPC, coupled with the oversight responsibilities provided by MFDP and MMEWR, and the interest of the stakeholders and the public at large in the effective management of the corporation are acceptable for ensuring efficient and effective utilization of the project funds and reporting of the activities of the corporation as the project implementation entity. In addition, the internal and external auditors have unrestricted access to the Chairman of the Audit Committee of the Corporation's Board as a measure to ensure efficient and effective corporate governance. The internal audit manager also has direct access to the Botswana Directorate of Corruption and Economic Crime (DCEC).

5. Recent assessment of the FM systems of some of the government ministries and departments[60] concluded that there are acceptable budgeting, accounting, internal control, financial reporting, flow of funds, and external auditing arrangements at the government level.

6. The FM assessment identified the financial management risks that BPC may face in the implementation of the project, and proposed measures to mitigate the risks, as shown in Table 28 below. BPC's system is capable of managing the project expenditure efficiently and effectively: accounting for utilization of the loan proceeds; ensuring effective internal controls; produce the project financial statements; and ensure timely audit of the statements. The assessment, however, recommended the update of the outdated operating accounting policies and manuals. The overall FM risk is assessed as **Low** based on the proposed use of BPC's FM system, and the oversight arrangements imposed by government on its parastatals as well as the implementation of the FM action in Table 29. The overall conclusion of the assessment is that the proposed FM arrangements meet the Bank's minimum requirements under OP 10.02 Financial Management.

[60] The recent FM systems assessment refers to the recently negotiated loans for the Botswana National HIV/AIDS Prevention Support Project and the Integrated Transport Project.

Country issues

7. The Bank has not carried out any country analytic work in the recent past due to the fact that the Government had not taken loans from the Bank in the last two decades. The Government, however, signed a loan agreement with the Bank for the implementation of the Botswana National HIV/AIDS Prevention Support Project (P102299) in January 2009, and the loan for the implementation of the Integrated Transport Project (P102368), negotiated in April 2009 and approved by the Board in May 2009.

8. Based on the *Report on Observance of Standards and Codes-Accounting and Auditing* (A & A ROSC) assessment conducted by the Bank, an Institutional Development Fund grant was provided to the Government in September 2008 to strengthen its Institute of Accountants with the main objectives of setting and enforcing professional standards among its members; establishing a national professional qualification /accreditation systems; and improving the country's accounting and auditing curriculum.

9. The European Commission initiated and sponsored a Public Expenditure and Financial Accountability (PEFA) assessment of the Government in 2008. The "Draft Final" report of the assessment, which covered three fiscal years, FY06-08, was issued in October 2008. The PEFA report highlighted the existence of a measure of fiscal discipline, achieved through effective top-down discipline to budget process, as well as the effective cash and debt management and fair budget certainty. It also indicated that there is some financial monitoring of public enterprise operations, but not with a fairly careful assessment, using a comprehensive risk analysis framework. It further noted the important reforms undertaken recently, which included the implementation of the Government Accounting and Budgeting System (**GABS**), improvements in the revenue administration, and strengthening of external audit.

Overview of the project and implementation arrangement

10. The project is estimated to cost US$1.66 billion. Financing will be provided by the Government, BPC, AfDB, IBRD, and commercial banks. It is proposed that the Bank will provide US$136.4 million in loan and about US$242.7 million through a partial credit guarantee. The components are: (1) the Morupule generation expansion, consisting (a) Morupule B Power Station; (b) transmission system; and (c) water supply system; (2) Alternative Energy Development, and (3) Institutional and Capacity Building. A detailed description of the project and components is provided in "Annex 4—Detailed Project Description.

11. Details of the project implementation arrangements are provided in "Annex 6—Implementation Arrangements." The PMU established by BPC will oversee and coordinate the activities of the four functional units responsible for the implementation of the project. The PMU is headed by a Project Manager at a Director's level. The four functional units are the: power plant; transmission; safeguards; and finance and administration. The head of the Finance and Administration unit is functionally responsible to the Corporation's Chief Financial Officer and reports to the Head of the PMU on the Project's financial management.

12. To facilitate project implementation, the Government has established a Reference Group chaired by the District Commissioner and comprising the ex-officio members from the various local and national authorities, including the Ministry of Health, MEWT, Labor Board, Tribal Secretary, District Lands Officer, Planner, Development Officer, Water Engineer, Roads Engineer etc.

13. BPC will implement Component A of the project through the EPC Contract, which includes engineering, design, manufacturing, purchases, construction, installation, and commissioning. The EPC Contract has been awarded to CNEEC-SBW, the successful bidder for Component A(1) of the project. Due to capacity constraints at BPC, other technical and professional firms (engineering, financial advisory, insurance, and legal) have been procured and appointed to support the monitoring of the implementation of the EPC. Component A(2) and BPC part of the TA (Component C(1)) will be managed by the Transmission Engineering Unit, headed by the Director of Transmission and assisted by

four staff and consultants. This Unit will ensure coordination of AfDB and IBRD funded subcomponents. The Engineering Manager with the assistance of the assigned staff and consultants will oversee the physical construction and commissioning of the water supply system, Component A(3), as well as of Component A(1). MMEWR will oversee and manage the implementation of its part of the TA under Component B and C(2). The PMU will however assist in ensuring efficient and effective procurement and contracting of all the TA subcomponents, following the agreed procurement procedures. BPC will also be responsible for the FM of the MMEWR TA subcomponents, including disbursements.

14. For the FM implementation of the project, BPC will use its existing FM system with appropriate oversight by MMEWR and MFDP.

15. The following table shows the identified FM risks and the proposed mitigating measures.

Table 28: FM Risk Mitigation Assessment *Risk Rating: H (High), S (Substantial), M (Moderate), L (Low)*

Risk	Rating	Risk mitigation measures	Residual risk	Negotiation/ effectiveness condition (Y/N)
Country Level Government's contribution of the project cost may not be released promptly. Non or late provision of counterpart funds may impact the successful implementation of the project.	M	The Government, by its policy, provides for development projects in its NDP and annual budget. It was confirmed that the Government will provide its financial contribution through the budget when the loan is approved by Parliament. Release of the contribution will be based on the project quarterly unaudited interim financial reports.	M	N
Entity Level The corporate unit responsible for the FM of the project is not familiar with and therefore has limited knowledge of the Bank's FM and Disbursement policies and procedures.	M	The Bank will conduct a comprehensive training on the Bank's FM and Disbursement policies and procedures by effectiveness of the loan agreement. Staff of the Corporate Finance and the Internal Audit units will be encouraged to participate in the Bank's periodic training program in FM and disbursement, and in courses organized by Bank recognized training institutions. MFDP will be responsible for the preparation and submission of withdrawal applications. The Ministry is familiar with some donors' FM/Disbursement procedures, but not fully with the Bank's procedures. The Bank FM Specialist provided training to the Finance and Budget staff of the MFDP and some other ministries and departments in Gaborone during FY08/09.	L	N

Risk	Rating	Risk mitigation measures	Residual risk	Negotiation/ effectiveness condition (Y/N)
Project Level The observed strong investment drive of BPC may impact flow of funds to the contractors and other beneficiaries.	L	The Internal Audit Field Team Unit will submit to the Audit Committee quarterly reports on the financial and operational audit of the project, including the operation and use of the Designated Account. The external auditors will also give an opinion on the use and operation of the Account. BPC will open and maintain a dedicated USD project account for the implementation of the Bank financed components of the project. BPC will also maintain a dedicated local currency account into which Government will effect quarterly releases of the local currency equivalent of its contribution for the implementation of the Government financed components and activities.	L	N
Control Risk Budgeting: due to the nature of the project, the risk that budget process may not be based on realistic cost estimates and procedures for approvals and variations may not be clearly laid out.	M	BPC's 2009/10 annual budget included the operational budget for the implementation of the project, and the capital budget for all the components of the project and already reviewed by the Board's Tender Committee.	L	N
Accounting No identified risk at this stage. BPC prepares monthly financial statements reviewed by the audit committee of the Board. The corporation uses the SYSPRO accounting software, which is capable of producing the required financial reports. The Corporate Finance unit is staffed with professionally qualified accountants as the heads of the four sections within the unit, except the manager of the supply chain unit who is a degree holder and a member of the Institute of Purchasing and Supply.		NA	NA	NA

Risk	Rating	Risk mitigation measures	Residual risk	Negotiation/ effectiveness condition (Y/N)
Internal Control The risk that accounting policies and procedures to be applied may not be current, and that desired procedures may not be followed consistently posing a weak control environment.	M	BPC has an effective Internal Audit Unit. The Internal Audit Manager has unrestricted access to the chairman of the Audit Committee. The Committee oversees BPC's internal control systems and their effectiveness. The noted outdated accounting policies and procedures were updated and approved by BPC's management prior to negotiation.	M	No longer applicable
Funds Flow The risk of timely settlement of contractors and suppliers invoices and certificates as a result of likely placement of funds in fixed deposits.	M	BPC will maintain a separate bank account for the funds received from MFDP under the IBRD Loan for the implementation of the Bank financed components of the project. The quarterly disbursement from MFDP will be based on the contractors' agreed schedule of payments and cash forecasts.	M	N
Financial Reporting Timeliness of reporting to MMEWR that could impact on the submission of IFRs to MFDP and the Bank.	M	BPC produces timely monthly financial statements and submits same to the Audit Committee for discussion. BPC will produce quarterly IFRs through its system and submit the reports to MFDP through MMEWR. Quarterly submission of the reports will be as agreed with Government in the loan agreement. MMEWR will review and provide comments (if any) to MFDP within five days (*i.e.*, 35 days of the end of the reporting quarter).	L	N
Auditing No specific audit risk. Section 17 of the *BPC Act* requires BPC to produce annual audited financial statements. The reviewed audited financial statements for the three fiscal years ended March 31, 2008 were signed by the auditors in August each year.				N

Risk	Rating	Risk mitigation measures	Residual risk	Negotiation/ effectiveness condition (Y/N)
Overall FM Risk Rating	M	The overall FM residual risk is "Low" with the implementation of the FM action described in Table 29 below. The country, entity, and project levels inherent risks are mitigated by use of BPC's FM system, assessed as satisfactory for the implementation of the project, and the functioning oversight arrangements provided by MMEWR and MFDP. The BPC's FM system is strengthened by the Corporate Finance Unit having adequate number of qualified accountants and being timely in the preparation and submission of monitoring financial reports and annual financial statements as well as the presentation of annual audit reports to the relevant committees of the BPC's board. The activities of the project will also be subjected to internal audit.	L	

The implementing entity (BPC)

16. BPC operates under a Board, appointed by the Minister of MMEWR, while the chief executive officer (CEO) of the corporation is appointed by the BPC Board.

17. Section 17 of the *BPC Act* requires BPC to, among others, set its charges to customers at a level that will ensure sufficient revenue on the fair value of its assets, sufficient to meet obligations on interest and loan repayments, investment requirements, reserves, and dividend payments to the Government. The *BPC Act* gives BPC the power to establish tariffs to meet the requirements of Section 17. Proposed tariffs are, however, subject to the approval of the Minister of MMEWR.

18. The Corporation consists of nine operating units and currently serves about 167,000 consumers in four recognized categories: mining, commercial, domestic and government. The nine units include the five strategic business units Corporate Services, Customer Services and Supply, Generation, Rural, and Transmission) and the four corporate support units (Human Resources, Corporate Finance, Internal Audit, and Office of the Corporation Secretary.

19. **The Board Committees** include the following:

(i) **Executive Committee**, responsible for the consideration of all matters of policy and other matters with significant impact on the business of the corporation, unless such matters fall under the jurisdiction of other committees of the Board.
(ii) **Tender Committee**, authorized to ensure and enforce the application of the corporation's tender regulations and tender adjudication on procurement of goods and services with values of BWP 500,000.

(iii) **Finance Committee**, a five-member committee with the mandate of considering financial performance of investments, corporate budgets, and other financial matters before the adoption and approval of the Board.

(iv) **Audit Committee** has the specific mandate to review the financial statements with external auditors before board approval; ensure the effectiveness of the internal audit function; review significant and extraordinary transactions; ensure effective mitigating measures against identified business risks; ensure the carrying out and effectiveness of the annual statutory audits; review accounting policies and guide on amendments thereto; and generally oversee systems of internal controls and their effectiveness.

20. **Ad-hoc committee/coordination committee**. In addition and due to the importance and magnitude of the proposed project, the Board has constituted a coordination committee to be dissolved upon completion and delivery of the project. The mandate of the committee is to monitor project execution and advise the Board on strategic and policy issues. It is currently a four member committee chaired by the vice chairman of the Board.

21. **Major strength**. The project FM is strengthened by the adequate external audit arrangements and the noted timely production of the financial statements and audit thereof within a period of five months. External auditors' observations and recommendations are followed-up promptly by the Audit Committee.

22. **Weaknesses and action plan**. The financial and accounting policies and manuals for finance, cash count dated January 3, 1992, the purchasing manual and procedures dated August 5, 2000 and some others were noted to be outdated; these policies and manuals were reviewed, updated and approved by BPC board prior to negotiations. Submission of regular reports to MMEWR was cited by the Ministry as a major weakness and lateness in the production of the IFRs or non-submission of the reports may impact on the effective and timely delivery of the project. This is rectified as BPC will produce and submit quarterly IFRs to MFDP through MMEWR as provided for in the loan agreement Since BPC has not been involved in the implementation of Bank financed projects, the Bank's FM specialist will deliver workshops on the Bank's financial management and disbursement, policies and procedures, including reporting requirements. BPC's Corporate Finance unit staff will also be encouraged to attend training programs offered by Bank accredited training institutions. .

23. The table below indicates the key F M actions to be taken.

Table 29: FM action plan

Action	Effective date	Responsibility
Conduct training of BPC accounting staff in Bank financial management and disbursement procedures	After Effectiveness	BPC and FM Specialist and LOA Finance Officer

24. **Budgeting**. Budgeting for the project has been done and will be reviewed for consideration and approval by the Board and the Government. The 2009/2010 Government-approved budget only provided for the ICBC-financed component since the proposed IBRD Loan had not been approved by Parliament. BPC however received the sum of BWP 1.5 billion in October 2008 through MMEWR, as approved by the cabinet and provided for in the fiscal year's budget, for the mobilization of the EPC Contractor. The BPC management accounting and systems department is responsible for the coordination of the corporation's budget. Budgeting process starts in July/August each year with budget circular from the office of the CEO. Each business unit prepares strategic agenda—a five year business plan with mandates and achievements, risks, and steps to be taken to achieve the budget. The final draft budget is defended by each directorate and the revised budget submitted by the CEO to the Board for approval, through the Finance Committee.

25. Government ministries, including MMEWR use the GABS for budgeting, accounting and financial reporting. MMEWR will defend the project's annual budget under the ministry's budget, but as a line item. The ministry will also submit "Project Memo" to MFDP on quarterly basis, requesting for funds to finance the Bank's eligible expenditure.

26. **Accounting**. The Corporate Finance unit is headed by the Chief Financial Officer, a professionally qualified accountant, and consists of four units, which are the: i) financial accounting; ii) treasury; iii) management accounting and systems; and iv) the supply chain. Each unit is headed by a professionally qualified accountant except for the manager of the supply chain unit. Implementing the external auditors' recommendation, BPC recruited two professionally qualified accountants in FY09 to enhance supervisory controls. BPC uses the SYSPRO accounting software and the financial statements are prepared in accordance with International Financial Reporting Standards (IFRS)

27. **Revenue and Expenditure**. The Customer Services and Supply Business unit is responsible for billing consumers for payment of electricity consumption on a monthly basis. The unit is headed by the Accounts Operations Manager, a professionally qualified accountant, and produces monthly performance reports on sales, including cash collections. Expenditure payments are centralized at the Corporate Finance Unit.

28. **Staffing**. The Corporation has staff strength of about 2,000 in total with 90 of them in the Corporate Finance unit.

Internal control and internal audit arrangements

29. **Internal control**. Approval and authorization controls are documented in the policies and procedures manual and compliance therewith is monitored by well experienced accounting staff. The financial and accounting policies and manuals, including the payment, purchasing manual and procedures stock purchasing, payments processing will be adopted for the project.

30. Update of the fixed assets register to agree with the cost/valuation of assets recorded in the general ledger was expected to be completed by March 31, 2009, but completed in May 2009. The data will be transferred into the FM systems upon the completion of the FY08/09 audit to ensure inclusion of the FY08/09 closing balances.

31. **Internal audit**. The internal audit department is headed by the internal audit manager, a holder of a master's degree in accounting and finance and also a member of the Institute of Internal Auditors. The internal audit manager reports to the Board functionally, through the Internal Audit Committee, and to the CEO administratively. The department consists of three units headed by managers: (i) Field Teams, which focus on financial and operational audits; (ii) Project Audits; and (iii) Information Technology Audits. The department has thirteen established positions, out of which eight were occupied by professionally qualified accountants. This situation is unusual in Botswana because BPC operates outside the civil service salary scales. The internal control functions of the project will be managed by the department.

Financial reporting

32. The project will produce and submit interim unaudited financial reports (IFRs) to the Bank on quarterly basis. These reports are designed to provide sufficiently detailed and timely information to the project management, the coordination committee, MFDP, and MMEWR, and will include:

(i) A narrative summary of the project implementation highlights;
(ii) Sources and uses of funds by disbursement categories;
(iii) Uses of funds by project component/activity- both actual and cumulative;
(iv) The Designated Account Activity statement;
(v) Summary of payments made for contracts subject to the Bank's prior review; and
(vi) Summary of payments made for contracts not subject to the Bank's prior review.

The quarterly Sources and Uses of Funds report will reflect contributions from all the financiers and utilization of the funds, while the reports listed in (iii) to (vi) will reflect Bank-eligible expenditures only.

33. BPC's accounting system is capable of producing the quarterly reports. The reports will be submitted to MMEWR with relevant supporting documentations within 30 days of the end of the reporting quarter. The format and contents of the reports were discussed with BPC and agreed at negotiation. MMEWR will review and submit the reports and supporting documentations with comments to MFDP within 35 days of the end of the reporting period. Final review and submission of the reports to the Bank by MFDP is within 45 days of the end of the reporting period. BPC produces monthly financial statements that provide information on the corporation's performance highlights, and ratio analysis (liquidity, gross margin, net margin etc.). The annual financial statements are produced by the system and submitted to the Corporation's auditors for annual audit.

Funds flow and disbursement arrangements

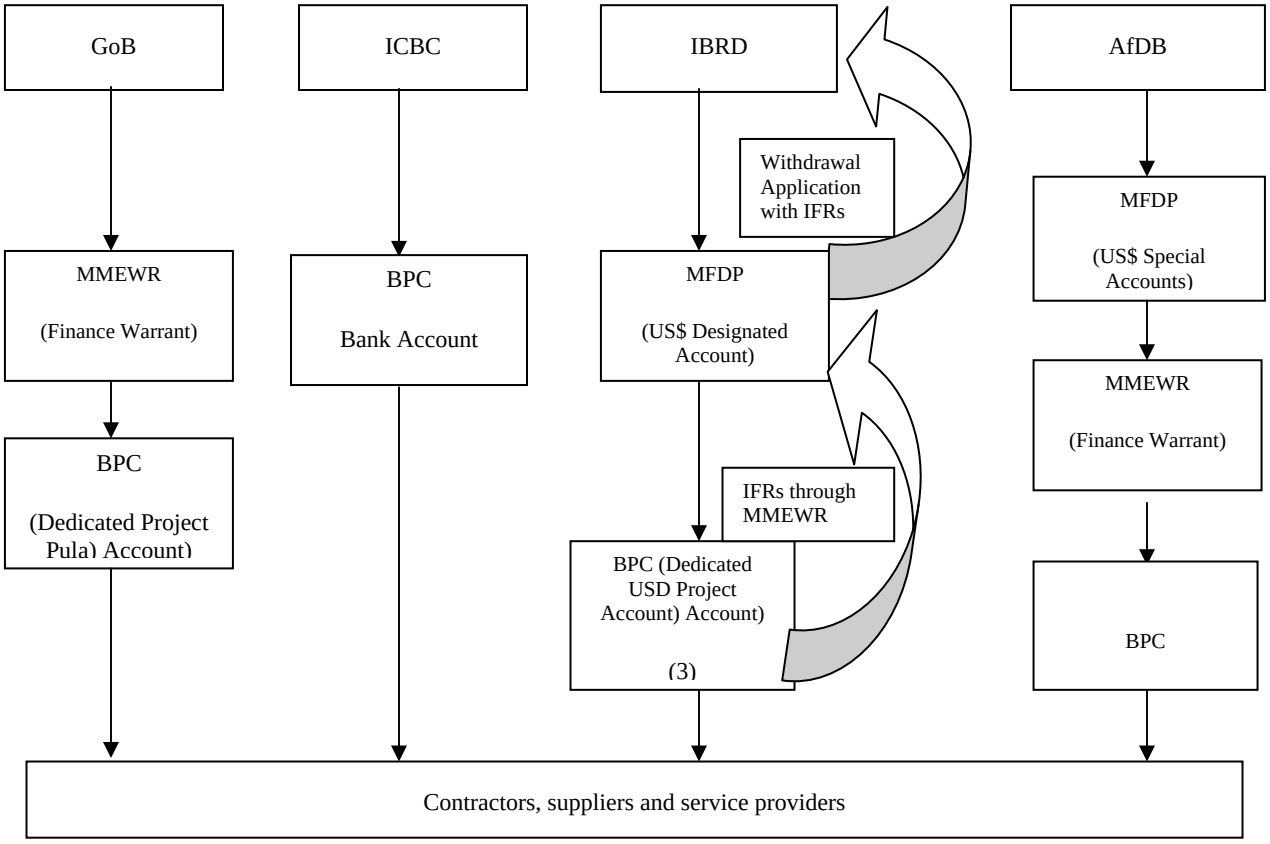
34. **Flow of funds**. Upon the signing of the Loan Agreement, the Bank will open a Loan Account in its books, in the name of the Government. Under a subsidiary agreement, the Government (through MFDP) will contribute funds to BPC towards the agreed subcomponents of Components A (2), A (3), B, C (1), and C(2) procured by BPC under World Bank procurement guidelines. Funds will flow from the Bank (Loan Account) into a US$ Designated Account (DA) maintained by the Government through MFDP at the Bank of Botswana. For the implementation of the Bank financed subcomponents of the project, BPC will maintain a USD Dedicated Project Account (DPA) into which funds will flow from the DA based on IFRs. BPC will also maintain a local currency DPA for the receipt of Government's contributions for its financed components, including the Government's share of the Bank financed subcomponents.

35. **Disbursement arrangements**. The project will use the Advance Disbursement method whereby withdrawals from the loan account will be deposited in the DA for payment of the Bank financed eligible expenditures. Disbursements from the loan account will be based on quarterly IFR documentation to be prepared and submitted by BPC to MFDP through MMEWR. The IFRs will be supported by documentations as may be required by MFDP. The submission will be within 30 days of the end of the reporting quarter. After appropriate review, MMEWR will submit the IFRs and the supporting documentation to MFDP. For withdrawal from the loan account, MFDP will be responsible for submitting withdrawal applications supported by IFRs, within 45 days of the end of each reporting period. The Government will also have the option of using: (i) the Direct Payment disbursement method involving direct payment from the Loan Account on behalf of the Government to suppliers of goods and services that have a value above a set threshold; (ii) the Reimbursement disbursement method, whereby the Government makes payments for the Bank eligible expenditures and submits withdrawal application for reimbursement; and (iii) the Special Commitment method whereby the Bank at the request of the Government, will issue special commitments to suppliers of goods under the Bank financed components. Upon the effectiveness of the loan agreement and submission of a withdrawal application, the Bank will disburse an amount equivalent to six months expenditure into the DA. Subsequent disbursements will be based on six-monthly estimated expenditure, taking into account the balance in the DA and the DPA at the end of the reporting period. Similarly, upon the effectiveness of the loan agreement, MMEWR will submit a request for funds to MFDP through the Director, Development Budget, also for an estimated six-month expenditure based on the project approved work plan. Subsequent disbursements by Government into the local currency DPA will be on quarterly basis as described for the Bank disbursements.

36. **Other financiers' flow of funds and disbursement arrangements**. AfDB advances will flow directly into Special Accounts as will be agreed in the loan agreement to be signed with the Government, while advances from ICBC will flow directly into one of the BPC's bank accounts in Botswana or as otherwise designated. The flow of funds from these financiers will be described in their respective loan documents.

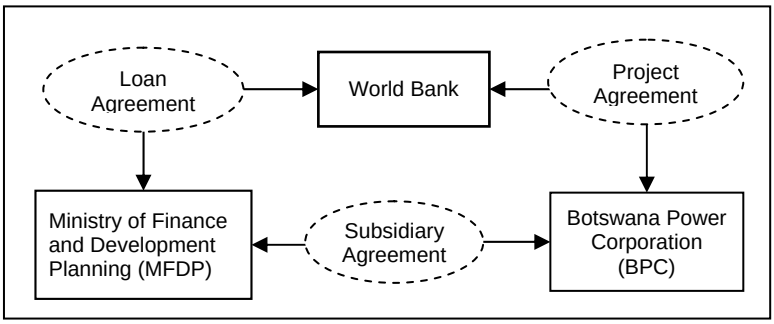
37. **Retroactive financing**. A retroactive financing arrangement of up to 20% of loan amount (US$27.8 million) will be provided to cover payments made prior to the signing of the Loan Agreement but on or after September 1, 2009, for all eligible expenditures financed by the Bank loan.

Chart 3: Flow of funds diagram



Note: GoB will finance 15%, 5% and 5% respectively of the expenditures in categories 1, 2, and 3 indicated in the Table 30 below.

Chart 4: IBRD Loan Structure



Allocation of the IBRD Loan proceeds

38. The following table shows the allocation of the proceeds of the IBRD Loan.

Table 30: Allocation of IBRD Loan proceeds

Disbursement Category	Amount of the Loan allocated (US$)	Percentage of expenditures to be financed (including taxes)
1. Goods and works under Component A(2) (a), (c), (f) and A(3) of the Project	124,100,000	85%
2. Consultant services under Component B and Component C(1) (a) to (d) and (C)(2) (b) and (c) of the Project	11,800,000	95%
3. Training and workshops under Component C(1)(e) and C(2)(d) of the Project	500,000	95%
Total	**136,400,000**	

Auditing arrangements

39. Section 17 of the *BPC Act* stipulates production of annual audited financial statements (**FS**). The FS together with the auditors' report supported by a comprehensive operational report are submitted on annual basis to the Minister of MMEWR for review and submission to the National Assembly.

40. BPC's auditors are appointed on a five-yearly basis. However, the firm of Pricewaterhouse Coopers audited BPC for seven years, including the last two years of the restructuring of the corporation. The firm of Deloitte & Touche (South Africa) has been appointed as the auditors for the corporation with effect from the 2008/2009 fiscal year. BPC operates the Government's fiscal year of April to March.

41. The annual audit is conducted in accordance with the International Standards on Auditing. BPC's FS which will include the project financial activities will be submitted to the Bank within six months of the end of the financial year, that is, by September 30 each year. The submission will include the auditors' report, management letter, and management's response thereto as an attachment to the FS.

42. **Audited financial statements**. BPC's FS will be acceptable to the Bank without a requirement for a separate audit report for the project. The auditors will, however, express an opinion on the quality of IFRs produced and submitted to the Bank during the period covered by the audit. The FS will also include a summary of all the withdrawals from the loan account during the period with assertion that the loan proceeds had been used for the intended purposes and in accordance with the Bank legal agreements. The Government will prepare the audit terms of reference in consultation with the Bank to ensure adequate coverage of the scope of the audit. The auditors will in addition provide special opinions on the provision and usage of and delivery of specified/agreed outputs/services—power station, transmission system, and water supply system as well as the operation and usage of the DA.

43. A review of BPC's FS for the 2006 to 2008 fiscal years) revealed that the Corporation made operating losses, but overall insignificant profit in each year, arising from income realized on its investments, which comprised income on cash deposits and long-term investments. The FS also provided for dividend to the Government each year, mainly out of its investment income. In addition to the waiver obtained in 2006, BPC has requested for a waiver of payment of the 2007/2008 dividends to the Government. The FS also indicated that BPC's borrowings were mainly from the Government and some international agencies, while the borrowings from international agencies are secured by the Government. The audit report for the period reviewed were available online, except for the 2006-2007 audit report.

44. **Office of the Auditor General**. By the Public Accounts Committee's (PAC) directive, BPC and other parastatals submit their annual audited FS to the Auditor General (AG) for review and inclusion in

the AG's annual audit report. BPC and the parastatals are however required to appear before the PAC with their parent ministries.

45. The following table identifies the audit reports that are required to be submitted to the Bank by the Government and the due date for submission.

Table 31: Audit reports

Audit report	Due date
Continuing Entity Financial Statements- April-March	September 30 each year
Special opinion on the: (i) quality of the IFRs used for withdrawal from the Loan Account (ii) Provision and usage of counterpart funds (iii) Operation and usage of the DA (iv) Delivery of specified/agreed output/services- power station, transmission and water supply systems	As part of the annual audit report

Conditionality

46. Actions to be taken by Effectiveness: None

47. Financial covenants: (a) Maintain the financial management system including records, and accounts in accordance with the terms of the IBRD Loan Agreement; (b) Prepare and furnish to the Bank, not later than 45 days after the end of each quarter, interim unaudited financial reports for the project covering the quarter, in form and substance satisfactory to the bank; and (c) Have BPC's financial statements audited (incorporating the project financial activities) in accordance with the provisions of Section 5.09 (b) of the General Conditions. Each audit shall cover the period of one year and shall be submitted to the Bank not later than six months after the end of the Government's fiscal year, that is, by September 30 each year.

Supervision plan

48. Based on the project's "Low" FM risk rating, the Bank will carry out the onsite FM supervision of the project once a year. In addition, the Bank's FM specialist will carry out desk-based quarterly review of the IFRs and the annual audit reports.

Governance and accountability

49. BPC's governance arrangements and the oversight provided by the Government through MMEWR, MFDP, and other stakeholders, which include the general public, are considered adequate for the implementation of the project.

50. The internal audit manager and the external auditors have unlimited access to the chairman of the board. The internal audit manager also has access to the DCEC either through the CEO, the audit committee, the board or directly, depending on the issues at stake. BPC, through the internal audit unit, was working on the establishment of a "tip-off and anonymous" (whistle blowing) service provided by the firm of Deloitte & Touche (South Africa). A contract has been prepared, and was awaiting management review and recommendation to the Board for approval.

Overall conclusion

51. Based on the proposal to use BPC's FM system for accounting and reporting the project receipts, expenditures and asset management, including commitments, the overall conclusion of the assessment of the system is that the proposed FM arrangements meet the Bank's minimum requirements for financial management under OP 10.02.

Annex 8: Procurement Arrangements

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

PROCUREMENT OF GOODS AND WORKS FINANCED BY OTHERS GUARANTEED BY IBRD COMPONENT A(1)

1. The Government has requested the provision of an PCG for the financing by commercial lenders of the EPC Contract for the Morupule B Power Station (Component A(1)). The Bank's procurement guidelines for PCGs require that goods and services must be procured with due regard to economy and efficiency (paragraphs 1.5 and 3.16 of the *Guidelines*). BPC, as the project implementing agency, is responsible for selecting the EPC Contractor for design, engineering, procurement, construction, and start-up of the power station. BPC, with the services of international consultants, conducted international competitive bidding for the EPC Contract. The EPC Contract was signed in November 2008.

Background

2. The proposed Morupule B Power Station was procured under EPC Contract terms, described in "Annex 4—Detailed Project Description." The cost of the signed EPC Contract for the power plant is shown in "Annex 5—Project Costs."

3. In September 2006, BPC appointed Fichtner Consulting Engineers (Fichtner), Germany as consultant for the preparation of the prequalification and tender documents as well as evaluation of bids and construction supervision. With the assistance of the European Investment Bank (EIB), in March 2007, a procurement notice was placed in the online Supplement to the Official Journal of the European Union.[61]

Prequalification

4. BPC received four applications for prequalification. All four applicants were pre-qualified in May 2007, as follows:

1. Alstom Power (France)
2. Bharat Heavy Electricals Limited (BHEL) (India)
3. China National Electric Equipment Corporation with Dongfang Electric Corporation (CNEEC-DEC) (China)
4. Dongfang Electric Corporation with Zelan Berhad (DEC-ZELAN) (China/Malaysia)

During the bid preparation period, the third consortium above changed to China National Electric Equipment Corporation with Shenyang Blower Works (CNEEC-SBW) and BPC confirmed that this consortium met the prequalification criteria.

Bidding

5. BPC made tender documents available to the four prequalified bidders in July 2007 and CNEEC-SBW and DEC-ZELAN submitted bids on December 14, 2007. Alstom informed BPC that they did not have the capacity to meet the required schedule. Whereas BHEL did not formally state why they would not bid, they had earlier suggested that they would be more competitive supplying larger units; this was unacceptable to BPC due to the negative implications it would have on their power system reliability requirement.

[61] See notice 2007/S 58-070689 at <http://ted.europa.eu/>.

Bid evaluation and pre-contract award discussion

6. The evaluation was based on a 70/30 points system, for technical/price, respectively, with the recommended bidder being the one who scored the highest combined score. As it happened, the bidder with the highest technical score also offered the lowest evaluated price. The bid opening prices are as follows:

- CNEEC-SBW US$697,800,000.00
- DEC-ZELAN US$734,920,837.00
  BWP 1,267,993,165.00
  South African Rand (ZAR) 97,239,852.00
  = US$956,365,579.00 at exch. rates as of Dec. 14, 2007

During clarification discussions with each bidder, to bring each into compliance, technical and commercial adjustments were made to each bid. The evaluated prices increased to the following:

- CNEEC-SBW US$918.91 million
- DEC-ZELAN US$1050.27 million

In addition, prices were fixed for the first 6 months and bidders were asked to propose the escalation method for the period from the 7th month till the end of the bid validity period. Also, additional amounts were added to each bid in respect of import duties and taxes. On October 27, 2008, BPC invited CNEEC-SBW, the winning bidder to negotiate the EPC Contract, which would lead to the award of contract. The EPC Contract was signed in November 2008.

Table 32: EPC procurement schedule

Activity	Date
Prequalification notice	March 23, 2007
Prequalification application submission	April 13, 2007
Prequalification notification	May 25, 2007
Tender document distribution	July 17, 2007
Receipt of bids	December 14, 2007
Invitation to negotiate	October 27, 2008
Signing of EPC Contract	November 15, 2008

Benchmarking

7. During 2005-2008, power equipment prices went up significantly due to increased demand in China, India, Middle East, the United States, and other parts of the world, and limited supply capacity. It has been common to observe 30 to 50 percent increases compared with the prices a few years earlier. In some cases, a 100 percent increase was observed. Therefore, EPC price of the boiler, turbine, and balance of the coal-fired power plants sometimes exceeds US$2,000/kW for large units (500 MW or above). Smaller unit sizes like Morupule B (150 MW) could have been higher than US$2,500/kW if OECD suppliers were to bid. OECD suppliers would also need an extended period of construction due to lack of designers, materials, and skilled workers. It may take over five years to complete construction for OECD suppliers.

8. The Chinese market, on the other hand, remained independent from other parts of the world, and the construction cost of their coal-fired power plants was relatively low at the beginning of 2008. The large supercritical units constructed in China were reported to be constructed at the price of around US$700-800/kW with a construction period of around three years. The smaller unit may be a bit higher than the large unit, but could be constructed below US$1,000/kW in the Chinese market. Chinese contractors have higher costs and charge more outside of China.

9. The EPC Contract price of about US$1,750/kW (without custom duties and withholding tax) is, therefore, a reasonable price considering the international standard. Also, a construction period of less than four years is only achieved by Chinese bidders in the current market conditions.

Conclusion

10. The Bank finds that although the procurement process deviated in significant ways from the Bank's standard bidding documents, especially concerning point scoring and different commercial requirements, the evaluation process was in accordance with the tender document requirements and the deficiencies have been sufficiently clarified and corrected prior to contract award. It also finds that the prices offered by the two bidders are comparable to those offered under international competitive bidding in several other parts of the world. It concludes that the procurement process has reasonably followed the provisions of paragraph 3.16 of the Guidelines, on which basis the Bank could guarantee loans for the project made by other lenders, and therefore supports the selection of CNEEC-SBW for the EPC Contract.

PROCUREMENT OF GOODS AND WORKS FINANCED BY IBRD COMPONENTS A(2), A(3), B, AND C

General

11. Procurement under the project would be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised October 2006 (referred to herein as the Procurement Guidelines) and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004 revised October 2006 (referred to herein as the Consultant Guidelines) and the provisions stipulated in the Legal Agreement. The Bank's SBD shall be used for procurement of goods and works under both ICB and NCB. Bank's Standard RFP shall be used for selection of consultants. The general descriptions of various items under different expenditure category are described below. For each contract to be financed by the IBRD Loan, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and timeframe would be agreed between the Borrower and the Bank in the Procurement Plan. **The prior review and procurement method thresholds indicated below are intended for the initial Procurement Plan.** The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvement in institutional capacity.

12. **Procurement of civil works (US$140.1million equivalent)**. The Bank financed civil works component of the project will include supply and installation of the following: (i) 400 kV Morupule to Phokoje line and associated works for the intertie between Morupule B and 220 kV lines deviation (Estimated at US$51.77 million), (ii) supply **and installation of three No. 315 MVA 400/220 kV transformers at Isang and Morupule B substations (estimated at** US$35.40 million) and (iii) construction of backup water supply facilities (gathering well and pipeline) for the power generation plant (estimated at US$53.3 million). All procurement will be undertaken on **post qualification** basis on the following grounds: (i) the components are critical to the start up of the Morupule B Power Station and have to be completed by January 2012 in line with the EPC Contract schedule and the Borrower has asked for advance procurement to ensure timely implementation; (ii) the power transmission lines and installation of transformer are not complex works and they use standard technology; (iii) the high cost is due to the quantities involved; (iv) the water supply system will be fully designed by consultants such that the tender preparation costs for the bidders would not be significant; and (iv) market experience show that there are few bidders who could undertake such power installation works and hence there would be no real advantage to undertake prequalification. Works estimated to cost US$3million equivalent and above shall be procured through International Competitive Bidding (ICB) using Bank Standard Bidding Documents (SBD). Works estimated to cost less than US$3million may be procured through National Competitive Bidding using Bank SBD. For procurement under NCB, the following provisions shall apply: (i) foreign bidders shall be not be excluded , if they so wish, to participate (ii) registration /

classification of bidders shall not be used as a condition for bidding but may be used as a condition of award; (iii) domestic preference shall not be applied; (iv) negotiations shall not be held with successful bidder for procurement of goods and works; and (v) contracts with contractors shall include a provision that contractors shall permit the Bank to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by the Bank pursuant to paragraph 1.14 (a) (v) (bb) of the Procurement Guidelines.

13. **Procurement of goods (estimated to cost US$1.6 million equivalent)**. Bank-financed goods procured under this project will include of AGC equipment. A consultant will be hired under the project to assess and design the upgrade of the existing equipment and software. It was agreed at appraisal that the AGC equipment may be procured through direct contracting with existing vendor subject to justification by BPC and recommendation by the consultants. In general, however, goods estimated to cost US$500,000 equivalent or more per contract shall be procured under ICB procurement method. SBD will be used.

14. **Selection of consultants (estimated to cost US$13.20 million equivalent)**. Consulting services under the project will include (i) transmission system harmonic study; (ii) transmission control area establishment; and (iii) transmission system operations training, among others. Except as detailed below, consulting services will be selected through competition among qualified short-listed firms based on Quality and Cost-Based Selection (QCBS). Consulting services by firms estimated to cost less than US$200,000 equivalent may be selected on the basis of Selection Based on the Consultant Qualifications (CQS). As appropriate, other selection methods such as Fixed Budget (FBS) or Quality-Based Selection (QBS) may be used for selection of consulting firms. Individual consultants shall be selected on the basis of Individual Consultant Selection method (IC) as per Section V of the Consultant Guidelines.

15. **Single-Source Selection of Consultants (**SSS**)**. As per initial plan, no single source consulting assignments are envisaged.

16. **Training and workshops**. The Bank-financed training under the project will be undertaken through a consultancy assignments as described above; however when appropriate, training may also be procured on the basis of SSS subject to review and approval by the Bank. When training takes place at a trainer's location, appropriate travel and subsistence costs would also be covered for trainees. When required, the PMU will formulate a training plan and budget which will be submitted to the Bank for its prior review and approval. The training plan will, *inter alia*, identify: (a) the training envisaged, (b) the justification for the training, (c) the personnel to be trained, (d) the location, selection methods of institutions or individuals conducting such training, (e) the institutions which will conduct training, if already selected, (f) the duration of proposed training, and (g) the cost estimate of the training.

17. **Short-lists of consultants**. Short-lists of consultants for services estimated to cost less than US$200,000 equivalent per contract may be comprised entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

18. **Prior review by the Bank**. The Borrower shall seek World Bank prior review in accordance with Appendix 1 of both Procurement and Consultant Guidelines for contracts above the thresholds as agreed in the Procurement Plan. For purposes of the initial Procurement Plan, the Borrower shall seek Bank prior review for (i) each contract for works estimated to cost US$3 million equivalent or more; (ii) each contract for goods estimated to cost US$500,000 equivalent or more, (ii) each contract for consultancy services with firms estimated to cost US$200,000 equivalent or more, (iii) each contract with individual consultants estimated to cost US$100,000 equivalent or more, (iv) each to be undertaken through single source selection estimated to cost US$1,000 equivalent and above, and (v) annual training plan. These prior-review thresholds will be reviewed annually and any revisions based on reassessment of the implementing agencies capacity will be agreed with the Borrower in an updated Procurement Plan. All other contracts will be post-reviewed during supervision missions.

19. **Procurement Plan**. BPC's Procurement Plan for project implementation has been discussed in detail and agreed during appraisal and cleared by the Bank. This plan will form the basis of procurement for the first eighteen months. The plan will be available at BPC offices and also be available in the project's database and in the Bank's external website. The Procurement Plan will be updated in agreement with the Bank annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

20. **BPC procurement capacity assessment**. The Transmission Business Directorate will coordinate all procurement activities of the project. Technical inputs will be provided by other specialized units such as Strategic Projects Unit and Corporate services as appropriate. The Supply Management Unit will manage the procurement process including issuing out tender documents, receipt of tenders and arranging for tender evaluation in agreement with technical units. Within the Transmission Business Directorate, the Projects and Technical Services Division will be responsible for day-to-day preparation of tender documents and contract management. BPC with its own funds has engaged three consultants who are assisting in the design of contract packages, preparation of bid documents, and adjudication of tenders for power transmission lines and transformer installation. BPC has engaged a consultant to design the backup water supply system including preparation of tender documents, which is expected to be completed by December 2009. A procurement capacity assessment of the BPC was undertaken by the Bank in February 2009. The key findings from the assessment are summarized below:

(a) **Legal aspects and procurement practices**. BPC is a statutory corporation, wholly owned by the Government, with legal mandate to enter into contracts. BPC has a board of directors appointed by the Minister responsible. The board has a Board Tender Committee comprised of five members of the board who are responsible for award of contract estimated to cost US$70,000 (about BWP 500,000) and above. A Management Tender Committee is responsible for award of contracts below this threshold. As a parastatal, BPC is not covered under the *Public Procurement and Asset Disposal Act* but has its own tender regulations that provide the policy and procedures for adjudication of tenders. The tender regulations provide adequate policy and procedures on procurement and in addition provides staff with adequate guidance on ethics and conflicts of interest. However, regulations do not clearly provide for standard bidding documents, procurement planning, does not have clear policy on ICB, does not have provisions of independent review of complaints by bidders and provide a wide range of cost preference to even service providers. In adequacies in regulations may lead into delays, use of uncompetitive procurement methods and non objective preference schemes. Bidding documents that are specifically adopted for each contract create uncertainty in bidders on the provisions of bidding documents

(b) **Quality, transparency, and efficiency of procurement**. BPC has strategic plan for projects it undertakes. However, procurement planning and regular follow up of compliance is not systematically carried out. Preparation of bidding documents is carried out by technical specialists with assistance from consultants. Staff has little familiarity with SBDs as most of their contracts are normally financed by their own funding. Evaluation of bids is undertaken by technical specialists with assistance from consultants and evaluation reports are prepared to reasonable acceptable quality. There are two levels of approval for tenders within the organization based on a threshold level of US$70,000 as noted above. The Management Tender Committee meets twice a month and the Board Tender Committee meets once a month. No significant delays are anticipated from these approvals. These internal approval processes will be upheld during the project. The organization does not have quality assurance teams to review documents prepared by consultants . Tender documents do not clearly state all the criteria and their methodology for their evaluations such as evaluation of alternative bids and or adjustments for evaluation purposes. This may lead to uneconomical selection of contractors and suppliers

(c) **Appropriateness of organizational and institutional capacity**. Procurement under the proposed project would be coordinated by the Project Manager. The Projects and Technical Services

Division within the Transmission Business Directorate will be responsible for procurement of power installation works and management of construction with assistance of consultants. The Projects and Technical Services division has three staff headed by an Acting Head of Projects and Technical Services. The head of the division has over fifteen years experience in project design and management. The other staff was also qualified engineers with not less than eight years experience in provision of engineering services but with less experience in project management. BPC has recruited two additional engineers to enhance capacity. The capacity of the unit to manage the proposed project was weak but recruitment of the two additional engineers brings it to satisfactory levels. BPC has engaged three consultants who are undertaking design of the contract packages and preparation of bidding documents under the proposed project and a consultant for the water supply system was under recruitment. The Transmission Business Unit did not have quality assurance teams to check the quality of the documents prior to submission to the tender committees or World Bank. BPC has now set up a quality assurance team following the recruitment of the additional staff to improve review of documents submitted by consultants. The water supply engineer will coordinate procurement of water supply system.

21. Based on the capacity assessment as summarized above and the assessed country procurement environment, the overall capacity of the implementing agencies to undertake procurement was considered **Moderate** and the risk as **Substantial**.

The following **risk mitigation measures** proposed are substantially implemented.

Table 33: Risk mitigation measures

No	Identified risk	Risk mitigation measure	Responsibility	Status
1	Inadequacies in regulations	Use Bank Guidelines and SBDs. This is provided for in Section 4 of BPC Tender Regulations	Bank/BPC	Agreed
		Prepare a Procurement Plan for the proposed project to cover eighteen months of implementation	BPC	Agreed
2	Uncompetitive provisions observed under NCB procedures	Use of Bank SBD and uncompetitive practices to be excluded for use under the Loan	BPC	Agreed
3	No standard bidding documents in use and quality of bid documents prepared is below standards	Use Bank SBDs	BPC	Agreed
		Provide training to staff in preparation of documents	BPC	Completed
		Constitute quality assurance team to review documents prepared by consultants	BPC	Completed
4	Inadequate staff both in numbers and experience	Engage at least two additional staff as planned	BPC	Completed
		Provide training in procurement and contract management to key staff	BPC/Bank	After effectiveness of loan

Implementation readiness

22. The following actions have been completed as at appraisal:

- BPC has engaged four consultants (using own funds) to design contract packages and assist in preparation of tender documents and evaluation of bids.
- Draft Procurement Plan was prepared and discussed and agreed with the Bank.
- The Bank provided three-day procurement training seminar to relevant staff from BPC on key principles and procedures in Bank procurement including procurement planning, standard bidding

documents on supply and installation contracts, prequalification, post-qualification criteria in civil works contracts, evaluation of bids and key considerations in the selection of consultants.

- A General Procurement Notice has been advertised locally and in United Nations Development Business online.
- Bidding documents for procurement of transformers and power transmission line have been cleared by the Bank and advertised before negotiations following Government request to advance procurement of these two actions.

Frequency of procurement supervision

23. In addition to the prior review supervision, the capacity assessment has recommended supervision missions to visit the field once a year to assess progress and assist BPC in resolving any procurement issues that may arise.

PROCUREMENT PLAN
BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

I. GENERAL

1. Project information: **Botswana - Morupule B Generation and Transmission Project**
   Project ID: **P112516**
2. Project Implementing Agency: **Botswana Power Corporation**
3. Bank's approval Date of the procurement Plan: *September 6, 2009*
4. Date of General Procurement Notice: **December 1, 2008**
5. Period covered by this procurement plan: **June 2009 to December 2010**

II. Goods and Works

Item	Procurement method	Prior review threshold ($)	Comment
1.	ICB (Goods)	>=500,000	All contracts
2.	ICB (Works)	>=3,000,000	All contracts
3	NCB (Works)	<3,000,000	First Contract only
4.	Direct contracting (goods or works)	>=1,000	All contracts

1. **Prequalification**. None
2. **Proposed procedures for CDD components (as per paragraph. 3.17 of the Guidelines): N/A**
3. **Reference to (if any) Project Operational/Procurement Manual: N/A**
4. **Any other special procurement arrangements**: Goods for automatic generation equipment may be procured on Direct contracting basis from vendor that supplied the existing equipment and software subject to justification
5. **Procurement Packages with Methods and Time Schedule**

Table 34: Procurement arrangements (goods and works)

Ref No.1/	Description of Contract	Procuring Entity	Cost Est. $ M 2/	Selection Method	Contract Type	Pre-Qualify Yes/No	Invite Tenders	Expected Contract Award
A(2)(a)	Morupule B - Phokoje 400 kV Line (105 km) & associated OPGW, 400 kV Line Bay at Phokoje, 315 MVA transformer intertie bay at Morupule B and 220kV Lines Deviation (5km)	BPC Trans-mission Unit	51.77	ICB	S & I	No	Sept 09	Jan 2010
A(2)(c)	3 X 315 MVA 400/220kV Transformers (2 at Isang and 1 at Morupule B substations respectively)	BPC Trans-mission Unit	35.40	ICB	S & I	No	August 09	Dec 09
A(2)(f)	Purchase of AGC Hardware, Software and installation	BPC Trans-mission Unit	1.60	D.C	S&I	No	Sept 2010	Jan 2011

Ref No.1/	Description of Contract	Procuring Entity	Cost Est. $ M 2/	Selection Method	Contract Type	Pre-Qualify Yes/No	Invite Tenders	Expected Contract Award
A(3)(a)	Development of New Paje well field and construction of 80km pipeline to Morupule B site	BPC – Engineering Dept	37.46	ICB	Major works	No	Feb 2010	June 2010
A(3)(b)	Electrical Works for Well field	BPC-Engineering Dept	11.96	ICB	Major works	No	Feb 2010	June 2010
A(3)(c)	5KM Extension pipeline from MCL-Morupule B	BPC – Engineering Dept	3.50	ICB	Minor works	No	Jan 2010	Apr 2010
Total 1/			**141.69**					

1/: Project subcomponent reference in Annex 4 and 5; 2/: Including taxes and duties

III. Selection of Consultants

1. **Prior review threshold**: Selection decisions subject to prior review by Bank as stated in Appendix 1 to the Guidelines Selection and Employment of Consultants May 2004 revised October 2006:

Table 35: Procurement arrangements (consultants)

	Selection method	Procurement method threshold	Prior review threshold	Comment
1.	Competitive Methods (Firms) –QCBS,QBS	No threshold	>=$200,000	All TORs to be reviewed by Bank
2.	Single Source (Firms & individuals)	No threshold	All contracts	All TORs to be reviewed by the Bank
3	CQS,LCS,FBS	< $200,000	None	All TORs to be reviewed
4	Individual Consultants	None	>=$100,000	Only TORs will be reviewed for assignments below US$100,000

2. **Short-list comprising entirely of national consultants**: Short-list of consultants for services, estimated to cost less than US$200,000 equivalent per contract, may comprise entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

3. **Any other special selection arrangements**: The contract for Air Quality and Emissions Monitoring system will include procurement of equipment which the consultant will initially use and then hand over to BPC after the assignment. Procurement of equipment will have prior approval of BPC.

Table 36: Consultancy assignments with selection methods and time schedule

Ref. No.	Description of Assignment	Procuring Entity	Est. Cost ($ M) 3/	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date	Expected assignment completion date
B(1)	Low-Carbon Growth Strategy	BPC-PMU	0.5	QCBS	Prior	Jan 2010	Jan 2011
B(2)	Preparation of CSP Project	BPC-PMU	1.0	QCBS	Prior	Jan 2010	Dec 2010
B(3)	Coal/CBM strategy development and implementation	BPC-PMU	4.0	QCBS	Prior	Oct 2010	Mar 2012

Ref. No.	Description of Assignment	Procuring Entity	Est. Cost ($ M) 3/	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date	Expected assignment completion date
B(4)	Feasibility studies for CCS	BPC-PMU	1.0	QCBS	Prior	Oct 2010	Oct 2011
C(1)(a)	Transmission System harmonic study	BPC-PMU	1.1	QCBS	Prior	July 2010	Apr 2011
C(1)(b)	Transmission Control area establishment	BPC-PMU	0.9	QCBS	Prior	Sep 2010	Nov 2011
C(1)(c)	Transmission system operations training	BPC-PMU	0.8	QCBS	Prior	Nov 2010	Mar 2012
C(1)(d)	Air quality and emission monitoring	BPC-PMU	0.5	QCBS	Prior	Dec 2009	Dec 2011
C(2)(b)	Electricity tariff policy and regulation	BPC-PMU	1.5	QCBS	Prior	Jan 2010	Jun 2011
C(2)(c)	Communication program	BPC-PMU	0.5	QCBS	Prior	Oct 2009	Dec 2012
C(2)(d)	Training for safe- guard monitoring	BPC-PMU	0.3	QCBS	Prior	Jan 2011	Dec 2011
C(2)(e)	Training/workshop for PMU staff	BPC-PMU	0.2	SSS			
Total 2/			**12.30**				

3/: Excluding taxes

Annex 9: Economic Analysis

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

1. The economic analysis for Morupule B covers the following main aspects:

- an assessment of the macroeconomic conditions and prospects of Botswana;
- a macroeconomic impact assessment of Morupule B;
- a microeconomic cost-benefit analysis of the Morupule B project; and
- an analysis of impacts of electricity tariffs on lower income households (including recommendations on possible mitigation measures)

MACROECONOMIC CONDITIONS AND PROSPECTS

Background

2. Botswana's remarkable economic development, sustained by diamond production, has taken it from the ranks of the world's poorest nations in the 1960s to an upper middle income country today. With average annual GDP growth rates of close to 9 percent for three decades (1975-2005), and per capita GDP growth of over six percent per year, Botswana is one of only thirteen countries in the world that has managed to sustain such high economic growth for so long.[62] Per capita GNI is $6,150 (2007), one of the highest in Africa, and although it has declined from heyday levels of the 1970s and 1980s, growth has remained solid, averaging about five percent over the past five years. Mineral wealth has been prudently managed, and invested in physical and human capital. Fiscal surpluses have often been accompanied by balance of payments surpluses, and public sector debt is low. Table 38 presents selected indicators for recent years). What is not spent on sustaining economic expansion and social spending has been saved, and today Botswana enjoys substantial reserves that, with continued prudent management, should help it cushion its people against the worst of the global economic crisis. Botswana regularly ranks at the top of the continent in terms of governance, transparency and business environment and continues to implement regulatory reforms.

3. Botswana is the world's leading producer of gem diamonds, and diamonds today account for a third of Botswana's GDP, over sixty percent of annual exports and about 40 percent of Government revenues. Yet current projections indicate that Botswana's diamond revenues will continue at high levels only until about 2021, before declining rapidly and depleting by 2040. Although new mineral discoveries may be made, diversifying the economy into other sectors is a looming necessity. Botswana is well aware of this imperative, and has two decades of experience with diversification efforts. This investment has begun to pay off, although much more remains to be achieved. The structure of goods exports has become more diversified and non-diamond exports have been growing faster than diamond exports: the latter's share has fallen from over 80 percent of total goods exports a decade ago to around 65 percent today. Exports of goods and services other than diamonds could only pay for around 30 percent of imports of goods and services in the early 1990s; today, non-diamond exports cover the cost of over 60 percent of imports. Services exports are also becoming increasingly important and are growing faster than both diamond and non-diamond goods exports, mostly reflecting the growth of tourism. A reduced dependence upon imports has been another of the objectives of economic diversification. Until the mid-1980s, imports accounted for close to 70 percent of Botswana's GDP and 60 percent of gross domestic expenditure. Today the figures are 30 and 40 percent, respectively.

4. In addition to diversifying away from diamonds and from too heavy a reliance on imports, Botswana is also concerned with reducing the economy's dependence on Government expenditures. The

[62] Commission on Growth and Development, 2008, The Growth Report: Strategies for Sustained Growth and Inclusive Development.

Government sector makes up 16 percent of GDP, second only to mining (at 40 percent of GDP) and is a major employer in the country, providing 40 percent of formal sector jobs. Between 1994 and 2005, the weight of the mining and government sectors together grew from 52 to 58 percent of GDP, while agriculture, manufacturing and construction experienced a secular decline, from contributing 16 percent to GDP in 1994 to 10 percent in 2005. While this growth model has enabled Botswana to take advantage of large and expanding mineral revenues, building infrastructure and providing social and economic services, medium-term challenges suggest that Botswana now needs to shift to a new economic model. The current dependence on mining has also resulted in high unemployment and thus, poverty, as the mining sector is highly capital intensive, generating only 3 percent of the country's employment but over a third of its output.

5. The challenge facing Botswana in the coming years is to build the foundation for diversification through a private sector that can compete and thrive in regional and global markets. The dependence on mining and government will reach its limits as diamond revenues start to decline, and emerging resource constraints will mean that infrastructure and social services will have to be provided by a leaner public sector. The private sector will need to take on a more important role in the economy, but private sector growth, while positive, has not yet been able to keep pace with the much faster growth of the mineral sector and with that of government. Constraints to competitiveness in the investment climate, regulatory issues, a mismatch between the skills produced by the education sector and those required by a modern labor market, as well as relatively high labor costs have hampered private investment. Attracting FDI beyond the mining sector has been difficult, due in part to the high cost of doing business in Botswana. Infrastructure capacity and quality have not kept pace with growth, and the electricity, transport and water sectors in particular are now presenting bottlenecks to growth.

6. A secure power supply is a major part of the equation to ensure Botswana's continued growth and successful diversification, greater employment generation, advances in poverty alleviation and improvements in the standard of living. Overall access to electricity is poor in comparison with other countries in the region, reflecting the limited level of domestic power generation; upper-middle-income countries enjoy average access levels above 85 percent. More immediately, the challenge is to overcome the impending electricity crisis in the region. The emergence of serious electricity supply problems in South Africa and their spill-over effects into Botswana, leading to serious supply interruptions in early 2008, have highlighted the vulnerabilities of the Botswana economy to the volatility of electricity imports.

7. Power shortages pose a significant threat to Botswana's economic growth. As in many other countries, electricity consumption in Botswana is closely related to growth and is a leading indicator of economic activity. There has been a rapid growth in power consumption in the country, doubling in the nine years between 1998 and 2007. Power consumption has grown more rapidly than GDP over the past decade, suggesting an increased dependence on electricity by the economy and by society. The mining sector is particularly reliant on power, accounting for around one-third of total consumption, making secure electricity supplies a priority not only for the sector, but for the economy at large. Over the past decade, mining demand has been increasing at around 5 percent a year. Reflecting growing household demand as well as diversification efforts, non-mining demand for power has been growing at a faster rate, about 9 percent a year. Over the past five years, a one percent increase in non-mining GDP has been associated with a 1.6 percent increase in non-mining power consumption. If this relationship is maintained, and in the absence of significant improvements in the efficiency of power consumption, a shortfall in electricity supplies would have a major negative impact on growth: a 10 percent cut in power supplies would lead to a fall of 6-7 percent in non-mining GDP.[63] While the current economic crisis will lead to a temporary fall in demand for electricity, particularly as mining activity slows, the medium-term

[63] Bifm Economic Review, 1st Quarter 2008.

outlook is for a resumption of rapid rates of growth in the demand for power. It has become abundantly clear that that not addressing the energy security challenge will impact Botswana's economic growth and diversification plans.

Current economic conditions and prospects

8. As Botswana tackles these longer term goals, it faces more immediate and pressing challenges, namely protecting the economy from the worst of the global economic crisis without endangering longer term macroeconomic and fiscal sustainability. Botswana is experiencing significant negative repercussions from the crisis. As a small open economy, Botswana's reliance on international trade means that what happens to exports and imports will be the main channel through which external developments are transmitted to the economy. The mining sector is suffering from severe financing constraints. The fall in diamond income has led to a sharp reduction in Government revenues. Economic growth for 2008-2011 is projected to decline substantially from the 2.9 percent attained in 2008/09, fiscal deficits will emerge after years of surpluses, the current account balance will shrink substantially from the 19 percent surplus seen in 2007, and unemployment will rise (Table 38).

9. Since the global economic crisis unfolded in earnest in the fourth quarter of 2008, diamond sales and prices—and thus export revenues—have fallen dramatically. In the first quarter of 2009, the value of Botswana's diamond exports dropped by 86 percent as compared to a year earlier. Diamond prices also fell by close to 10 percent in 2008, and further declines are expected, with analysts forecasting a total drop of 20-30 percent. In addition to diamonds, copper-nickel export values, which represent about 15 percent of total exports, have also dropped by over 50 percent since the crisis. Declines of this magnitude are likely to induce a 20 percent fall in Government revenues, and this is reflected in the current budget for 2009/2010.

10. The Government is forecasting significant fiscal deficits through 2012, averaging 10 percent of GDP over the coming two years (2009/10 – 2010/11). Given the large role played by Government expenditures in the economy, Botswana's infrastructure needs associated with diversification and poverty reduction efforts, and the fiscal requirements of HIV/AIDS treatment and prevention programs, a sharp cut in expenditures would carry large long-term costs. Currently, the Government expects expenditures to remain fairly flat in real terms over the next two years, although this will be reevaluated in light of global developments regarding the projected depth and duration of the crisis and their impact on Botswana's mineral revenues.

11. In contrast to the 1981-82 crisis, where Botswana's diamond exports fell by close to 50 percent, and the impact on GDP and employment was negligible, the effect on GDP growth of the current crisis will be large. Already, quarterly GDP has fallen by 22 percent between the final quarter of 2008 and the first quarter of 2009. Unlike the situation in the early 1980s, where Debswana Diamond Company continued to produce diamonds and added to its stockpiles, today the decision has been made to reduce production significantly. The inability of the global diamond industry pipeline to absorb new supplies of rough diamonds led Debswana to shut down operations from December 2008 through mid-April 2009. The company also announced the closure of two mines for the entirety of 2009. Smaller companies in diamond exploration have also shut down operations, as have nickel and copper mines. In terms of employment the impact of the crisis on the mining sector, which employs around 13,000 people, is just beginning to be felt. Mine closures have resulted in the loss of an estimated 4,500 jobs, about half of them at Debswana. More job losses are likely in the coming months as companies in the Debswana supply chain are affected, and over time the secondary effects of a decline in the sector may reach deeper into the economy, although to date this has not occurred.

12. The prospects for diamonds depend on economic developments in the major markets; the US, Europe and Japan together account for 76 percent of the diamond market, with the US alone representing 45 percent (2006). With current expectations for a slow and weak recovery in the US and other developed markets, it is likely that Botswana's diamond exports will remain very depressed for some time to come.

The early 1980s recession serves as a bleak reminder: it took seven years before rough diamond sales recovered to pre-crisis levels, although for other reasons, the impact on Botswana was muted. Latest figures for Q2 2009 indicate that diamond exports are picking up slightly, although export revenues remain far below pre-crisis levels and a recovery will be gradual and slow.

Table 37: Selected economic indicators (percent of GDP, unless otherwise noted*)

	2000-2004	2005/06	2006/07	2007/8	2008/9e	2009/10p	2010/11p
GDP growth, %	6.2	0.6	5.3	3.3	*2.9*	*-10.3*	*4.1*
CG balance	0.4	8.4	11.8	8.0	*-3.5*	*-10.9*	*-8.2*
Total revenues*	38.2	40.3	42.5	41.1	*32.4*	*31.8*	*32.7*
Mineral revenues	20.4	19.9	20.4	17.5	*11.0*	*9.1*	*9.7*
SACU receipts	5.5	7.1	10.3	10.2	*8.9*	*8.5*	*8.5*
Total expenditures & net lending	37.9	31.9	30.7	33.1	*37.3*	*42.7*	*41.0*
External public debt	6.4	4.1	3.5	2.7	*2.3*	*11.9*	*16.4*
Current account balance (CY)	6.1	14.4	19.3	19.0	*7.0*	*-7.1*	*-13.5*
Imports, fob, % change (US$, CY)	13.2	1.3	-11.7	16.5	*26.2*	*-17.0*	*18.2*
Exports, cif % change (US$,CY)	7.8	20.5	-0.3	12.6	*-0.4*	*-35*	*6.4*
International Reserves (million US$, CY)	5753	6309	7993	9790	*9118*	*8100*	*8230*
Inflation (CPI period avg, %, CY)	7.9	8.6	11.6	7.1	*12.6*	*8.4*	*5.8*

Source: IMF Staff Reports and World Development Indicators database;
* Fiscal year runs April 1 to March 31 CY: Calendar Year

13. With diamond exports unlikely to return to pre-crisis levels any time soon, current account balances will shrink significantly from the 19 percent surplus attained in 2007, and are likely to turn to deficits, partly as a result of reduced diamond and metals (nickel and copper) exports but also due to growing capital goods imports to support the Government's investment program. Imports will be restrained by the decline in economic activity and the effects of BWP depreciation against some currencies[64], although this will be counterbalanced by the needs associated with transport and energy infrastructure.

14. Following global trends, CPI Inflation, which had peaked at 15 percent in August 2008 is on a downward trend. Inflation stood at 7 percent in June 2009. Projections are for inflation to continue to decline in 2009, approaching the Bank of Botswana's 3-6 percent medium-term objective. High inflation in 2008 justified a tight monetary policy environment, which began easing in December 2008 when the bank rate was reduced from 15.5 percent to 15 percent, and today stands at 11.5 percent. At the end of April 2009, on an annual basis, the BWP depreciated against the yen (17 percent), US dollar (11.4 percent), although it had appreciated slightly against the euro (3.6 percent) and was largely unchanged with respect to the rand. BWP depreciation to date has largely reflected movements in the South African rand, and not structural concerns. Botswana has a fairly high domestic savings rate (a gross domestic savings rate of 45 percent in 2007), does not borrow internationally to any significant extent, and is a

[64] On an annual basis the Pula has depreciated in 2008 by 20 percent against the US dollar and 16 percent against the euro, although it appreciated by 10 percent against the South African rand.

substantial net international creditor. This status is reflected in the low level of public external debt, large holdings of foreign currency assets by both the public sector (in the form of official foreign exchange reserves of US$8.4 billion in May 2009, and approximately 19 months of import cover) and the private sector (the offshore assets of pension funds). Both the reserves and pension fund assets are diversified, and are invested across a range of financial markets, instruments and currencies.

15. Botswana's banking sector is still fairly robust, with ample liquidity and high capitalization and profitability. There has been an increase in bad debts, and arrears have been rising, driven by a few large (pre-crisis) corporate failures and by a small increase in arrears on loans to individuals. Botswana's exposure to property lending is very low, at around 3.6 percent of GDP in mid 2007 and there is no evidence of problems in the property market. The banking system nevertheless remains vulnerable to the effects of a protracted global economic downturn on diamond export revenues, which is the main direct and indirect income source for a great number of borrowers. At the end of mid-August 2009, the Domestic Companies Index had declined by 25 percent since its peak in mid-October 2008.

16. It should be stressed that Botswana is in a stronger position than many other mineral producing economies in the continent, with international reserves providing nearly two years' worth of import cover, and a year's worth of expenditures saved from previous years' fiscal surpluses. The Government is hoping that these savings will provide a cushion that will enable a gradual, rather than abrupt, adjustment to adverse circumstances. Very low, though rising, external and domestic public debt levels (at 2.9 and 2.7 percent of GDP, respectively) and an investment grade sovereign debt rating provide additional flexibility. Nevertheless, the country's deep dependence on a few commodities heightens its vulnerability to global shocks. Trade and fiscal deficit financing will become an increasing challenge as the fall in exports stretches into the medium term.

MACROECONOMIC IMPACT ASSESSMENT OF MORUPULE B

17. Due to its size, the impact of the project on the macroeconomic projections for Botswana is significant, although this is not expected to raise major concerns regarding debt sustainability or current account deficits given low baseline debt and high foreign exchange reserves. The table below shows the impact of expected expenditures from Morupule B in terms of:

(a) The share of forecast development expenditures in 2009-2010
(b) The increase in the level of public debt as a percent of GDP
(c) The decline in net exports as a percent of GDP

Table 38: Macroeconomic impacts of Morupule B

	2009	2010
Share of development spending (%)	30	40
External public debt as % of GDP (baseline)	11.6[65]	15.8
Impact of project on public debt as % of GDP	2.0	2.5
Baseline current account estimates US$ million	-752	-1477
Impact of project on current account US$ million	-301	-421

Note: Based on IMF estimates and World Bank Staff projections; Baseline development spending estimates are projections for 2009/2010; Baseline current account estimates are for projections 2009/2010

18. The calculations assume that of the total costs of Morupule B, half will be financed from Government spending and the rest from external borrowing. Some of this could be private sector borrowing not guaranteed by the Government but it is here assumed that all such borrowing will be public

[65] This assumes that according to plan, the Government will contract external borrowing on the order of $1.5 billion to cover the 2009/10 fiscal deficit, of which $1 billion would be disbursed in 2009 and $0.5 billion in 2010.

or publicly guaranteed. The total costs are taken as US$1.67 billion, of which US$1.2 billion, or 72 percent, are foreign expenditures. The amounts of expenditure on the project in 2009 are taken as 25 percent of the total and in 2010 they are estimated at 35 percent.

19. The planned large electricity investments (Morupule B) will represent a significant portion of public capital spending over the coming 3-4 years. The figures indicate that annual investment costs of Morupule B represent about 30 to 40 percent of projected annual development expenditures for 2009/10. As such they are a significant share of total development expenditures. 2010 is expected to be the peak expenditure year, with spending volumes declining in 2011 and 2012.

20. In terms of external public debt, the level will increase by 2.0 to 2.5 percent of GDP. However, since the base level of external public debt is low (it is estimated to be 2.3 percent of GDP in 2008, rising to 11.6 percent in 2009 and 15.8 percent in 2010), the increase does not take indebtedness to a level that would cause great concern. While the proposed investments are large, they are affordable from a debt perspective. Beyond the country's low public external debt levels, debt sustainability analyses indicate that there is little risk of debt distress in Botswana under a variety of stress scenarios, although debt levels are projected to rise significantly due to the increased financing needs associated with projected fiscal deficits. Separately, the Government has requested technical assistance from the World Bank in terms of building a Medium-Term Debt Management Strategy, and this will help to ensure continued prudence in debt-related issues.

21. Finally, the development of Morupule B will affect the current account balance (through net exports) as a result of the large associated projected imports. The project entails foreign costs of around US$1.2 billion. This will reduce net exports by US$301 million in 2009 and US$421 million in 2010. The baseline projections for the external account are US$ -752 million in 2009 and US$ -1477 million in 2010.

22. One potential concern is the impact on the real exchange rate. Here the case of Mozal aluminum smelter in Mozambique, built to produce aluminum for export, is illustrative. Mozal I and II amounted to about $2 billion in investment in a national economy of $6 billion, larger in relative terms than the proposed Morupule B investments in Botswana. The investments were executed at a faster pace than is being proposed in the Botswana case. Despite this, there was little impact seen on the exchange rate as most of the resources financed imports. This is also expected to be the case in Botswana, and this will limit the exchange rate impact.

MICROECONOMIC COST-BENEFIT ANALYSIS OF MORUPULE B

- **Project scenarios for microeconomic analysis**

23. The microeconomic analysis evaluates the costs and benefits of the Morupule B project given the demand forecasts for electricity in Botswana. Morupule B consists of a 530 MW coal fluidized bed plant power station, using local coal. The plant will start generating electricity in 2012 (with a small output at the end of 2011). An economic assessment of Morupule B has been carried out analyzing two alternatives to meet future demand, including:

- Alternative I—solar thermal capacity; and
- Alternative II—some load shedding combined with diesel generation to 2020 and solar generation thereafter.

24. Alternative I—solar thermal capacity: Under this alternative instead of Morupule B future electricity demand will be met by building solar thermal capacity. High temperature collectors concentrate sunlight using mirrors or lenses and are used for electric power production.

25. Solar energy is not available at night and either back up generation or storage facilities will be required. Two scenario are analyzed under Alternative I. Scenario A assumes that solar thermal capacity will be installed without storage facilities. To meet night and peak time demand in Botswana this will

require backup power, assumed to be provided by diesel generators. Under Scenario B solar thermal capacity will be installed in combination with storage facilities that will be able to store energy produced from the solar plant. Storage is either in the form of saline storage for parabolic trough or using a compact linear Fresnel reflector.[66](CLFR, see Box 8).

Box 9: Technology Overview of Various Solar Options Analyzed

Compact linear Fresnel reflector: Instead of the parabolic troughs or mirrors used in other solar thermal systems, this form of CSP uses flat reflectors moving on a single axis plus Fresnel lens to concentrate the solar thermal energy in collectors. Flat mirrors are much cheaper to produce than parabolic ones. Another advantage of CLFR is that it allows for a greater density of reflectors in the array.

Saline storage for parabolic trough: Solar energy can be stored at high temperatures using molten salts. Salts are an effective storage medium because they are low-cost, have a high specific heat capacity and can deliver heat at temperatures compatible with conventional power systems. Molten salt is used in solar power tower systems because it is liquid at atmosphere pressure, it provides an efficient, low-cost medium in which to store thermal energy, its operating temperatures are compatible with today's high-pressure and high-temperature steam turbines, and it is non-flammable and nontoxic. In addition, molten salt is used in the chemical and metals industries as a heat-transport fluid, so experience with molten salt systems exists in non-solar settings.

The molten salt is a mixture of 60 percent sodium nitrate and 40 percent potassium nitrate, commonly called saltpeter. The salt melts at 430 °F (220 °C) and is kept liquid at 550 °F (290 °C) in an insulated cold storage tank. The uniqueness of this solar system is in de-coupling the collection of solar energy from producing power, electricity can be generated in periods of inclement weather or even at night using the stored thermal energy in the hot salt tank. Normally tanks are well insulated and can store energy for up to a week. As an example of their size, tanks that provide enough thermal storage to power a 100-megawatt turbine for four hours would be about 30 feet tall and 80 feet in diameter.

[66] Both storage options under option (b) are discussed in are detailed in K. Ummel and D. Wheeler (2008). Desert Power: "The Economics of Solar Thermal Electricity for Europe, North Africa and the Middle East", Working Paper Number 156, Centre for Global Development, Washington DC.

26. Alternative II—load-shedding and diesel self-generation: This scenario assumes that no immediate alternative is available for 2010 and widespread load-shedding will be required for all customer groups for long periods. The exception is larger industrial users (such as the mining sector) that will install auto generation using diesel generators (something they are already considering). It is anticipated, however, that the economics of solar power will improve substantially over the next decade and under this alternative by 2020 the gap in supply and demand will be met through an investment in solar trough generation with storage of 350 MW. This means that there will be no load shedding from 2020 onwards. Under this scenario then instead of Morupule B future electricity demand will be met in the short run by a combination of load shedding and some diesel generation for large industrial generators and in the longer run by building solar thermal capacity.

- **Microeconomic analysis for Morupule B**

27. Results from the economic analysis demonstrate that Morupule B is more economic to meet future electricity demand in Botswana compared to using the solar thermal capacity with or without storage (Alternative I) or shedding load, installing self-generation for larger industrial users and solar power installations from 2020 (Alternative II). The average cost for electricity from Morupule B was estimated at US¢5.76/kWh at a discount rate of 12 percent and the Economic Rate of Return (ERR) came out at 14.1 percent.[67]

28. In comparison, not building Morupule B and instead installing solar capacity without storage (Alternative IA) would almost triple electricity costs to over US¢15/kWh. If relevant storage would be added (Alternative IB) electricity costs would amount to increase to US¢11.4/kWh. The corresponding ERRs are 0.7 percent and 5.4 percent, respectively. Moreover, we consider that both these estimates are on the low side. For example, the local study commissioned by BPC for solar power without storage has capital costs that are 50 percent higher and generation cost estimates of around US¢20/kWh. Thus the estimates used in the analysis here are not overestimating the costs of solar power. Finally the alternative of diesel self-generation combined with load shedding and construction of solar capacity by 2020 would increase generation costs to US¢14.1/kWh and result in an ERR of 6.7 percent.

29. No value is included in the economic analysis on the cost of GHG emissions. Instead, the switching value for carbon for each alternative is calculated. The 'switching value' is the lowest value at which the NPV from the alternative options is equal to Morupule B.

30. The switching value for solar combined with storage indicates that the price for CO_2 is US$69 per tonne of CO_2. This makes solar as attractive an alternative as Morupule B. In the case of a solar thermal facility with no storage the switching value increases to US$127 per tonne of CO_2. This higher value reflects the need for expensive back up generation to meet peak and night time demand when the solar thermal plant does not produce electricity. The diesel and load-shedding alternative needs a price for CO_2 of at least US$99 per tonne to make it equally attractive than Morupule B.

31. The table below summarizes the outcome of the microeconomic analysis. Key parameters include a discount rate of 12 percent, all costs are taken net of taxes and no shadow prices applied for labor and capital.

[67] The ERR is calculated using costs net of taxes and subsidies and ideally includes costs and benefits that do not have corresponding monetary flows, such as environmental costs and employment gains and hence differs from financial rate of return. In this analysis we have focused on the costs of carbon by looking at switching values. See the section on Key Data and Assumptions.

Table 39: Microeconomic analysis

Option	Cost per kWh (US¢/kWh)	ERR %	Switching value 1/ US$/tonne CO_2
Morupule B	5.43	14.1	n.a.
Solar thermal, no storage, diesel backup	15.0	0.7	112
Solar thermal, with storage	11.4	5.4	69
Diesel and load-shedding alternative 2/	14.1	6.7	99

1/: 'Switching Value' is the value at which the NPV of the option is equal to the NPV of Morupule B.
2/: The 'diesel + load shedding' option also includes provision of solar power in 2020 to meet future demand.

32. Another way to compare the solar option with Morupule B is to ask how much credit the former would need to get in terms of CO_2 emissions avoided if it were to be as attractive as the latter. This is not the same as calculating the switching value, because the switching value approach debits the coal project but does not credit the solar option (which has no emissions). In this case we credit the solar option with the savings in emissions by not carrying out Morupule B. The calculation is only done for the solar trough with storage (CLFR). It turns out that a credit of US$87/tonne CO_2 would be needed to equalize with Morupule B. This credit would be paid per year as generation and savings in CO_2 emissions were confirmed for 10 years as in a CDM project; this stream of revenues would be equivalent to an upfront capital subsidy of US$1,360 million.

33. Sensitivity analysis was carried out, including:

- Price of CO_2: At a carbon price of US$100/tonne all three options are uneconomic assuming a discount rate of 12 percent.
- Price of coal: Each ten percent fall in the price of coal from BWP 250/tonne (US$38.3/tonne) increases the economic rate of return (ERR) for Morupule B by 0.32 percent.
- Capital cost of solar: The capital costs of solar power are high, at US$2,480/kW. However, even if these costs fall significantly, Alternative I – scenario (A) of the solar option remains relatively unattractive. The reason for the option being so uneconomic is the cost of diesel backup. In the case of scenario (B) with storage the switching value at which this option is as attractive as Morupule B is US$2,150/kW, or 39 percent of the current estimated cost.
- Price of diesel: The price of diesel assumed here is around US$94 /barrel. This was the price in South Africa at the beginning of December, since when prices have fallen further.[68] The US$89/barrel price of diesel corresponds to a crude oil price of around US$53/barrel. If prices fall permanently further, to say US$40 (or about 25 percent from the levels taken here) that raises the ERR of the diesel +load shedding option from 5.7 percent to 9.0 percent. Furthermore, the switching value for carbon now falls to US$36 against the diesel + load shedding option.

- **Willingness-to-pay (WTP) for electricity and costs of unserved energy**

34. If there were no excess electricity demand at present and the power generated from Morupule B (or its alternatives) were to satisfy incremental electricity demand in Botswana, the economic value of those additional power sales could be valued at the price at which electricity is currently sold.

35. However, Botswana faces a shortage of electricity to date. Consequently, the economic value of electricity produced by Morupule B is greater than the current price paid as customers pay more expensive backup generation to meet their energy demand. This indicates that customers' are willing-to-pay for electricity more than the current electricity tariff.

[68] Feasibility Study for the Epupa Hydropower Scheme, Cunene River, Namibia.
http://www.dme.gov.za/energy/December/Price%20elements%20diesel%20December%202008.htm..

36. No WTP study has been carried out for Botswana but relevant literature indicates that the marginal value of 'un-served' energy ranges from US$0.25 to 5.00/kWh. The study for the Epupa hydropower scheme in Namibia took a value of US$1.50/kWh.[69] A least cost planning study for the South Africa Power Pool takes a much lower value of US$0.14/kWh for un-served energy.[70] Conservatively, therefore the WTP for households in Botswana has been estimated at US$0.14/kWh and for businesses at US$0.25/kWh. This indicates that the US$0.06/kWh for Morupule B, as calculated in the above economic analysis, is well within the WTP of customers in Botswana.

37. The real costs of the load shedding option are not reflected in the average reported costs of generation. To appreciate the true costs of the option one has to look at the net benefits and the IRR. The analysis presented here of the load shedding option (Alt II) gives the average cost of generation for that alternative and does not report the net benefits, taking account of the cost of not meeting demand. These net benefits were calculated for each of the alternatives, including that of load shedding. In the latter case a cost of un-served energy of US$0.14/kWh for households and US$0.25/kWh for small businesses was taken. These estimates are based on the EPUPA study for South Africa and, as indicated above, the figures are considered conservative. Studies show that the average value of lost load could be between US$1 and US$3 per kWh in countries in SSA similar to Botswana (AICD, 2009). Moreover losses to the small and medium sector have been put at as much as 16 percent of turnover. Based on such studies the loss to the business sector could be very high and reach a significant percentage of GDP.

38. Even the conservative analysis undertaken here with much lower values of un-served energy also indicate that this option of load shedding is not attractive. The ERR, which measures the net benefits of each option gives an ERR of 6.7 percent for this option compared to over 14% for the Morupule B option. If one takes a value of lost load for the small and medium business sector that is, say US$3/kWh (the lower limit of the AICD range), the ERR for this option declines to -0.4 percent.

Key Data and Assumptions for Economic Analysis of Morupule B

39. The following provides details of the data, sources and key assumptions used in carrying out the economic cost-benefit analysis for Morupule B and alternative investment options and scenarios.

Direct economic costs of Morupule B:

(a) Capital costs of Morupule: estimate of $1,118 million excluding taxes and duties and interest during construction.
(b) O&M fixed costs: US$25/kW
(c) O&M variable costs: US$3/MWh
(d) Fuel (coal): BWP 250/tonne. Estimates identical to those in the financial analysis. A sensitivity analysis on this price has been carried out.
(e) Water: US$0.46/$m^3$. The coalmine and the power station have significant water demands. The additional costs of water to the mine are reflected in the costs of coal to the power station and do not need to be counted again. The costs of water to the power station should be added to the costs of the plant and the appropriate price is the opportunity cost of the water. The current tariff of BWP 5.7/m^3 (US$0.76/ m^3) is taken as the full cost of supply of the water.

Indirect economic costs of Morupule B:

(a) Cost of AIDS: there are two options. One is to estimate the number of cases resulting from the project, times the costs per case of AIDS, which has a lower bound of US$1000 per year. The other is to include the costs of a mitigation program to avoid any additional cases of AIDS. This

[69] Feasibility Study for the Epupa Hydropower Scheme, Cunene River, Namibia

[70] http://www.pudue.edu/dp/energy/centers/gp_sAfrica.php. Accessed 6th April 2008

can be justified on the grounds that the costs of the program are less than the costs of additional cases of AIDS. We would recommend the second approach but given a lack of data this has not been done. The impact of including this on the ERR, however, is insignificant.

(b) Costs of non-GHG emissions: SOx, NOx, and particulates from the plant cause environmental damages and ideally should be valued. We did not have the capacity to carry out a full cost analysis based on dispersion modeling, which will be undertaken as part of the environmental assessment (see "Annex 12—Safeguard Policy Issues"). Initial estimates of emissions are as follows (in milligrams per kilowatt-hour (mg/kWh)): PM_{10} (50), SO_2 (455), NO2 (750).

Alternative I—scenario (a) solar <u>without storage</u> facilities and diesel backup generation:

(a) Capital costs of solar trough: US$2,480/kW (team estimates).
(b) O&M fixed costs of solar trough: US$32.4/kW, taken from Ummel and Wheeler, 2008 (op. cit.).[71]
(c) O&M variable costs: zero.
(d) Fuel costs: for diesel backup. It is assumed that the solar thermal plant has a capacity factor of 25 percent. With backup equal to 60 percent of the solar units the system is brought to a 45.6 percent capacity factor when backup is provided by diesel. The solar facility provides a maximum of 34 percent of the generation and diesel provides 66 percent. The price of diesel is taken as the current price in South Africa, net of taxes but inclusive of transport costs. This is US$16.8 per gigajoule, equivalent to US$94 per barrel. The costs are high in view of the difficulty in transporting diesel to Botswana. Operations of diesel plants are assumed to have an efficiency of 36 percent.
(e) Water: as above.
(f) GHG emissions: calculated as a switching value. Emissions come from the diesel backup. Assuming 42 percent of the power coming from backup facilities the emissions would be 198 g/kWh. See diesel option below.

There are two stages of investment under this scenario: initially 500 MW of capacity are created through solar trough, backed up by 300 MW of diesel. Then in 2017 another 80 MW of solar trough investment is made, backed up by 35 MW of diesel. Since capital costs are expected to fall for solar, it is assumed that the second investment will cost about 8 percent less per kW (*i.e.*, a rate of decline in cost of 2 percent per annum).

Alternative I—scenario (b) solar <u>with saline or Fresnel reflector CSP storage</u>:

(a) Capital costs of solar trough: US$5,546/kW. Estimates are the averages for the two technologies for a 250 MW plant. The system is assumed to operate at 60 percent capacity[72]. Figures are from Ummel and Wheeler, 2008 (op. cit.). The team take the view this capacity factor is optimistic; it has been adopted to give this solar option the most favorable evaluation.
(b) O&M fixed costs: as above.
(c) O&M variable costs: zero.
(d) Water: as above.
(e) Fuel costs: zero.
(f) GHG emissions: no direct emissions from this scenario.

[71] This cost is on the low side. The prefeasibility study for solar power BW prepared by Fichtner Solar GmbH assumes a figure of €2,890/kW, equal to US$3,757/kW at current exchange rates. We carry out the analysis with the lower estimate of Ummel and Wheeler to give solar the most favorable consideration.

[72] Included in this cost is the cost of land. The amount of land needed for solar power is substantial. For the CLFR option, which has been considered the estimate is for at least 1.4 hectares/MW, implying that a total of around 900 hectares would be needed. This is the least demanding of the solar options, with other technologies requiring much more land. Indeed the options being considered by BPC could involve as much as 4,400 hectares.

This solar option investment is also undertaken in two stages: initially 600 MW of capacity are created through solar trough, which are fully operational in 2013. Then in 2017 another 35 MW of solar trough investment is made. Since capital costs are expected to fall for solar, it is assumed that the second investment will cost about 8 percent less per kW (*i.e.*, a rate of decline in cost of 2 percent per annum). It should be noted that with this option there are three years when full demand is not met. These are 2012, 2015, and 2016. In these years imports of 395,000, 50,000, and 30,000 MWh will be needed.

Alternative II—diesel option with load shedding:

(a) Capital costs of diesel: US$800/kW
(b) O&M fixed costs: US$14.2/kW
(c) O&M variable costs: US$3.55/MWh
(d) Fuel costs: US$223/MWh. The price of diesel is taken as the current price in South Africa, net of taxes but inclusive of transport costs. This is $16.0 per gigajoule, equivalent to $89 per barrel. To this one would have to add costs of transportation to Botswana. We have added another 6 percent, giving a figure of US$94 per barrel. The costs are high in view of the difficulty in transporting diesel to Botswana. Operations of diesel plants are assumed to have an efficiency of 36.5 percent and a heat rate of 9,474kJ/kWh.
(e) GHG emissions: Calculated as switching value. Estimates of emissions of GHGs per kWh from each alternative are assumed to be 0.733 kg/kWh.

In this option diesel is used only for meeting demand for the large industrial users. All other users face load shedding until 2020, when an investment in solar trough with storage of 350 MW comes on stream (investment starts in 2017). This means there is no load shedding from 2020 onwards.

Comparative costs and assumptions

There are several analyses showing comparison of solar thermal power to coal alternatives. The costs and assumptions made in this analysis include Botswana specific ones where available and known (e.g. coal costs) and those from industry averages, other studies and experience in specific countries. The Table below presents the comparative costs and other relevant assumptions. The specific study from which comparative data are taken is Ummel and Wheeler (U&W, 2008). The figures show that the results obtained here are not based on differences in capital costs between the alternatives. The Botswana coal prices are lower than those assumed in U&W, but since these are the negotiated prices for a future project it seems reasonable to take them as the appropriate ones[73].

Table: Key comparative cost data for coal and solar thermal power alternatives

Item	Unit	This Analysis for Botswana	Ummel and Wheeler (U&W)	Remarks
Coal				
Capital Costs	US$/kW	1700	1844 to 2474	Higher value is for Europe; lower one for Morocco
Capacity Factor: %	%	80	80	
Fuel Costs of Coal	USc/kWh	1.86	2.64	Based on MCL supply cost for Botswana
Solar: No Storage				

[73] We also note that in a prefeasibility study for solar power in Botswana the capital costs provided by Fichtner Solar GmbH of Germany to BPC were higher than the figures we have taken. For a 200 MW plant with no storage the company quoted €578 million, amounting to €2,890/kW or at current exchange rates about US$4,075/kW.

Item	Unit	This Analysis for Botswana	Ummel and Wheeler (U&W)	Remarks
Capital Cost	US$/kW	2480	2924 to 3096	
Capacity Factor: %	%	25	26	
Rate of decline in cost	% per annum	2.0	2.3	Estimate of levelized cost from U&W.
Solar: With Storage				
Capital Cost	US$/kW	5546	5388 to 5704	
Capacity Factor: %	%	60	60	Estimate of levelized cost from U&W.
Rate of decline in cost	% per annum	2.0	3.5	

Note: The rate of decline in cost in U&W is based on the learning rate (i.e. the percentage fall in costs from a doubling of total global installed capacity). Estimates of decline in levelized costs are therefore speculative to the extent that rates of adoption over the next 10-15 years are unknown, as well as the learning rates. Results here are not significantly dependent on the difference in rates of cost decline between this analysis and U&W, since capacity is not added after the initial investment in the base case runs.

THE IMPACT OF MORUPULE B ON THE POOR

40. The Morupule B project is expected to have the following impact on the poor in Botswana:

(a) By promoting growth, it can increase incomes to all groups in society, including the poor;
(b) By creating employment it will benefit working households, including some low income ones;
(c) By raising tariffs it may make low income households worse off, and unable to afford an essential commodity such as electricity. It should be noted that tariff increases are required even without the project as import costs have steadily increased and expected to rise further. Some support to the poor consumers may be necessary.

Impact on growth

41. Power shortages pose a significant threat to Botswana's economic growth. As in many other countries, electricity consumption in Botswana is closely related to growth and is a leading indicator of economic activity, and, over the past five years, a one percent increase in non-mining GDP has been associated with a 1.6 percent increase in non-mining power consumption. Thus, a power shortage would have a negative impact on economic growth in the absence of significant improvements in the efficiency of power consumption.

42. The mining sector, Botswana's main engine of growth, accounting for about 40 percent of the country's GDP and about 80 percent of its exports, is particularly reliant on power, making secure electricity supplies a priority not only for the sector, but for the economy at large. Power consumption has grown more rapidly than GDP over the past decade, suggesting an increased dependence on electricity by the economy and by society. In spite of this, there are indications that a shortage of power has inhibited growth in Botswana, along with most sub-Saharan countries and that increased investment in this sector would enhance growth by around one percent per annum.[74]

[74] C. Calderon (2008), Infrastructure and Growth in Africa, Working Paper 3, Africa Infrastructure Diagnostic, The World Bank, Washington DC.

43. Indirectly therefore the project should help alleviate poverty by supporting a higher rate of GDP growth than would be achieved if the project were not carried out or if a more expensive option were to be chosen. It is difficult to make precise estimates of the 'costs' in terms of lower growth of choosing one of the more expensive options as a substitute for Morupule B. If, for example, the alternative is to develop the solar trough option, the total cost of meeting the same demand will be much more: around US$3.5 billion as opposed to US$1.1 billion for Morupule B (an additional 2.4 billion dollars). This will take away resources that can be channeled to other productive investments, thus reducing the growth rate. Such a reduction in GDP growth could impact on the fall in the poverty rate. It should also be noted that such a large scale solar power plant does not exist.

44. The typical elasticity of poverty reduction with growth (the percent reduction in poverty for each one percent growth in per capita income) is around 2. It does, however vary with the degree of inequality in the country: while the poverty elasticity of growth is 2 on average it is as high as 4 in countries with an income 'gini' coefficient of 0.3 and lower, and it can be close to zero in countries with a 'gini' coefficient of 0.6 and higher.[75] Botswana has a high level of inequality, with a gini coefficient that is still around 0.6, although it has fallen from an even higher value in 1993. Thus the impact of the future growth on poverty will depend on specific Government actions to address poverty issues in the country.

Benefits of employment

45. The development of Morupule B and the associated mining operations would create some employment, which in turn would have a multiplier effects in the surrounding communities. Estimates of labor needs of the projects are given below. About 440 unskilled and semiskilled jobs will be created during the construction phase and about 210 thereafter for the power station and the mine. These will provide employment in areas of the country where opportunities are limited.

Table 40: Employment potential of the project

	Construction	Power Station	Mine
Skilled	869	59	40
Semi-skilled	333	39	123
Unskilled	107	0	48
TOTAL	1,309	98	212

Impacts of tariffs

46. Botswana does not provide any lower rate tariffs for electricity supplied to low-income households. The current tariff is 36.7 thebe/kWh (US¢ 5.60/kWh), plus a monthly fixed charge of BWP 10.2 (US$1.56) levied on all domestic customers. For a household using a modest 50 kWh a month (enough for 4-5 lights, a TV and a radio but not for a refrigerator, heater, or kitchen appliance), the monthly cost is BWP 28.5, or US$4.40. Under the proposed project the tariff may increase to thebe 50/kWh, implying an increase in the outlay for this low consumption of electricity of BWP 6.7, or just over one US dollar. While this may seem a small amount it would be a noticeable increase in the burden of any poor household who had a connection to the grid. The household income and expenditure survey of 2002/03 (the last one available) indicates that 38 percent of rural and urban village households and 18 percent of city households had a monthly income (including non-cash) less than BWP 500 (US$76 or US$2.50 a day for an average household of four persons).

47. Such low-income households would probably not consider connecting at the current tariffs, and they would be even less inclined to take up a connection if the tariff were to be raised. Given the substantial benefits (health, educational and social) to be derived from having access to electricity to it is

[75] Ravillion, M. 2004. 'Pro-poor Growth: A Primer', *World Bank Policy Research Working Paper No 3242*, Washington DC: The World Bank.

worth looking at schemes that do not raise the tariff for low-level consumers of electricity. A lifeline rate would also facilitate connections for the majority of households who do not have any access to electricity. As of 2005 only 29 percent of rural and 'urban village' households and 58 percent of urban households had electricity connections.[76] The implied national connection rate of 37 percent is close to the average for **low-income** countries (36 percent). Other upper-middle income countries like Botswana have much higher rates of access: South Africa, for example, with a per capita income of US$4,770 compared to Botswana's US$5,590 has an access rate of 66 percent and the average for all middle income countries is even higher, at 90 percent.[77]

48. Many developing countries offer some reduced tariff rate (or lifeline rate) and BPC could do likewise. For example, if the new average tariff for domestic customers were set at thebe 50/kWh and a lifeline rate of thebe 36.7/kWh were introduced this would require a rate of thebe 51.95/kWh for consumption above 50 kWh, an increase of about 4 percent. A lower lifeline rate of thebe 18.8/kWh would require a higher rate of thebe 54.66/kWh or an increase of a little over 9 percent. Further work is needed to determine the exact implications of introducing such a protection scheme, or indeed to consider other way of achieving a degree of social protection. This will be handled through the new tariff policy study under the project.

[76] Taken from the Government of Botswana Mid-term Review of NDP 9, MFDP, March 2006

[77] Data are from the World Resources Institute, Earth Trends, Environmental Portal, http://earthtrends.wri.org.

Annex 10: Financial Analysis

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Botswana Power Corporation

1. BPC was established as a statutory corporation under the *Botswana Power Corporation Act* on 30 June 1970 and is wholly owned by the Government. Under the *BPC Act*, the Minister of MMEWR has the authority to appoint the board of directors of BPC, including the chairman of the board. BPC's chief executive officer is appointed by the board, with the approval of the Minister.

2. Section 17 (1) of the *BPC Act* requires BPC to act "on sound commercial lines." Further, the *BPC Act* requires BPC to produce audited accounts annually which are submitted to the Minister (who in turn presents them to the Parliament), supported by a comprehensive operational report. The Minister may also require BPC to produce forecasts of revenue and expenditure (and other information and records) and may give BPC directions as to the exercise of its powers and functions, subject to these not being inconsistent with the *BPC Act*.

3. The above-noted Section 17 (1) of the *BPC Act* also requires the BPC to set its charges to customers at a level "as to ensure that its revenues are sufficient to produce on the fair value of its assets a reasonable return" (a reasonable return is defined as net operating income sufficient to meet interest and loan repayments, investment requirements, reserves and dividend payments to Government). Section 18.1 of the *BPC Act* gives the BPC the power to establish tariffs to meet the requirements of Section 17, on the basis that the proposed tariffs are subject to the approval of the Minister.

Past financial performance analysis

4. BPC is the third smallest power utility in the SAPP with only 132 MW of installed capacity, compared to over 50,000 MW in the SAPP combined. Only Lesotho (73 MW) and Swaziland (42 MW) are smaller than BPC. BPC's financial performance has been generally satisfactory, though its reported profits have been on the decline in the recent years mainly due to significant increases in power import costs. BPC's key performance indicators for the period 2004-08 are as below.

Table 41: BPC's key performance indicators for the period 2004- 08 (in BWP 000, unless stated)

FY ending March 31	2004	2005	2006	2007	2008
Energy sold (GWh)	2,366	2,416	2,626	2,777	2,889
Own generation (GWh)	727	833	866	726	631
Imports (GWh)	1,915	1,898	2,050	2,394	2,585
Operating income	593,271	644,586	725,063	821,738	964,681
Operating expenses	526,693	621,862	752,161	885,152	1,050,448
Of which: depreciation	110,284	121,972	147,078	174,968	196,583
Operating income	66,578	22,724	(27,098)	(63,414)	(85,767)
Net investment income	139,428	139,262	147,816	164,719	196,910
Profit for the year	206,006	161,986	120,718	101,305	111,143
Total assets	3036,108	3,335,755	5,390,587	5,666,957	6,592,477
LT liabilities	229,142	320,298	359,467	339,554	570,383
Net worth (less rev. reserve)	1,314,872	1,436,361	2,221,987	2,328,145	2,411,502
Operating ratio	11.2%	3.5%	(3.7%)	(7.7%)	(8.9%)
Cash operating ratio	29.8%	22.5%	16.6%	13.6%	11.5%
DSCR	11.05	11.47	20.30	23.53	15.69
Current ratio	3.45	3.54	3.47	3.03	2.26
LT debt to equity	17.4%	22.3%	16.2%	14.6%	23.6%

5. BPC's financial health was quite satisfactory over the years through 2008 as can be seen from the comfortable indicators of operations (operating ratio), creditworthiness (DSCR), liquidity (current ratio)

and leverage (debt to equity). The revenues increased by an annual average of about 13 percent, whereas costs increased by nearly 19 percent, thereby eroding the operating margins during the 2004-08 period. The negative trend in operating income was offset by large financial income from investments, which contributed to BPC's profitability and creditworthiness (DSCR[78]). But such income was insufficient in 2008-09 to offset the impact of huge increase in power import costs (which doubled) and resulted in large operating loss and net loss for the year. The unit cost comparators for BPC are summarized below.

Table 42: Unit cost comparators for BPC (in thebe/kWh, unless stated)

FY ending March 31	2004	2005	2006	2007	2008	2009
Own generation	15.21	12.70	16.10	24.88	30.66	37.76
Imports	7.38	8.88	11.36	11.98	15.81	24.79
Combined average cost	10.65	11.36	14.18	16.83	20.05	27.00
Transmission	5.76	5.15	7.44	7.63	10.06	9.94
Admn. and overheads	6.70	7.90	7.74	8.34	7.17	7.09
Total unit cost	23.11	24.41	29.36	32.81	37.29	44.03
Average tariff	24.59	26.24	28.25	29.52	32.49	36.00
Unit contribution	1.48	1.83	(1.11)	(3.29)	(4.80)	(8.03)
Financial income	6.43	6.31	6.12	6.39	7.20	6.30
Net contribution	7.91	8.14	5.01	3.10	2.40	(1.73)

6. Both own generation costs and import costs have doubled in nominal terms during 2004-08, accounting for the largest component cost increases for BPC; import cost further doubled in one year during the current year. Since Morupule A power generation costs has been consistently higher than import costs, BPC gained financially by imports rather than own generation from Morupule A plant. In 2001, Morupule plant factor was 90 percent, whereas it gradually reduced, reaching 55 percent in 2007-08. Since power import cost is expected to rise sharply in the coming years, BPC should aim to increase its plant factor and efficiency at Morupule A, which will help BPC financially.

7. The financial outlook of BPC depends upon the cost of financing for the Morupule B project, operating efficiency of Morupule A plant to generate maximum energy at reasonable cost, imports from Eskom and SAPP, transmission and distribution efficiency, administrative and overheads. Improving reliability and hence availability of Morupule A plant will help achieve its rated efficiency and generation output. BPC does not have much control or influence over costs of imported energy and has to sustain its efforts to find alternative sources to Eskom. The transmission, distribution, and other overheads costs could be controlled by BPC to ensure better efficiency and utilization of financial resources.

8. It is expected that Eskom prices[79] would reach up to thebe 31/kWh during 2009-10 and increase further thereafter to reach about thebe 45/kWh by 2012. Such increases would need to be passed on in the rates to customers by BPC, while at the same time aiming for improving its own operating efficiency to keep the rate increases in an efficient range. In the foregoing 2008-09 year, BPC's average revenue had to be at least thebe 37.73/kWh (instead of thebe 36.00/kWh) to break even and higher to make a net profit and thus be in compliance with its laws. Hence, timely and adequate tariff adjustments would be essential to maintain BPC's financial viability and ensure its attractiveness to lenders for financing the Project.

[78] DSCR is an indicator of creditworthiness. Lenders typically require DSCR of above 1.0 for public utilities, and usually in the range of 1.25 to 1.50 during the debt service period.

[79] BPC's revised contract with Eskom

Table 43: BPC operating costs estimates (2009-10 to 2011-12)

	2009-10	2010-11	2011-12
Total contracted supply (GWh)	**3250**	**3029**	**3028**
Imports (GWh)	2700	2167	2166
Morupule A (GWh)	550	862	862
Net Sales (GWh)	**2980**	**2787**	**2786**
Operating Costs (BWP million)	**1463**	**1782**	**1792**
Purchased power	645	663	661
Own generation	134	207	217
System loss	61	94	94
T&D expenses	216	242	242
Corporate and Administration	171	298	298
Rural Administration	30	40	42
Depreciation	206	238	238
Thebe/kWh	**41.07**	**63.95**	64.33
Investment Income (BWP million)	239	239	240
Thebe/kWh equivalent	8.01	8.58	8.62
Target Average Revenue Thebe/kWh	**41.06**	**55.37**	**55.71**
Target Ave. Rev. (excl. depreciation)	**34.15**	**44.68**	**45.02**

9. Based on financial projection, BPC estimates that average revenue would need to be over thebe 60/kWh by 2012 when debt service on the commercial borrowings for the project commence. At the same time, tariff increases of such magnitude would raise social and competitiveness concerns, but the current tariff policy has shortcomings. Tariffs policy, *inter alia*, should: (i) be based on "efficient costs" rather than actual costs of BPC; (ii) incentivize conservation and efficiency; and (iii) include measures to protect the poor. Further, independent regulatory oversight would promote transparency and accountability. Botswana would need to adopt a new electricity tariff policy and ensure implementation through an independent regulator. Technical assistance and support to the Government in this regard is included in the project scope.

10. Whereas adopting and implementing a new tariff policy through a new regulator will take at least two years as noted above, electricity tariffs would need to be adjusted in the interim to ensure BPC's financial viability and going concern status. BPC estimates that it would require thebe 56/kWh to cover operating expenditures during the 2009-11, excluding costs of emergency power from diesel generators. The Government is examining several measures, including smaller but frequent adjustments (*e.g.*, quarterly), considering the already negative impact of the economic crisis on customers and recovery. The Government has initiated the procurement of consultants to undertake analysis of options for interim BPC tariff adjustments. The consultants are expected to provide their recommendations within three months, by early-2010. The options to be examined include: (i) waiver of the 10 percent value added tax on electricity by classifying it as "essential service," and instead allow BPC to collect the same amount as part of its rate which has neutral impact on customers; (ii) administering the National Electrification Fund approved by the Government in July 2009 for financing BPC's rural network operations and maintenance; and (iii) administering the budget support measures for emergency power supply from diesel units during 2010-12 (also approved by the Government in July 2009) to cover gaps in electricity supply. These measures are intended to ensure BPC's ability to cover its cash operating costs through periodic (e.g. quarterly) adjustments, and gradually start the process of adjustment to the fully cost-reflective tariffs that will be developed as part of the long-term tariff policy study.

Annex 11: IBRD Partial Credit Guarantee

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

IBRD PARTIAL CREDIT GUARANTEE

1. The Government has requested the International Bank for Reconstruction and Development (IBRD) to consider providing an IBRD partial credit guarantee ("PCG") in respect of BPC's commercial borrowing to fund Component A(1), the proposed Morupule B power station. The IBRD PCG would support commercial lenders to BPC by covering them against certain specified portion of debt service default: (i) resulting from the nonpayment by BPC *and* (ii) upon the nonpayment by the Government under its own state guarantee (Government Guarantee). IBRD would be obligated to pay out under the PCG regardless of the cause of such debt service default.

Proposed IBRD Guarantee

2. BPC, with a deed of guarantee from the Government, has arranged for a twenty-year loan (Export Credit Facility) from the Industrial and Commercial Bank of China Limited (ICBC), a state-owned commercial bank in China, in the amount of US$825 million. China Export & Credit Insurance Corporation (Sinosure) will guarantee 95 percent of scheduled debt service amounts for the first fifteen years of the ICBC loan. With an indemnity from the Republic of Botswana, IBRD will guarantee payment of the scheduled outstanding principal amount and one accrued interest payment falling due and payable after the fifteenth year, on an accelerable basis only on and after the beginning of the sixteenth year. The PCG will be denominated in US$. The PCG and the Sinosure insurance policy would not overlap or otherwise cover the same payment obligations under the ICBC loan; the IBRD PCG would not benefit the bilateral agency Sinosure. While the proposed co-guarantee operation is a new feature for Bank PCG operations, such combination in a non-overlapping manner was assessed appropriate given the current financial crisis affecting Bank's client countries including Botswana.

3. The ICBC loan will be fully amortized over its twenty-year life. When the IBRD PCG is first callable at the beginning of the sixteenth year, the nominal value, and IBRD's exposure, would be US$242.7 million (*i.e.*, 10/34 of the total principal amount of the loan). The present value now (*i.e.*, Bank's immediate exposure amount under the IBRD PCG) would be about US$121 million.

Guarantee coverage

4. Based on negotiations between BPC and its lenders, the Bank proposes to issue an IBRD PCG covering the principal amount outstanding and one accrued interest payment using the original repayment schedule where such repayment amounts fall due and payable any time during the period from the beginning of the sixteenth year after the effective date of the loan agreement and ending on the scheduled final date for repayment of the loan (IBRD Callable Period). For the avoidance of doubt, the PCG would not cover any amounts of principal or interest that fall due and payable (whether due to nonpayment by BPC, the Government, or Sinosure) prior to the commencement of the IBRD Callable Period, and which remain outstanding at any time during the IBRD Callable Period. In case of acceleration of the loan, the PCG can be accelerable only after the commencement of the IBRD Callable Period, and, in such case, only in respect of amounts falling due and payable during the IBRD Callable Period.

5. The PCG would only be callable on or after the date of commencement of the IBRD Callable Period and following, among other things, the failure by: (i) the Borrower to make any payment of principal and one accrued interest payment which falls due during the IBRD Callable Period or, if accelerated, which would have fallen due during the IBRD Callable Period; and (ii) the Government to pay such amount due to the lenders under the Government Guarantee.

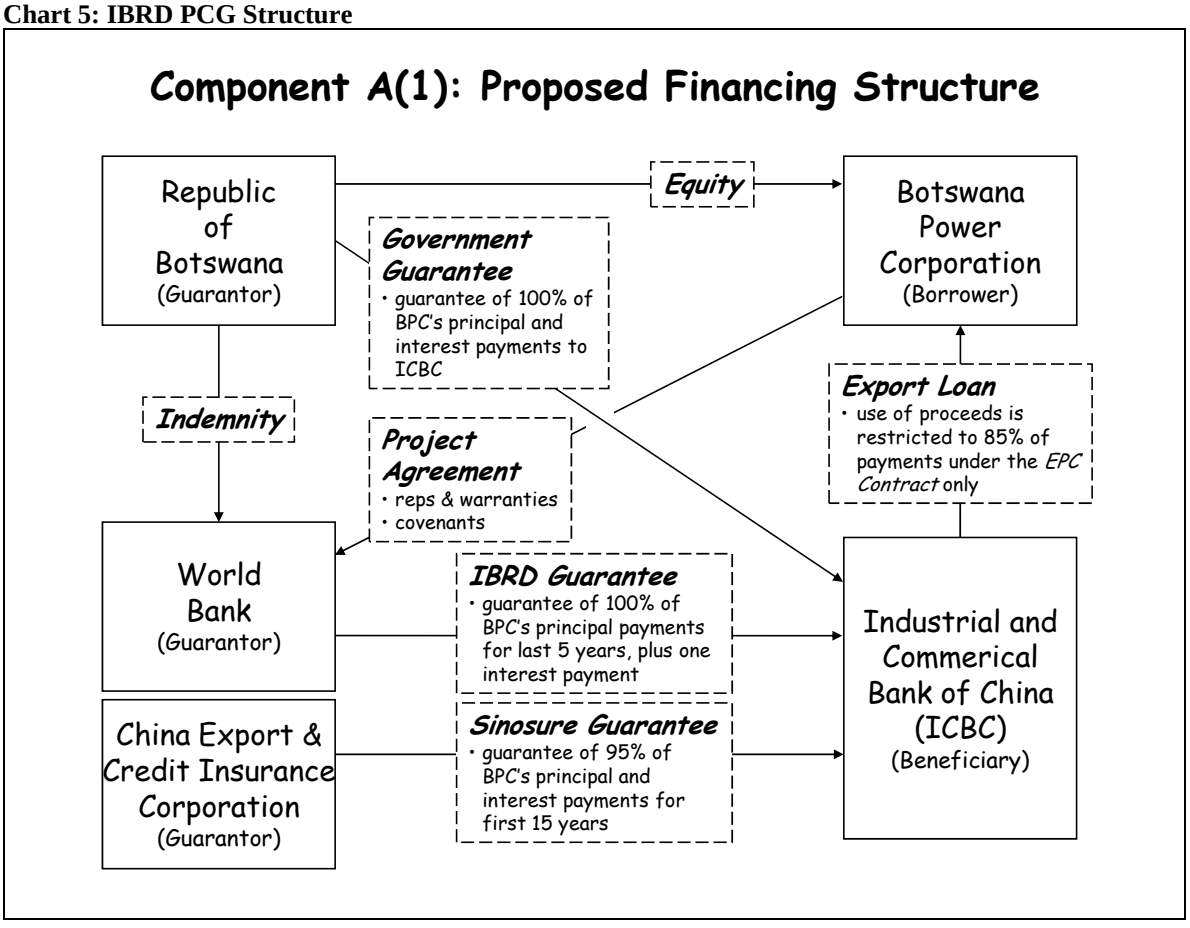
Required documentation

6. Required documentation includes the following:

- **Guarantee Agreement**. The terms and conditions of the PCG will be embodied in a Guarantee Agreement between an agent acting for itself and on behalf of the beneficiaries and the World Bank.
- **Project Agreement**. BPC will execute a Project Agreement with IBRD in order to create a direct contractual relationship with IBRD. It will contain undertakings to the World Bank with respect to matters of particular concern, such as the use of proceeds of IBRD-guaranteed debt, consent requirements for changes to project documentation, provisions relating to corrupt practices, compliance with World Bank environmental and social safeguards policies, and assignment of rights.
- **Indemnity Agreement**. The Republic of Botswana will enter into an Indemnity Agreement with IBRD to indemnify IBRD in the event it makes payments under the PCG, and against any other expenses or liabilities incurred by the World Bank relating to or arising from the PCG.

7. An indicative summary term sheet for the proposed PCG is attached and should be read in conjunction with the statements contained herein.

Chart 5: IBRD PCG Structure



SUMMARY OF INDICATIVE TERMS AND CONDITIONS OF THE PROPOSED IBRD PCG

Borrower:	Botswana Power Corporation.
Loan Agreement:	Export Credit Facility between the Borrower and the Industrial and Commercial Bank of China (ICBC), as Agent Bank for lenders.
Mandated Lead Arrangers:	ICBC and Standard Bank of South Africa.[80]
Agent Bank:	ICBC.
Lenders:	ICBC initially, to be syndicated after financial closing.
Use of proceeds:	The Guaranteed Loan will be used by BPC exclusively for the purposes of financing eighty-five percent of the payments under the EPC Contract for the Morupule B Power Station.
Loan currency:	US$.
Loan amount:	US$825 million.
Loan final maturity:	Subject to the continuing availability of the IBRD PCG, twenty years from financial closing. If and when the IBRD PCG is terminated early, the final maturity will be reduced to fifteen years.
Loan grace period:	3.5 years.
Repayment schedule:	Semiannual equal principal installments.
Prepayment option:	Subject to payment of swap breakage costs.
Loan availability period:	3.5 years.
Loan interest rate:	US$ London Interbank Offered Rate (LIBOR) plus a market-based margin.
Loan commitment fee:	Market-based rate per annum on undisbursed amounts.
Choice of law:	England.
Guarantees:	**Government Guarantee**. The Government will guarantee to ICBC, as Agent Bank, the timely payment of all scheduled and unpaid principal and interest, and any additional amounts (*e.g.*, penalty interest premium, tax gross up), payable by the Borrower. **Sinosure Guarantee**. China Export & Credit Insurance Corporation (Sinosure) will guarantee to ICBC, as Agent Bank, the timely payment of 95 percent of all scheduled and unpaid principal and interest payable by the Borrower, but not paid by the Borrower nor paid under the Government Guarantee, during the first 15-year period (**Sinosure Callable Period**). It is anticipated that under Sinosure's coverage, if the PCG is terminated early for any reason, then the ICBC Loan will revert from a 20 year loan to a 15 year loan and Sinosure would cover ICBC for up to 95 percent of the full US$825 million.

[80] ICBC is also the sole original lender, which intends to syndicate a portion of the Facility to other commercial banks; while Standard Bank is also the initial hedging bank.

IBRD PCG. IBRD will guarantee to ICBC, as Agent Bank, the timely payment of all scheduled and unpaid principal payments, accelerated as the case may be, and one interest payment, falling due and payable by the Borrower, during the last 5-year period (**IBRD Callable Period**) (see Addendum A), but not paid by the Borrower nor paid under the Government Guarantee, as further described below, and in accordance with the mechanics and terms set out in the Guarantee Agreement. For the avoidance of doubt, the Agent Bank (on behalf of the Lenders) may not make any demand under the PCG until after the commencement of the IBRD Callable Period and then only in respect of scheduled amounts that: (i) fell due and payable during (and not prior to) the IBRD Callable Period, and (ii) if the loan is accelerated, would have fallen due and payable during the IBRD Callable Period.

Maximum IBRD Liability:

Principal: The aggregate of the scheduled and unpaid principal payments during the IBRD Callable Period, as shown in Addendum A (*i.e.*, up to US$242.7 million); plus

Interest: One accrued and unpaid interest payment (excluding default or other additions to the base rate), as shown in Addendum A.

IBRD Front-end Fee: The Borrower will pay to IBRD a one-time Front-end Fee of 0.25 percent on the Maximum IBRD Liability.

IBRD Guarantee Fee: The Borrower will pay to IBRD a Guarantee Fee of 0.30 percent per annum on the *present value* of the Maximum IBRD Liability (where the present value is calculated based from the first day of the IBRD Callable Period), payable in advance of each semiannual fee period against the average balance of the present values for such a fee period.

Other provisions related to IBRD's policy and legal requirements for guarantees:

Subrogation: If IBRD makes a payment under the PCG, IBRD would be entitled to stand in the place of the private lenders and exercise the rights of such lenders to seek reimbursement for amounts paid by IBRD. The specific provision on subrogation will clearly stipulate that the World Bank would be entitled to exercise its rights of subrogation immediately, regardless of whether the Agent Bank and the beneficiaries have been fully repaid all amounts owed to them by BPC under the Guaranteed Loan.

Amendments and waivers: IBRD will be entitled to be kept fully informed about any proposed waiver or amendment to the terms of the transaction. Certain amendments or waiver to the provisions of the loan documentation and guarantee, insofar as they relate to the PCG, requires the prior written consent of IBRD. **Suspension**: IBRD may, during the availability period, inform the Agent Bank that no further drawdown under the Guaranteed Loan, from the date of notification by IBRD up until such notice is revoked by IBRD, will be covered by the PCG upon the occurrence of the following types of scenarios, *inter alia*: (i) an event of default occurs under the Guaranteed Loan; (ii) BPC has breached a material obligation under the Project Agreement relating to the PCG and such breach continues after any applicable cure period; or (iii) the Agent Bank or a beneficiary of the IBRD PCG engaged in certain sanctionable practices (fraud,

corruption, coercion, collusion, obstruction). If the event giving rise to a suspension has been waived by IBRD, or remedied to IBRD's satisfaction, then IBRD may revoke its suspension notice and let the Agent Bank know which amounts are reinstated for coverage under the PCG.

Exclusion: IBRD may deny payment to a beneficiary of the PCG in the following types of scenarios, inter alia: (i) a sanctionable practice (fraud, corruption, coercion, collusion, obstruction) has been found to have been committed by the Agent Bank or a beneficiary of the PCG; (ii) the Agent Bank or a beneficiary of the PCG, *inter alia*, amends, transfers, or assigns to a non-commercial lender without IBRD's prior consent); (iii) the Agent Bank or a beneficiary under the PCG engages in certain securities transactions in respect of the PCG.

Termination: IBRD may terminate the PCG in the following types of scenarios: (i) untrue statements are made by the Agent Bank or a beneficiary of the PCG in connection with a demand made under the PCG; (ii) the IBRD Guarantee Fee is not paid; or (iii) the PCG is otherwise terminated due to full repayment of guaranteed amounts.

Consents: As required under the IBRD Articles of Agreement, all necessary market and currency consents will be obtained prior to effectiveness. (*These consents have been obtained*)

Indemnity: The Republic of Botswana will enter into an Indemnity Agreement with IBRD in respect of the PCG. Under the agreement, Botswana will undertake to reimburse and indemnify IBRD on demand, or as IBRD may otherwise direct, for all payments under the PCG and all losses, damages, costs, and expenses incurred by IBRD relating to or arising from the PCG.

ADDENDUM A

Table 44: Guaranteed amounts [not final]

For the ICBC loan during the following period:			IBRD-Guaranteed Principal Repayment Amount[81]	Payment Date	IBRD-Guaranteed Interest Payment Amount
1-Jul-24	to	31-Dec-24	242,661,341.00	31-Dec-24	7,279,840.23 or
1-Jan-25	to	30-Jun-25	218,395,206.90	30-Jun-25	6,551,856.21 or
1-Jul-25	to	31-Dec-25	194,129,072.80	31-Dec-25	5,823,872.18 or
1-Jan-26	to	30-Jun-26	169,862,938.70	30-Jun-26	5,095,888.16 or
1-Jul-26	to	31-Dec-26	145,596,804.60	31-Dec-26	4,367,904.14 or
1-Jan-27	to	30-Jun-27	121,330,670.50	30-Jun-27	3,639,920.11 or
1-Jul-27	to	31-Dec-27	97,064,536.40	31-Dec-27	2,911,936.09 or
1-Jan-28	to	30-Jun-28	72,798,402.30	30-Jun-28	2,183,952.07 or
1-Jul-28	to	31-Dec-28	48,532,268.20	31-Dec-28	1,455,968.05 or
1-Jan-29	to	30-Jun-29	24,266,134.10	30-Jun-29	727,984.02

[81] The IBRD Guarantee is accelerable during the IBRD Callable Period.

Annex 12: Safeguard Policy Issues

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

APPLICABLE SAFEGUARD POLICIES AND REGULATORY CONTEXT

1. The project is designated Category A under OP 4.01 Environmental Assessment reflecting the scale of potential environmental impacts. In addition, the OP 4.12 Involuntary Resettlement also applies, as does OP 4.37 Safety of Dams given the need to ensure sound management of the ash impoundment dam, and OP 4.09 Pest Management to ensure safe handling and use of pesticides at Isang Substation. OP 7.50 regarding Projects on International Waterways is triggered because the primary source of water for the proposed Morupule B Power Station is the NSC, which transfers surface water from the northeastern part of Botswana to the south. Botswana has conformed with the requirements of OP 7.50 for notification to riparian states regarding the transfer of water via the NSC in accordance with the provisions of the SADC Revised Protocol on Shared Watercourses of 2000.

2. Botswana has an evolving framework of environmental protection legislation pertaining to projects such as the proposed Morupule B power plant and the associated transmission system. This legislation includes the *Environmental Impact Assessment Act 2005*, which requires the developers of such projects to file an environmental impact assessment with the DEA, and to obtain an authorization from DEA as a precondition for receiving a license from the relevant sectoral licensing authority. In addition, there is separate legislation governing the operation of facilities that give rise to atmospheric pollution or the production of waste materials. This body of legislation, consisting of the *Atmospheric Pollution (Prevention) Act 1971* and the *Waste Management Act 1998*, is administered by DWMPC.

3. All the environmental and social studies related to the main components of the project – the power station, transmission line, mine expansion and primary water supply - have been completed, reviewed, approved, and disclosed in Botswana and in the Bank's Infoshop. Public consultations were conducted for the project as part of the various environmental and social assessments. A public meeting was held at Palapye main Kgotla on September 4, 2007, and was conducted in Setswana as all the participants could speak and understand the language. A meeting with key local and central government officers was also convened in Palapye in September 2007, and the stakeholder engagement team undertook consultations with focus groups comprised of local farmers in the following lands areas within 10 km of the proposed power station site: Morupule; Mantshadidi; Mmalenakana; Dikabeana; and Molapowadipitse.

Table 45: Environmental and Social Impact Assessments completed

Report	Approval by DEA	Disclosure in Botswana	Disclosure in InfoShop
Environmental:			
EIA for Morupule B Power Station	Feb. 2008	Dec. 2008	Feb. 2009
EIA for BPC transmission lines	Nov. 2007	Dec. 2008	Feb. 2009
EIA for the new Paje well field	Feb. 2009	May 2009	May 2009
Social:			
RPF for project	n/a	May 2009	May 2009
Abbreviated RAP for family at Morupule B site	n/a	May 2009	May 2009
Associated infrastructure:			
EIA for MCL mine expansion	Dec. 2008	April 2008	May 2009
EIA for NSC–MCL water pipeline	Feb. 2008	Feb. 2008	May 2009

4. The EIA for the Morupule B Power Station was approved by the DEA in February 2008. The EIA for the transmission line corridors to the north and south of Morupule was approved as part of the

Mmamabula IPP in November 2007. The EIA for the new Paje well field proposed as a water source for Morupule B was approved in February 2009. Each EIA contains an EMP for ongoing monitoring and management; in addition, a supplementary EMP for the northern transmission line was completed in April 2009. With respect to the associated infrastructure, The EIA for the MCL mine expansion was approved in December 2008, and the EIA for the water pipeline connecting the mine to the NSC was approved in February 2008. World Bank safeguards staff have conducted field visits to both sites. Mine expansion will occur underground on existing facilities and will not require land acquisition. Also, no resettlement is required due to the underground water pipeline. The approved EIAs have been made publicly available on the BPC and MCL websites, as well as locally at the public libraries in Palapye and Serowe.

5. As noted above, an EIA for the northern and southern transmission line corridor was completed and disclosed in November 2007. Since then, BPC has been in the process refining the southern portion of the transmission line (Morupule-Isang) in order to further minimize the need for resettlement and compensation. An alternate routing is being prepared, and the field investigations have indicated some additional areas in which minor changes may be made to minimize impact. As the precise routing of the transmission line is being finalized, the final RAPs will be prepared following initial consultations and a Resettlement Action Plan baseline study and in accordance with the RPF. Accordingly, the location of the substation at Isang has been defined and the EIA completed and approved by the DEA in September 2009. Preliminary consultations took place in March 2009. Once these final RAPs are prepared, subsequent consultations will take place with the affected peoples, and the RAPs will be disclosed. The Paje-Morupule water pipeline is a backup system only and will be laid along the existing water pipeline corridor and thus would not involve land acquisition or resettlement. When the routing for pipeline on the section for connecting the new well field up to the existing well field is finalized, BPC will obtain right of way from the Land Board; the land along this section has little or no habitation, and is bushy and sandy terrain. The environmental impacts are expected to be minimal and the EMP is being prepared. Preliminary consultations have taken place and additional consultations will be undertaken as part of finalizing the EMP for the water pipeline. Related environmental studies to be conducted during project implementation include an air quality monitoring campaign focusing on the existing Morupule A Power Station, and a Regional Environmental and Social Assessment (RESA) to consider the cumulative and transboundary impacts of all planned coal-fired power investments on both sides of the Botswana/ South Africa border.

Table 46: Status of remaining safeguards documents

Report	Status	Approval by DEA	Disclosure in Botswana	Disclosure in InfoShop
Environmental:				
EIA for Isang Substation	Completed	Sep 2009	Expected Oct 2009	Expected Oct 2009
EMP for Paje well field water pipeline and power connection	Underway	Expected Dec. 2009	Expected Dec. 2009	Expected Dec. 2009
Social:				
RAPs for Morupule–Phokoje 400 kV and Morupule–Isang 400 kV transmission lines	Underway	n/a	Expected Nov 2009	Expected Nov 2009

ENVIRONMENTAL SAFEGUARDS

6. The EIAs of the project considered environmental impacts in the following categories:

- Water resources, including (i) groundwater usage, (ii) surface water usage, and (iii) community access to water;

- Ecological impacts, including impacts on (i) fauna, (ii) flora, and (iii) soils;
- Impact on the atmosphere, including health impacts of gaseous emissions, and noise impacts;
- Waste management practices;
- Social impacts including (i) resettlement, (ii) impacts on health and safety, (iii) traffic and safety, (iv) current and future planning, and (v) impacts on heritage resources; and,
- Institutional capacity requirements.

The relevant EMP will be included in the tender and contract documentation for contractors working on the project. The EMPs that form part of the EIAs listed in Table 45 above are available in the project files.

Environmental Impacts and Mitigation

7. **Emissions of pollutants**. Specifications for the proposed Morupule B Power Station include achievement of applicable World Bank emissions standards (*Thermal Power: Guidelines for New Plants, Pollution Prevention and Abatement Handbook*, 1998). While Botswana has not established emissions standards for power stations, the *Air Pollution (Prevention) Act* of 1971 requires the application of best practicable means to control emissions. The EIA for the proposed Morupule B Power Station found that current emissions from the Morupule A Power Station may be causing occasional local exceedances of Botswanan and World Bank air quality standards for ambient SO_2 and particulate matter concentrations. World Bank emissions standards are more stringent than the maximum permissible limits specified by the Botswana authorities for Morupule A's current boiler operations. The dam safety report also identified existing elevated levels of sulfate in the groundwater adjacent to the Morupule A ash disposal dump.

8. The power station will include continuous ambient air quality and in-stack emissions monitoring for compliance with applicable standards. DWMPC holds the primary responsibility for enforcing the compliance of the project with national environmental regulatory requirements, and with the approved EMPs. In order to strengthen the capacity of DWMPC to fulfill their mandate, the TA component of the project includes resources to provide DWMPC with training and equipment for air quality monitoring, and expert advice for the development of national emissions standards for power plants.

9. Prior to making a decision regarding investment in emissions control at Morupule A, BPC intends to undertake a two-year air quality monitoring campaign to better define the issues to be addressed and possible solutions. This is necessary because the EIA provided only a "predicted baseline" for air quality, due to the limitations of available directly monitored data. Based on: (a) the results of the two-year air quality monitoring campaign at Morupule A, (b) the performance results from test operations of Morupule B units, and (c) the projected results of combined operations of A and B plants, BPC will implement measures as necessary to ensure that the joint operation of Morupule A and B does not lead to exceedances of World Bank or Botswanan air quality standards. For Morupule B units, the EPC contract guaranteed design value[82] for SO_2 limit is 455 mg/Nm^3, which is well within the range of 200-850 mg/Nm^3 limit per the new and more stringent World Bank guidelines. Therefore, key considerations for emissions control from combined A and B operations are the following: (a) reduced need for Morupule A from 2013 onwards, possibly as stand-by for Morupule B plant, correspondingly decreasing emissions; (b) potential for reducing Morupule A emissions using washed and low sulfur coal from MCL; (c) availability of water for retrofit options for Morupule A, (*e.g.*, FGDs); (d) potential for reducing Morupule B emissions by up to an additional 10 percent using additional limestone; and (e) finally, significant emission reductions in Morupule B if required through expansion of limestone and ash handling capacities.

[82] The values for NOx and particulates are respectively 750 and 50 mg/Nm^3. Since CFB boilers are low temperature combustion, Morupule B units could meet the 510 mg/Nm^3 limit for NOx without need for selective catalytic reduction (SCR) controls.

10. To avoid further groundwater contamination from the old ash lagoon, in the future, ash slurry from the Morupule A Power Station will be rerouted to the new ash lagoon at the Morupule B Power Station, which will have a sealed base.

11. **Availability of water**. The estimated water requirement for the combined operation of Morupule A and Morupule B is about 2.2 million cubic meters per year for a variety of aspects of their operation, in particular as make-up water for blow-down losses. Currently, about seven hundred thousand cubic meters per year are being supplied for the Morupule A Power Station from an older section of the Paje well field. Both the Morupule A and the proposed Morupule B power stations are designed for air-cooling technology to minimize water requirements. Further measure for water conservation is through recovery and reuse of water from the ash ponds.

12. The primary source of water for the proposed Morupule B Power Station is the NSC and the backup supply system is the new Paje well field. The primary and backup water supply systems and allocations are a part of and consistent with the National Water Master Plan prepared by the WUC. The WUC captures surface water from the northeastern part of Botswana and transfers it via the NSC to various users including in the capital city of Gaborone. The coal mine and power station will use the existing capacity of the ongoing NSC scheme, and will not entail works and activities that would exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme. The Government of Botswana has conformed with the requirements of OP 7.50 for notification to riparian states regarding the capture and transfer of the designed capacity of water to the NSC, as required by the SADC Revised Protocol on Shared Watercourses[83] and recorded in the minutes of the meetings of the Limpopo Basin Permanent Technical Committee.[84]

13. As mentioned above (paragraph 5), a new Paje well field will be developed as the backup source of water for Morupule B operations. The EIA of the proposed new well field indicates that meeting the full water requirement from this source would draw down the aquifer by 30 percent in twenty years, potentially affecting a number of cattle post boreholes. The EIA identifies a geological structure separating the new Paje aquifer into distinct northern and southern compartments, both of which lie wholly within Botswana. If the northern compartment of the aquifer is used, the seeps at the foot of the adjacent escarpment which feed the Motloutse River may be affected.

14. Although the power station will be connected to the new Paje well field, by stipulating that the NSC is the primary water supply, BPC will be minimizing the impact on the slowly recharging underground aquifer at Paje. Furthermore, BPC has identified an underground structure separating the new Paje aquifer into distinct northern and southern compartments. To avoid affecting the seeps at the foot of the adjacent escarpment, only the southern compartment of the new Paje well field will be connected. Further studies and modeling will be conducted before taking any decision to connect the northern compartment of the aquifer, before which no-objection from the World Bank would be requested.

15. **Safety of dams**. BPC commissioned an independent assessment by a qualified specialist of the safety of the existing ash impoundment dam, as well as the design of the new ash dam. This assessment was completed in March 2009, and indicated that while the existing ash dam appears stable at present, improvements in the structure and operation of the dam are recommended to address any possible

[83] The Limpopo Basin Permanent Technical Committee (LBPTC), established in 1986, provides a forum for the Limpopo riparians (Botswana, South Africa, Zimbabwe, and Mozambique) to notify each other of activities affecting the Limpopo River, including the development of the NSC. The members of the LBPTC are also signatories to the SADC Revised Protocol on Shared Watercourses, signed on August 7, 2000.

[84] As recorded in the minutes of the meetings of the LBPTC that took place on November 25, 2004, and May 3, 2005.

concerns. The assessment of the existing ash dam provided a set of recommendations that will be implemented by BPC, including:

- Structural measures to improve the integrity of the outer wall of the ash dam;
- Provision to pump off water pools for return to the power station;
- Construction of bunds around the south-east of the ash dump to catch any contaminated runoff, eroded material or slippage;
- Construction of diversion ditches to the north-west to divert runoff and prevent erosion;
- Alteration of the deposition system;
- Improvements in the groundwater monitoring system; and
- A detailed geotechnical investigation of the existing ash dam.

16. OP 4.27 Safety of Dams is triggered for the design of the new dam. The design of the new ash dam will be subject to independent review. The new ash dam to be built will meet the design requirements and conform to OP 4.37 Safety of Dams. BPC plans to use the new ash dam for collecting ash from both existing Morupule A power plant and the proposed new Morupule B power plant. In the meanwhile, BPC will examine the measures needed to implement the recommendations of dam safety assessment suitably.

17. **Use of pesticides**. BPC does not intend to use pesticides to control vegetation under transmission lines; however, BPC has sought guidance from the Plant Protection Division of the Ministry of Agriculture on appropriate herbicides to use for control of vegetation at substations, and received the recommendation to use preparations of tebuthiuron, an active ingredient categorized by the World Health Organization as Class III, slightly hazardous. OP 4.09 Pest Management is triggered.

18. The environmental assessment of the Isang Substation, which is currently underway, will include a pest management plan providing guidance on the safe storage, handling, application, and disposal of herbicides and pesticides to be used by BPC at this and other substations, as well as recommendations on the training needed to implement this guidance. When implemented, this will meet the requirements of OP 4.09 Pest Management.

Alternatives

19. **No-project alternative**. Given the regional shortage of power, the no-project alternative implies that BPC will be unable to meet projected national demand for power. The benefits of this alternative are that most of the negative impacts associated with the proposed development option will be prevented; these benefits are out-weighed, however, by the economic costs of continued and worsening national power shortages.

20. **Site alternatives**. The main factors influencing the location of a coal-fired power plant are proximity to a coal resource of suitable quality and water supply. Other important factors that influence location include availability of land, environmental suitability, proximity to the market and availability of infrastructure such as roads, railways and telecommunications. Establishment of the power station at any other location in Botswana would require significant additional infrastructure to be constructed such as roads, rail and the establishment of a new coalmine. Notwithstanding the financial cost associated with this additional infrastructure, the impact to the environment would be significantly greater than the proposed expansion of the existing Morupule A footprint.

21. **Technology alternatives**. The electricity demand pattern in Botswana requires that a base-load generation technology be considered, as a peaking electricity generation technology will only limit the extent to which imported power will be needed at certain times of the day. Although this will assist in reducing reliance on imported power, it will not enable BPC to replace the current seventy percent reliance on imported power with local generation capability, which is a key strategic objective of this project, given the renegotiation of the contract with ESKOM which will terminate any sales of electricity

to Botswana by 2013. Recent developments in energy storage technologies are bringing renewable energy technologies such as solar thermal generation and wind energy closer to providing base-load requirements, however these new technologies cannot yet be considered to be commercially proven. Given the urgent need to establish base-load capacity in Botswana to replace imported power, and the prohibitive cost of an oil-fired plant, the only financially feasible option is a coal-fired plant.

22. **Design alternatives**. Design options considered for Morupule B Power Station focused on either the CFB boiler design or the PC boiler design. The CFB design is an advanced coal utilization technology which has the following benefits over conventional thermal power plants:

- Wide range of fuel adaptability which allows for the use of low grade coal, biomass and waste tires;
- Decreased emissions of NOx and SOx;
- High combustion efficiency; and
- Space saving and improved maintenance ability

23. Selecting between PC and CFB boiler designs is a complex decision and environmental performance is only one criterion which should influence this decision. CFB boiler design is able to achieve a similar environmental performance with respect to gaseous emissions to PC technology with emissions control, at a lower operating cost. The large unit sizes (500 MW and above) necessary for super-critical boiler technology were deemed inappropriate for a small system like the one in Botswana.

Institutional arrangements

24. BPC will be responsible for the overall implementation, administration and enforcement of the EMP. BPC:

- has appointed implementation supervision consultants who will ensure that the relevant EMP specifications are included in all tender documents issued for Components A2 and A3, and will monitor and enforce adherence to these requirements by contractors; will amend the EPC contract by effectiveness to clearly assign the respective responsibilities of BPC and EPC contractor for the EMP;
- has appointed an Environmental Liaison Officer to monitor implementation of and compliance with EMPs for the duration of the works; and
- will issue fines or stop work orders for contravention of EMPs and give instructions regarding corrective action.

25. DWMPC holds the primary responsibility for enforcing the compliance of Morupule A and B with national environmental regulatory requirements. In order to strengthen the capacity of DWMPC to fulfill this mandate, the TA component of the project includes resources to provide DWMPC with training and equipment for air quality monitoring, and expert advice for the development of national emissions standards for power plants.

SOCIAL SAFEGUARDS AND SOCIAL ISSUES

26. In the context of the EIAs, two SIAs have been carried out for the project: one for the Morupule B power station site and another for proposed transmission line corridors. The SIAs examined the resettlement issues present and the broader social issues. In addition, a RAP Baseline investigation has been undertaken for the new (to be finalized) transmission line routing.

27. The proposed project site falls within the Palapye Planning Area in the Central District. The current population was estimated at 26,293 in 2001; however, Palapye has experienced significant population growth in recent years. This trend is expected to continue with the opening of a new University in the area. Palapye is also located at the junction of major roads linking Gaborone and Francistown (north-south corridor) and Serowe (west). Although Palapye itself is growing, the proposed

transmission line corridors are still sparsely settled. During project preparation, World Bank safeguards staff undertook two separate field visits to the proposed corridor, accompanied by BPC staff.

28. The combined factors of strategic location and projected influx of population pose particular issues that will be addressed through different mitigation measures (see risk matrix). The principal issues are: safeguard issues, potential conflict, and likely increase in the incidence of HIV/AIDS.

Resettlement Policy Framework

29. The draft resettlement framework in the SIA report provided a foundation for the project's RPF. Based on this and with recommended examples, BPC has prepared an RPF for the project. An environmental and social safeguards specialist from AfDB joined the May 2009 mission, including field visits to sites along the proposed transmission line, to coordinate.

30. The RPF covers the proposed transmission line routing, but the precise routing has not yet been finalized. As the area is sparsely settled at present and the topography is relatively flat, BPC altered the initial routing of part of the transmission line corridor to minimize social impact and resettlement. There have been initial surveys of this section of the transmission line corridor, but routing and placement of towers can be adjusted to further minimize proposed impact. BPC has indicated that this is technically feasible.

Resettlement Action Plans

31. A family of four lives at the Morupule site. The World Bank social safeguard specialist met with the family during two missions. In discussions, they expressed awareness that the construction of the power plant was imminent and willingness to move, provided acceptable alternative land plots were secured. Botswana Law outlines the process under which alternative land can be designated, and the family assisted with relocation.

32. The World Bank team has stressed to BPC that the resettlement of the family would need to follow World Bank operational policy and that alternative land would need to be provided. Based on this guidance, BPC has prepared an abbreviated RAP for this family and submitted it to the World Bank. In line with this RAP, activities to resettle the family have begun. BPC agreed that resettlement of the family would occur prior to any construction activities, prior to transfer of the property, and in line with the agreed abbreviated RAP.

33. When the surveys are completed for the final routing of the transmission lines, additional RAPs may be required, in compliance with the RPF. If required, each such plan must be implemented, any resettlement must be completed, and any compensation must be paid prior to commencement of construction activities on that subcomponent.

34. At appraisal, the water supply component is not expected to require a RAP. A detailed EMP would be prepared for this component. If a RAP is required, it would be prepared in accordance with the RPF.

Fencing the power plant construction site

35. As of appraisal, the Morupule B power plant site remained unfenced as BPC intended to change the contractor. This risks further encroachment and/or squatting on the proposed construction site. BPC has indicated that the fence construction duration would be sixteen weeks and a new contractor has been appointed.

Other social issues

36. The SIA for the Morupule B power station differentiates between the social issues present during the construction phase and those during the operational phase. A key challenge will be the influx of job seekers (separate from the contracted construction camp). Previous experience has shown that in-

migration seeking opportunities surrounding construction projects should be anticipated. Local authorities and BPC will need to co-operate in managing informal settlements, both in terms of conflicts between the local population and in-migrants, and HIV/AIDS prevention and outreach. The SIA notes that there are already well-established relations between the government departments, local authorities, the power station and the coal mine.

37. The March 2008 mission identified additional issues from the SIA in terms of managing conflict among informal job seekers, power plant construction workforce and the existing villages. While internal village conflict mechanisms provide means for handling minor offenses, the only mechanism for managing conflict among stakeholder groups is the police. In Dovedale, police presence has already been increased to respond to incidents from informal job seekers who have heard of potential jobs associated with the Mmamabula IPP project (not Morupule). In the more developed context of Palapye, combined with the expected population growth due to the university construction, mitigating inter-group conflict will require the existing co-operation to be strengthened.

38. Similarly, both BPC and the colliery have established HIV/AIDS prevention and treatment programs that utilize distribution of condoms and information, testing, and peer-to-peer counseling and education. There is the potential to use these programs as a basis for outreach to the temporary construction workforce (adapting for language as necessary with an immigrant workforce imported by the construction company) and also for the in-migrants (including sex workers) who are likely to establish an informal community selling services and goods to the construction force. Such outreach will need to be supported by resources and explicitly designed with input from the WB-funded HIV/AIDS prevention project. The current arrangements are narrowly delimited to the formal employees and their families, and the provision of services by government departments receive resources based on the current population, not on expected influx.

Box 10: Regional Environmental and Social Assessment—Phase 1

Context: Regional investments in coal-fired power

The SAPP generation expansion plan, which includes twelve countries of the region, indicates a need to add nearly 39,000 MW through 2025, of which about 32,000 MW is intended to meet South Africa's demand alone. In addition to the Morupule B project, two other energy projects are being considered in Botswana, the Mmamabula IPP and an additional large coal-fired plant in the same region, for which the Aviva Corporation is examining the feasibility. Two major new coal-fired facilities are planned on the South African side of the border. Combined with the existing Morupule A power plant in Botswana and the Matimba power plant in South Africa, it is possible that within a decade or so there may be more than 12,000 MW of coal-fired generation capacity within approximately 150 km of the Botswana–South Africa border. Beyond the power generation sector, there is also a proposal from Sasol to develop a production facility in the same area on the South African side of the border. Taken together, these facilities raise the possibility of cumulative environmental and socio-economic impacts, with potential transboundary consequences, that may not be adequately addressed through their individual EIAs. The RESA will examine the cumulative environmental and socio-economic impacts of all the planned and existing energy sector investments on both sides of the border between Botswana and South Africa. The World Bank will engage a consultant to undertake a preliminary study in preparation for the full RESA.

Objective of the preliminary study for the RESA. The objective of the proposed study is to develop an initial analysis of the scope of the cumulative environmental and socio-economic regional impacts that are likely to occur as a result of investments in coal-fired power and associated mines on either side of the Botswana–South Africa border over the next twenty years. The principal outputs of the proposed study will be: (i) a report presenting the initial analysis of cumulative impacts; and (ii) draft terms of reference for a more detailed RESA that will include public consultation to be undertaken as an element of World Bank support for the development of the energy sector in Botswana.

Organization of the work. The consultant will report to the World Bank team preparing the proposed Bank support for the energy sector in Botswana. In undertaking this assignment the consultant will work closely with the Governments of Botswana and South Africa, as well as with BPC and South Africa's electricity company, Eskom.

Tasks

Task 1: Scoping - definition of spatial extent and types of impact and stakeholder mapping

Spatial extent and types of impact

A primary task of the proposed study is to define the spatial scope and types of impact to be considered in the full RESA.

Stakeholder mapping

The consultant will also prepare a preliminary mapping of the key stakeholders for the various existing or proposed power plants, coal mines and other relevant facilities. Stakeholder mapping will identify the key governmental actors on various levels (regional, national and sub-national), potentially affected populations and private sector interests, as well as relevant civil society and NGOs. The consultant will prepare a matrix of the likely interest and influence that the various stakeholders will have on the proposed developments. Based on this matrix, the consultant will outline a strategy for consultation to be undertaken in the next phase of the study program for the RESA.

Task 2: Initial characterization of cumulative impacts

The consultant will develop a more detailed qualitative description of the environmental and socio-economic impacts to be considered in the full RESA, and to the extent possible using available data, will develop simple models to forecast the likely quantitative extent of these impacts. As part of this process, the consultant will identify what data are already available and what additional research might be necessary. The focus include: (a) long-range transport of acid and other airborne pollutants; (b) Impacts on water availability and quality; and (c) socio-economic impacts.

Task 3: Preparation of terms of reference for RESA—Phase 2

Based on the analysis undertaken for Tasks 1 and 2, the consultant will prepare terms of reference, estimated budget, and schedule for the more detailed RESA—Phase 2 that will focus on the cumulative environmental and socio-economic impacts of existing and proposed coal-fired power plants and associated coal mines in the study area over the next twenty years. These terms of reference will clearly identify: (i) the power plants and coal mines to be considered; (ii) other key facilities including the proposed Sasol facility; (iii) the relevant international and regional legal agreements and national laws and policies that relate to the issues under study and their provisions in the context of the proposed activities; (iv) the spatial extent of the impacts to be analyzed; (v) the scope of an analysis of alternatives, including the no action alternative and a range of feasible alternatives; (vi) the types of impact to be assessed; (vii) the data to be collected, in particular any primary collection of environmental or social data; (viii) the approaches to be used in analyzing potential cumulative impacts; (ix) the approaches to be used in evaluation of climate change issues; and (x) the consultative process to be followed for preparation and finalization of the RESA—Phase 2.

PUBLIC CONSULTATIONS

39. Public consultations were conducted for the project as part of the various environmental and social assessments indicated in Table 45. The stakeholder engagement process for the EIA of the power plant commenced in August 2007 with the publication of an advertisement in English and Setswana announcing the project. An invitation to attend the scheduled public meeting regarding the project was included in the advertisements, and at these meetings a background information document was presented in both Setswana and English.

40. The first public meeting was held at Palapye main Kgotla on September 4, 2007, and was conducted in Setswana as all the participants could speak and understand the language. A meeting with key local and central government officers was also convened in Palapye in September 2007, and the stakeholder engagement team undertook consultations with focus groups comprised of local farmers in the following lands areas within 10 km of the proposed power station site: (i) Morupule; (ii) Mantshadidi; (iii) Mmalenakana; (iv) Dikabeana; and (v) Molapowadipitse. Additional consultations have taken place in the context of updating of the resettlement instrument.

41. The principal comments received during these consultations are indicated below:

- **Public, farmers, and livestock owners meetings** – (a) preference should be given to local people for non-skilled and semi-skilled labor requirements and the hiring should be done in a transparent manner, such as through use of the Kgotla, (b) concern was expressed regarding the increased probability of illegal occupiers of land who will come in as job seekers;
- **Business community** – the contractor should source some of the materials and services locally; and,
- **Local government** – construction phase may exert pressure on existing social amenities such as schools and clinics available in the town.

42. In compliance with the Bank's policy on disclosure of information, BPC has made the approved versions of all safeguard documents available both on the BPC website and at the public libraries in Palapye and Serowe.

Annex 13: Project Preparation and Supervision

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Table 47: Project implementation schedule

	Planned	Actual
PCN review (ROC)		July 16, 2008
PCN review (OC)		September 29, 2008
Initial PID to PIC		January 22, 2009
Initial ISDS to PIC		January 26, 2009
Appraisal		August 24, 2009
Negotiations	September 16, 2009	
Board approval	October 29, 2009	
Planned date of effectiveness – PCG	November 30, 2009	
Planned date of effectiveness – Loan	February 15, 2010	
Planned date of mid-term review	November 2011	
Planned closing date	June 2014	

Key institutions responsible for preparation of the project:

- Ministry of Finance and Development Planning
- Ministry of Minerals, Energy, and Water Resources
- Ministry of Environment, Wildlife, and Tourism
- Botswana Power Corporation

Table 48: Bank staff and consultants who worked on the project

Name	Title	Unit
Varadarajan Atur	Lead Energy Specialist, TTL	AFTEG
Scott Sinclair	Lead Financial Officer, Co-TTL	AFTEG
Aman Sachdeva	Consultant (Finance)	AFTEG
Anil Markandya	Consultant (Economist)	SASDE
Candy Perque Herlihy	Lead Financial Officer	BDM
Cecilia M. Garmendia	Sr. Infrastructure Economist	AFTSN
Franz Gerner	Sr Energy Economist	ECSSD
Heather B. Worley	Communications Officer	EXTOC
Jemima Harlley	Program Assistant	AFCS1
John Strongman	Consultant (Extractive Industries)	COCPO
José-Manuel Bassat	Sr Communications Officer	EXTCD
Karan Capoor	Sr Financial Specialist	AFTEN
Kimberly Versak	Consultant (Communications)	EXTCD
Luz Meza-Bartrina	Sr Counsel	LEGAF
Mark Moseley	Sr Counsel	LEGPS
Masaki Takahashi	Sr Power Engineer	ETWEN
Michael Stanley	Lead Mining Specialist	COCPO
Modupe Adebowale	Sr Financial Management Specialist	AFTFM
Monica Restrepo	Counsel	LEGCF
Mudit Narain	Consultant (Renewable Energy)	ETWEN
Paul Jonathan Martin	Sr Environmental Specialist	AFTEN
Paula Lytle	Sr Social Development Specialist	ECSSD

Name	Title	Unit
René Mendonça	Consultant (Transmission)	MNSSD
Reynold Duncan	Lead Energy Specialist	AFTEG
Serwat Hussain	Senior Communications Officer	AFREX
Simon Chirwa	Procurement Specialist	AFTPC
Stratos Tavoulareas	Consultant (Power Plant)	ETWEN
Susan Maslen	Legal Counsel	LEGFI
Susan Shilling	Program Assistant	AFTEG
Suzanne F. Morris	Sr. Finance Officer	CTRFC
Teuta Kaçaniku	Consultant (Monitoring and Evaluation)	AFTEG
Tomoko Matsukawa	Sr Financial Officer	FEU
Zeinab Partow	Sr Country Economist	AFTP1

Table 49: Peer Reviewers for the project

Name	Title	Unit
Gary Stuggins	Lead Energy Economist	ECSSD
Mohinder Gulati	Country Sector Coordinator	ECSSD
Graeme Hancock	Sr Energy Specialist	COCPO
Ranjit Lamech	Sector Manager	ECSSD
Darius Lilaoonwala	Senior Manager	CINPW

Bank funds expended to date on project preparation:

1. Bank resources: $931,073
2. Trust funds: Nil
3. Total: $931,073

Estimated Approval and Supervision costs:

1. Remaining costs to approval: $50,000
2. Estimated average annual supervision cost: $300,000

Annex 14: Documents in the Project File

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Laws and regulations

- Botswana Power Corporation Act 1970
- Electricity Supply Act 1973
- Electricity Supply (Amendment) Act 2007
- Environmental Impact Assessment Act 2005
- Atmospheric Pollution (Prevention) Act 1971
- Waste Management Act 1998
- Electricity Supply (Licensing) Regulations
- Draft Environmental Impact Regulations
- SADC Protocol

Technical

- Regulatory Reform Phase 1 Report (Stone & Webster)
- Regulatory Reform Phase 2 Report (Stone & Webster)
- Morupule B Feasibility Study, 2004 and 2006
- Ash dam safety review report, April 2009
- Pre-feasibility Study for CSP, Fichtner Solar GmbH, December 2008

Environmental and social

- EIA for Morupule B Power Station (including EMP)
- EIA for the Transmission lines
- Supplementary EMP for transmission lines (not sure if we have this one)
- EIA for the Isang substation (pending)
- EIA for the Paje well field
- EMP for the pipeline and power connections to the Paje well field (pending)
- EIA for the expansion of the MCL mine
- EIA for the NSC to MCL water pipeline
- Resettlement Policy Framework
- Abbreviated Resettlement Action Plan for power plant site
- Abbreviated Resettlement Action Plan for the Morupule B - Isang transmission line.

Procurement-related

- Owner's Engineer Contract with Fichtner, October 2006
- EPC Contract, November 2008
- Prequalification document for the EPC
- Request for proposals for EPC
- EPC Bid Evaluation Report

Terms of references

- Feasibility Study for CCS
- Feasibility Study for CSP Plant
- Communications and Consultations Support
- Electricity Tariff Study and Regulatory Agency Development
- Air Quality Monitoring and Management
- Transmission Control Training
- Establishment of BPC's Automatic Generation Control
- Power System Harmonics Study
- Coal/CBM Policy and Strategy Development
- Regional Environmental and Social Assessment – Phase 1
- Capacity Building for Safeguards Monitoring

Financial

- Financial proposals evaluation and recommendation, TDI, March 2009
- BPC Annual Reports, 2005 to 2008

Other

- Botswana Communications Strategy, September 2008
- DEA Authorization of the EIA for Morupule B Power Station
- DEA Authorization of EIA for the Paje well field
- Draft National Energy Policy (Dec.2008)
- NDP-10 Document
- Notes to files on Safeguards

Annex 15: Statement of Loans and Credits

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P102299	09	BW-HIV/AIDS Project SIL (FY09)	50	-	-	-	-	50		
P102368	09	BW-Integrated Transport Project (FY09)	186					186		
		Total:	236.0	0.00	0.00	0.00	0.00	236.00236.0	0.00	0.00

BOTSWANA

STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	**Quasi Equity	Partic.	Loan	Equity	**Quasi Equity	Partic.
2001/08	AfrbnkCorp	0.00	7.07	13.55	0.00	0.00	7.07	0.00	0.00
2005/08	Letshego	14.59	3.97	0.00	0.00	14.59	3.97	0.00	0.00
0	Petra Diamonds	0.00	0.54	0.00	0.00	0.00	0.54	0.00	0.00
	Total portfolio:	14.59	11.58	13.55	0.00	14.59	11.58	0.00	0.00

** Quasi Equity includes both loan and equity types.

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.
	Total pending commitment:	0.00	0.00	0.00	0.00

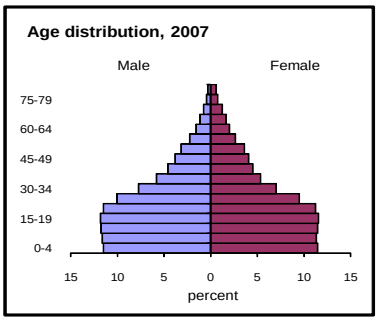
Annex 16: Country at a Glance

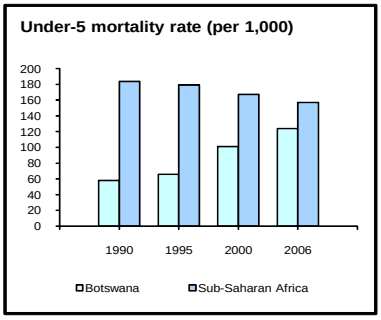
BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Botswana at a glance

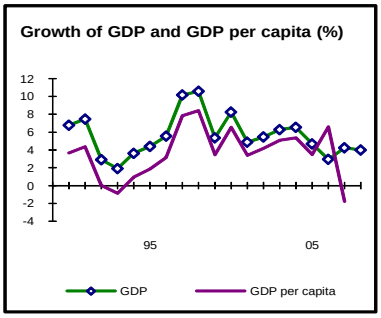
4/6/09

Key Development Indicators	Botswana	Sub-Saharan Africa	Upper middle income
(2008)			
Population, mid-year (millions)	1.9	800	823
Surface area (thousand sq. km)	*582*	24,242	41,497
Population growth (%)	1.3	2.4	0.6
Urban population (% of total population)	*60*	36	75
GNI (Atlas method, US$ billions)	11.5	762	5,750
GNI per capita (Atlas method, US$)	6,100	952	6,987
GNI per capita (PPP, international $)	*12,420*	1,870	11,868
GDP growth (%)	4.0	6.2	5.8
GDP per capita growth (%)	2.7	3.7	5.1
(most recent estimate, 2003–2008)			
Poverty headcount ratio at $1.25 a day (PPP, %)	..	50	..
Poverty headcount ratio at $2.00 a day (PPP, %)	..	72	..
Life expectancy at birth (years)	50	50	70
Infant mortality (per 1,000 live births)	90	94	22
Child malnutrition (% of children under 5)	..	27	..
Adult literacy, male (% of ages 15 and older)	80	69	94
Adult literacy, female (% of ages 15 and older)	82	50	92
Gross primary enrollment, male (% of age group)	109	99	112
Gross primary enrollment, female (% of age group)	107	88	109
Access to an improved water source (% of population)	95	58	95
Access to improved sanitation facilities (% of population)	42	31	83





Net Aid Flows	1980	1990	2000	2008 [a]
(US$ millions)				
Net ODA and official aid	105	145	31	65
Top 3 donors (in 2006):				
European Commission	6	8	4	28
United States	12	15	1	25
Germany	15	19	7	3
Aid (% of GNI)	10.4	3.9	0.5	0.6
Aid per capita (US$)	106	106	18	37



Long-Term Economic Trends	1980	1990	2000	2008 [a]	1980–90	1990–2000	2000–08
					(average annual growth %)		
Consumer prices (annual % change)	12.5	11.4	8.5	12.7			
GDP implicit deflator (annual % change)	10.2	6.3	12.0	4.3			
Exchange rate (annual average, local per US$)	0.8	1.9	5.1	6.8			
Terms of trade index (2000 = 100)	..	119	100	52			
Population, mid-year (millions)	1.0	1.4	1.7	1.9	3.2	2.3	1.2
GDP (US$ millions)	1,061	3,792	6,177	12,126	11.0	5.8	5.0
		(% of GDP)					
Agriculture	14.7	4.9	2.4	1.8	2.5	-1.2	-0.8
Industry	50.7	61.0	58.9	50.2	11.3	5.6	4.5
Manufacturing	5.1	5.1	4.4	3.4	11.4	3.8	4.5
Services	34.6	34.1	38.6	48.0	15.2	7.5	5.3
Household final consumption expenditure	52.0	33.2	23.2	34.5	6.3	6.4	2.0
General gov't final consumption expenditure	21.3	24.1	22.9	19.6	14.9	6.0	4.7
Gross capital formation	40.1	37.4	35.0	32.1	7.6	5.2	3.6
Exports of goods and services	53.1	55.1	52.6	46.6	12.5	4.3	5.0
Imports of goods and services	66.4	49.8	33.7	47.0	9.2	4.4	4.3
Gross savings	27.4	41.6	51.7	34.0			

Note: Figures in italics are for years other than those specified. 2008 data are preliminary. .. indicates data are not available.
a. Aid data are for 2006.

Development Economics, Development Data Group (DECDG).

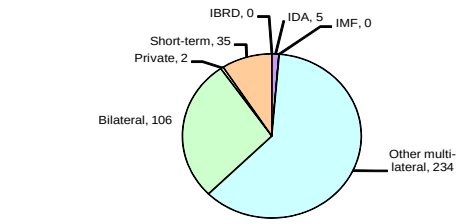
Botswana

Balance of Payments and Trade	2000	2008
(US$ millions)		
Total merchandise exports (fob)	2,682	4,714
Total merchandise imports (cif)	2,005	5,868
Net trade in goods and services	681	-557
Current account balance	547	-283
as a % of GDP	8.9	-2.3
Workers' remittances and compensation of employees (receipts)	26	*117*
Reserves, including gold	6,300	9,100

Central Government Finance		
(% of GDP)		
Current revenue (including grants)	42.8	35.5
Tax revenue	36.6	21.9
Current expenditure	25.5	25.6
Overall surplus/deficit	7.1	-1.5
Highest marginal tax rate (%)		
Individual	25	*25*
Corporate	15	*15*

External Debt and Resource Flows		
(US$ millions)		
Total debt outstanding and disbursed	453	382
Total debt service	69	53
Debt relief (HIPC, MDRI)	–	–
Total debt (% of GDP)	7.3	3.1
Total debt service (% of exports)	2.0	0.8
Foreign direct investment (net inflows)	57	*279*
Portfolio equity (net inflows)	-6	*62*

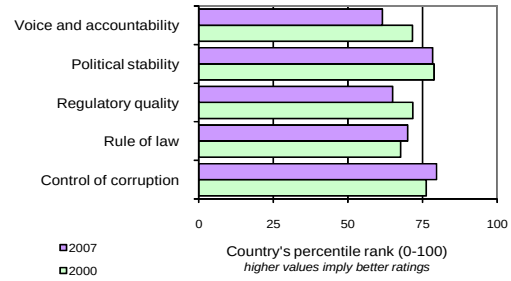
Composition of total external debt, 2008



US$ millions

Private Sector Development	2000	2008
Time required to start a business (days)	–	78
Cost to start a business (% of GNI per capita)	–	2.3
Time required to register property (days)	–	11
Ranked as a major constraint to business (% of managers surveyed who agreed)	**2000**	**2007**
Access to/cost of financing	..	*24.3*
Anticompetitive or informal practices	..	*11.6*
Stock market capitalization (% of GDP)	15.8	47.7
Bank capital to asset ratio (%)	10.3	*9.7*

Governance indicators, 2000 and 2007



Source: Kaufmann-Kraay-Mastruzzi, World Bank

Technology and Infrastructure	2000	2007
Paved roads (% of total)	*56.0*	*33.2*
Fixed line and mobile phone subscribers (per 100 people)	21	83
High technology exports (% of manufactured exports)	0.5	*0.4*

Environment		
Agricultural land (% of land area)	46	*46*
Forest area (% of land area)	22.1	*21.1*
Nationally protected areas (% of land area)	..	*30.9*
Freshwater resources per capita (cu. meters)	..	*1,307*
Freshwater withdrawal (% of internal resources)	*8.1*	..
CO2 emissions per capita (mt)	2.5	*2.4*
GDP per unit of energy use (2005 PPP $ per kg of oil equivalent)	9.2	*11.7*
Energy use per capita (kg of oil equivalent)	1,065	*1,032*

World Bank Group portfolio	2000	2007
(US$ millions)		
IBRD		
Total debt outstanding and disbursed	16	0
Disbursements	0	0
Principal repayments	7	1
Interest payments	1	0
IDA		
Total debt outstanding and disbursed	9	6
Disbursements	0	0
Total debt service	1	0
IFC *(fiscal year)*		
Total disbursed and outstanding portfolio	2	6
of which IFC own account	2	6
Disbursements for IFC own account	1	0
Portfolio sales, prepayments and repayments for IFC own account	0	1
MIGA		
Gross exposure	–	–
New guarantees	–	–

Note: Figures in italics are for years other than those specified. 2008 data are preliminary. 4/6/09
.. indicates data are not available. – indicates observation is not applicable.

Development Economics, Development Data Group (DECDG).

Annex 17: Map

BOTSWANA: MORUPULE B GENERATION AND TRANSMISSION PROJECT

Map IBRD 37033 September 2009 (see next page)

IBRD 37033

BOTSWANA

MORUPULE B GENERATION AND TRANSMISSION PROJECT

TRANSMISSION LINES: Project / Future / Existing
- 400 kV
- 220 kV
- 132 kV
- 66 kV
- 33 kV

- POWER PLANTS, COAL FIRED
- 400/220 kV SUBSTATION
- 132/66 kV SUBSTATIONS
- WATER PIPELINE
- WELL FIELD
- MINES
- ABBATIOR
- RIVERS
- INTERMITTENT RIVERS
- SWAMP/SALT FLATS
- SELECTED CITIES
- DISTRICT CAPITALS
- NATIONAL CAPITAL
- DISTRICT BOUNDARIES
- INTERNATIONAL BOUNDARIES

ZAMBIA
ZIMBABWE
SOUTH AFRICA
BOTSWANA
KGATLENG
KGALAGADI
GHANZI
KWENENG
CHOBE
NGWAKETSE
CENTRAL
NORTH-EAST
SOUTH-EAST
Kasane
Gweta
Nata
Bulawaya
Makgadikgadi Salt Pans
Bushmam
Tutume
Ramokgwebana
Matsitama
Sua Pan
Francistown
Orapa
Letlhakane
Shashe
Mmadinare
Seruli
Selebi-Phikwe
COPPER NICKEL (BCL)
Pont Drift
Morupule A
Morupule B
Serowe
Morupule
Palapye
COAL
Lotsane
Limpopo
Sherwood Ranch
Mahalapye
Machaneng
Mmamabula
Isang
Elisras
Mochudi
Segoditshane
GABORONE
Kang
Letlhakeng
Mabutsane
Molepolole
Jwaneng
Tamaga
Khakhea
Kgalagadi
Moshaneng
Kanye
Ramotswa
To Spitskop
Lobatse
(B.M.C.)
Werda
Ramathlabama
Mafeking
Tshabong
Bokspits
Nossob
Molopo
DIAMONDS
COPPER
SODA
GOLD
GOLD (MAP NORA MINE)
0 50 100 150 Kilometers
0 25 50 75 100 Miles
25°E
20°E
20°S
25°S

D.R. OF CONGO
TANZANIA
SEYCHELLES
COMOROS
ANGOLA
MALAWI
ZAMBIA
ZIMBABWE
MOZAMBIQUE
NAMIBIA
BOTSWANA
MADAGASCAR
GABORONE
SWAZILAND
SOUTH AFRICA
LESOTHO
ATLANTIC OCEAN
INDIAN OCEAN

SEPTEMBER 2009

IBRD 37033

BOTSWANA

MORUPULE B GENERATION AND TRANSMISSION PROJECT

Project Future Existing TRANSMISSION LINES:
400 kV
220 kV
132 kV
66 kV
33 kV

POWER PLANTS, COAL FIRED
400/220 kV SUBSTATION
132/66 kV SUBSTATIONS

WATER PIPELINE
WELL FIELD

MINES
ABBATIOR
RIVERS
INTERMITTENT RIVERS
SWAMP/SALT FLATS
SELECTED CITIES
DISTRICT CAPITALS
NATIONAL CAPITAL
DISTRICT BOUNDARIES
INTERNATIONAL BOUNDARIES

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ZAMBIA
ZIMBABWE
SOUTH AFRICA
BOTSWANA
CHOBE
GHANZI
KGALAGADI
KWENENG
NGWAKETSE
KGATLENG
CENTRAL
NORTH-EAST
SOUTH-EAST
Kasane
Seruli
Selebi-Phikwe
COPPER NICKEL (BCL)
Morupule A
Serowe
Morupule
COAL
Palapye
Morupule B
Lotsane
Limpopo
Sherwood Ranch
Mahalapye
Machaneng
Mmamabula
COAL
COAL
Isang
Elisras
Mochudi
Segoditshane
GABORONE
Gweta
Nata
Bulawaya
Makgadikgadi Salt Pans
Bushmam
COPPER
Tutume
Ramokgwebana
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GOLD (MAP NORA MINE)
Shashe
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Pont Drift
To Spitskop
Kang
Letlhakeng
Mabutsane
Molepolole
Jwaneng
Tamaga
Khakhea
Kgalagadi
Moshaneng
Kanye
Ramotswa
Lobatse
[B.M.C.]
Werda
Ramathlabama
Mafeking
Tshabong
Bokspits
Nossob
Molopo
20°E
25°E
25°S
20°S
0 50 100 150 Kilometers
0 25 50 75 100 Miles

D.R. OF CONGO
TANZANIA
SEYCHELLES
COMOROS
ANGOLA
MALAWI
ZAMBIA
ZIMBABWE
MOZAMBIQUE
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SEPTEMBER 2009