CHAPTER 9

ENERGY

INTRODUCTION

9.1 Given that energy is essential to economic development, future energy programmes and plans will be guided by the national goals and objectives as enshrined in Vision 2016. Provision of affordable, environmentally friendly and sustainable energy sources promotes economic and social activities leading to a happy and prosperous nation.

9.2 Integrated Energy Planning (IEP) was adopted in order to meet the basic energy requirements of the economy. IEP is a shift from supply side to the demand side approach. The benefits derived from this approach were the ability to focus on energy needs, easy identification of suppressed demand and development of a policy of optimal energy source mix as opposed to concentration on individual fuels. This resulted in a provision of adequate choice of energy forms to the consumer.

9.3 Over the NDP 8 period, some achievements were made including but not limited to:

- Acceleration of rural electrification from the planned 14 villages annually to 72 villages over a period of two years. Electricity tariffs were only increased twice in February 1999 and June 2002 by 5% each year. Rural Electrification Collective Scheme (RECS) was reviewed in April 2000 allowing for a decrease of upfront costs from 10% to 5% and repayment of the remaining 95% over 15 years instead of 10 years. The revision of the payment terms for RCS benefited an additional 18 727 consumers during the period under review.
- Two central coal depots in Francistown and Gaborone were leased to a private coal dealer. The increase in coal customer base at the depots led to an increase from 800, 000 tonnes in 1997 to 948,000 tonnes in 2001. Government institutions such as BDF and Prisons reduced using fuelwood replacing it with coal, electricity or Liquefied Petroleum Gas (LPG). Although households continued using fuelwood, use of other energy sources like electricity or LPG and solar energy increased. These contributed positively towards environmental protection.
- Another achievement was the establishment of standards for coal fired equipment, solar water heating systems, Photovoltaic (PV) systems, LPG, and the establishment of cross border trade regulation for the import and export of LPG cylinders.

9.4 The restructuring of the electricity sector, subject to the outcome of the study to be undertaken, could result in a competitive and efficient sector with an increased choice of energy sources. Biomass will be inventorised giving a picture of the existing resources countrywide and hence facilitating planning. More Government institutions and private households will be encouraged to switch from fuelwood to other alternative energy sources.

9.5 Although Botswana will continue importing petroleum products, the current strategic storage capacity will be increased to cater for growing demands and to cushion the country against any

disruptions. Alternative routes and sources of supply will also be assessed and, if feasible, established.

Institutional Framework

9.6 The Ministry of Minerals, Energy and Water Resources (MMEWR), through the Energy Affairs Division (EAD), is responsible for formulation, direction and coordination of the national energy policy. The Botswana Power Corporation (BPC), a parastatal under MMEWR is responsible for electricity generation and supply. The following ministries, parastatals and Non Governmental Organisations (NGOs) share energy portfolio responsibility with MMEWR:

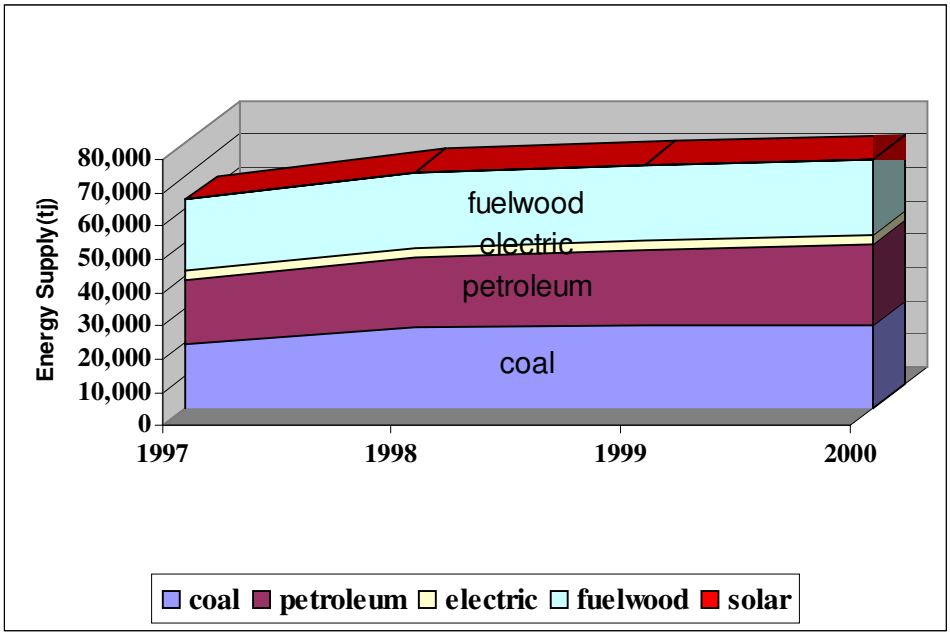
- ♣ The Ministry of Environment, Wildlife and Tourism is responsible for forestry and environmental conservation. Excessive harvesting of fuelwood and emissions resulting from exploitation and use of energy are some of the major environmental concerns.
- ♣ Forestry Association of Botswana (FAB) engages in long-term research on fuelwood, productivity of natural woodlands and in promotion and implementation of fuelwood programmes.
- ♣ Ministry of Works and Transport is responsible for off-grid power supply and installation and maintenance of solar energy equipment in Government institutions in rural and urban areas through its Department of Electrical and Mechanical Services (DEMS).
- ♣ Oil companies are responsible for purchasing, supply and physical distribution of petroleum products. However Government manages its strategic reserves through the oil companies.
- ♣ Rural Industries Innovation Centre (RIIC) is responsible for developing, testing and dissemination of renewable energy technologies.
- ♣ Botswana Technology Centre (BOTEC) undertakes research and development and information dissemination on solar energy

REVIEW OF PERFORMANCE DURING NDP 8

9.7 The National Photovoltaic Rural Electrification Programme (NPVREP) had about 70% customers in default of payment. Solar panels belonging to various institutions mainly Police, BDF, and Telecomms were stolen, leading to financial losses of about P8 million. Lack of standards and poor maintenance of equipment, particularly solar water heaters, resulted in inefficient solar equipment and hence poor performance of solar water heaters. The use of coal, despite its abundance, did not increase in the domestic sector due to unavailability of affordable coal equipment. Energy efficiency and conservation was implemented towards the end of the plan and its impact has not been evaluated.

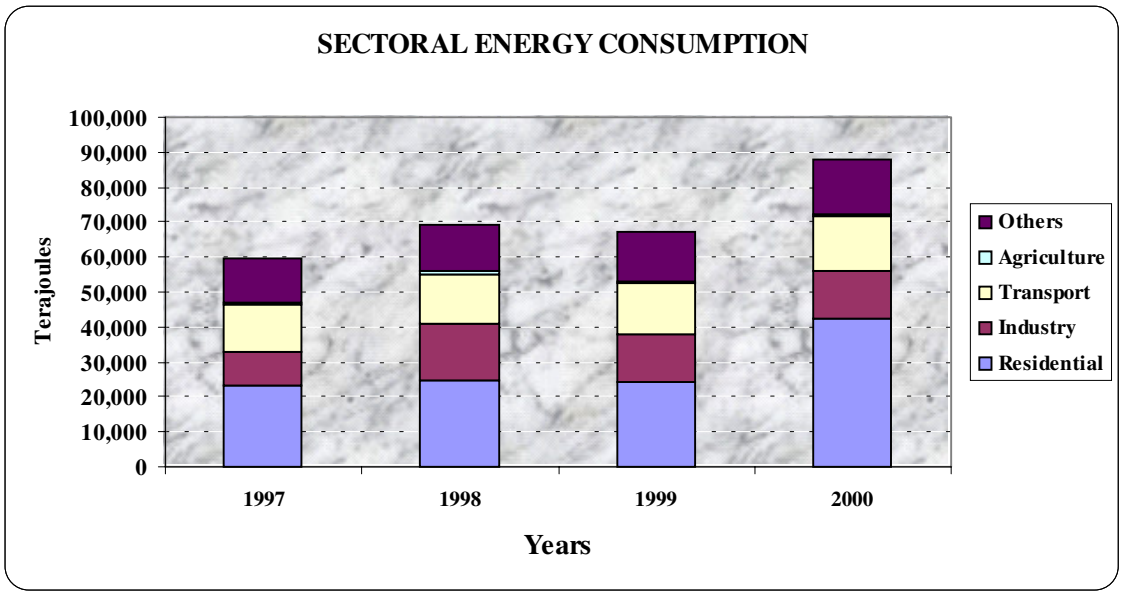
9.8 During NDP 8, the energy sector continued to meet the basic energy requirements of the economy through both local production and imports. Total primary energy consumption increased from 62,586 TJ (Terajoules) at the beginning of the plan period to 74,885 TJ in 2001, an annual increase of about 20 %. The structure of the primary energy supply is shown in Chart 9.1, while the consumption by sector is shown in Chart 9.2.

Chart 9.1: Primary Energy Supply



Source: EAD Energy Data Base

Chart 9.2: Sectoral Energy Consumption



Source: EAD Energy Data Base

Energy Planning and Management

9.9 During NDP 8 energy planning and management focused on:

- Strengthening EAD by grouping together the main energy sub sectors of petroleum and electricity. This was achieved by transferring the Petroleum

Management Unit from the Ministry of Trade and Industry to the Ministry of Minerals, Energy and Water Resources.

- Setting up structures at EAD to effectively engage the industry, commerce, transport and agricultural sub-sectors in policy review and formulating implementation strategies. Biomass Unit and Energy Efficiency and Conservation Unit were as a result established to provide data to facilitate policy formulation and implementation of strategies, and
- Developing programmes and projects with measurable outputs to achieve policy objectives.

9.10 As a result of adopting the IEP approach, Government's intervention focused on ensuring adequate analysis of energy needs. Furthermore, Government's role also included designing and implementing regulatory systems to facilitate protection of natural resources and maintaining sound environmental quality.

9.11 The coordination and implementation of policy activities were effectively undertaken by the two new units which were formed, namely, the Biomass unit which developed and implemented strategies for the sustainable use of fuelwood and the Energy Efficiency and Conservation unit which developed and implemented strategies to promote energy efficiency and conservation.

9.12 During the period under review a Rural Energy Planning Network Project was initiated by SADC so as to set up appropriate institutional structures and harmonize energy planning within SADC. It entails training and recruitment of skilled staff to facilitate the efficient and effective management and planning of the energy sector.

Petroleum

9.13 During NDP 8, the petroleum sub-sector continued to meet the basic energy requirements of the economy despite the reduced strategic stock holding capacity of the two Government Strategic fuel depots to below 90 days. By the end of the financial year 2001/02, the strategic stockholding capacity was approximately 29 days for both petrol and diesel and 49 days for illuminating paraffin.

9.14 Insufficient storage capacity compelled the Government to conduct a feasibility study for an oil storage development programme in March 1999 to determine the most cost effective and technically sound method of storing refined strategic petroleum products. Other objectives of the study included an assessment of the existing strategic storage facilities to reflect on their operating conditions and make recommendations for improvements as well as the strategic storage needs assessment for the country. Some of the recommendations of the study, such as the upgrading of the operational safety of the existing storage facilities in Gaborone and Francistown, were implemented in 2001/02, while the construction of the storage facility will commence during NDP 9.

9.15 During NDP 8, alternative petroleum supply routes and sources were partially investigated and will continue in NDP 9.

9.16 On the supply side, the oil industry was able to procure and distribute adequate petroleum products to its major consumers and other sectors of the economy. During the plan period, consumption of petrol and diesel grew by an average of 6% and 10% respectively, while the consumption of paraffin declined by about 3%.

9.17 Government continued to exercise price controls on petrol, diesel and illuminating paraffin while at the same time ensuring that the private sector earned some returns on its investment to allow its sustainable participation in the economy.

9.18 Two parts of the Liquefied Petroleum Gas (LPG) standard, BOS 3 – The Handling, Storage and Distribution of LPG in Domestic, Commercial and Industrial Installations were developed and approved during NDP 8 under the auspices of the Botswana Bureau of Standards. Part I was for LPG installations involving gas containers of individual water capacity not exceeding 500 litres, while Part II was for Storage and filling sites used for refilling LPG containers of capacity not exceeding 48 kilograms.

Electricity

9.19 During NDP 8 the policy of maintaining a balance between local generation and imports to obtain a least cost mix was adopted and expansion of local generation was deferred to take advantage of the relatively cheap power in the region. This policy enabled BPC to meet the requirements of the economy in a cost effective manner. The Corporation recorded unprecedented growth rates in electricity consumption, the number of consumers and net profits during the period. (see table 9.1 below)

Table 9.1: BPC's Performance Data

	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03*
Net Profit P'000	95,678	89,501	127,645	165,335	146,890	156,741
Return on Fixed Assets	6.5	6.0	7.7	7.7	5.4	4.2
Demand MW	239	256	285	316	337	372
Energy Sold GWh	1,378.3	1,501	1,670.7	1,842.6	1,958.9	2,302.6
Consumers	60,023	67,397	76,380	86,165	96,961	108,596

Source: Botswana Power Corporation
* Forecast

9.20 By June 2002 the power and energy sourcing configuration (i.e. the generation/import mix) was 45/55 as compared to 70/30 at the beginning of the plan period. A new import agreement with Eskom came into force in January 2000 and will expire at the end of 2007. Apart from acquiring bulk imports through the Southern African Power Pool (SAPP), BPC also made cross border connections where these were deemed to be cost effective.

9.21 The Morupule Power Station continued to operate as a base load station and generation was maintained at an average of 91% (availability factor). Despite the deferment of national generating capacity, work on a feasibility study for generation expansion of the Morupule Power Station was initiated by BPC in March 2001. The study will be completed during NDP 9.

9.22 Several projects aimed at enhancing system integrity, security and reliability of power supplies were completed during NDP 8. These included:

- ♣ The Phokoje 400/220kV substation and associated lines, linking Botswana, Zimbabwe and South Africa in 1998.
- ♣ A 132kV cross border transmission line from Heuningvlei, South Africa, together with a 132/11kV 20MVA substation to augment the capacity of the 22kV system which had become inadequate due to load growth in and around Tsabong.
- ♣ A 132kV line between Thamaga switching station and Kanye, together with 132/11kV and 132/33kV

substations to augment power supplies to Kanye and surrounding villages.

- A 125MVA capacity increase at Segoditshane substation and construction of the Gaborone East, Airport road and Government enclave substations in 1999 to supply increased demand in Gaborone and surrounding areas.
- Installation of a third 10MVA 132/11kV transformer at Lobatse in 1999 and a 5MVAr reactor at Maun in 1998.
- Selebi-Phikwe 66/11kV substation capacity expansion to cater for increased town loads.
- Upgrading of Mahalapye, Palapye and Serowe supplies from 33 kV to 66 kV to cater for increased loads and improve continuity and reliability of supplies to the three major villages.
- Upgrading of the Mogoditshane substation from 40MVA to 80MVA 132 /11 kV in March 2000.

Centralised Power Supply Systems

9.23 Centralised Power Supply Systems (CPSS) operated by DEMS were established in Kang and Hukuntsi to supply Government institutions with electricity. These systems, together with the one at Gumare, were later de-commissioned when these villages were connected to the national grid through the 72 Villages Electrification Project. In June 1999, a three year Energy Supply Agreement was entered into with Barloworld for the operation of the Ghanzi Diesel Power Station. The cost of generating a unit of electricity at this station stood at about P1.47 compared to the selling price of P0.31, resulting in an average annual subsidy by Government of about P10 million over the duration of the agreement. Meanwhile, construction of a 132kV cross border supply from Namibia to replace the diesel generators will be completed by 2004.

Rural Electrification

9.24 During NDP 8, the Rural Electrification Programme was accelerated through extension of the electricity grid and cross border connections. This was made possible because of the surplus financial resources realised from the deferment of generation expansion and the benefits derived from less expensive imported power. A total of 114 new villages were electrified as compared to 45 villages that were done during NDP 7. In addition, the electricity distribution network was extended in 29 villages.

9.25 The concept of standard costing for connection fees, whereby customers in a certain village pay the same amount for connections was introduced during 1997/98. Additionally, in April 2000 the financing terms of the Rural Electrification Collective Scheme were relaxed from 10% to 5 % down payment with the remaining 95% being financed by Government and repaid by the consumer over 15 years at prime interest rate minus 1. As a result, the number of rural electrification collective schemes increased from 499 with 4,494 consumers at the beginning of the plan period to 1,331 schemes with 23,388 consumers in 2001.

Tariffs

9.26 During the review period, tariffs were increased by 5% in February 1999 and June 2002 respectively. This was in keeping with the Botswana Power Corporation Act that mandates the Corporation to conduct its affairs on sound commercial basis.

Coal

9.27 During NDP 8, emphasis was placed on promoting the use of Botswana coal in all sectors of the economy. The uptake of coal in the household sector was hampered by the unavailability of

affordable coal fired equipment as the existing ones had proven to be very expensive for this sector – especially the rural households. In the commercial and industrial sectors, the major impediment to the use of Botswana coal was the quality of the coal itself. Being Run Off Mine (ROM), this coal contains a lot of incombustible material which increases the operation and maintenance costs. Thus the major consumers of Botswana coal during the period remained the Morupule Power Station, BCL and the Soda Ash plant.

9.28 The commercialisation of the Expanded Coal Utilisation Project was completed in 1997. The two central coal depots at Francistown and Gaborone were leased to a private company for five years with the option to renew. In an effort to improve coal haulage and distribution, Government constructed office blocks and rail-spurs and off-loading bays in 2001/2002.

9.29 A coal beneficiation study to assess the viability of upgrading the quality of Botswana coal was undertaken in 1997. The study established that there is a market potential for washed coal. A follow up study on market assessment of energy use in Government institutions, industries and households was undertaken in 1998 to assess the viability of establishing a washing plant. The study established that there is a market potential of 40 000 tonnes of washed coal and the estimated cost of establishing a washing plant is P4 million. The construction of a coal washing and coal briquettes manufacturing plant will be done during NDP 9.

9.30 Two parts of the Solid Fuel Fired Equipment standard, namely the Coal Burning Appliances (reduced smoke emission type) Specifications and Code of Practice for Centralised Hot Water Supply were developed and approved during NDP 8.

Biomass

9.31 A number of studies were conducted with the aim of establishing the extent and seriousness of the fuelwood problem. Information on the resource base, use patterns, pricing structure etc was collected and used to set up a database and develop projects. Studies undertaken included:

- Fuelwood Flow Paths in Francistown which was concluded in February 1999 with the aim of collecting information on the fuelwood situation in and around Francistown i.e. how it is harvested, transported and used as well as the pricing structure at various stages of the flow path. The recommendations were: Government should assist and set up the institutional framework for the establishment of community-based management of fuelwood resources. This has led to investigation of fuelwood management practices study.
- Fuelwood/Woody biomass assessment around Mochudi and Bobonong was conducted between February and August 2000 with the emphasis of documenting historical trends of depletion of the woody biomass resource. The study recommended expansion to other areas of the country and this is being undertaken and will be continued into NDP 9.
- A study on fuelwood use and future strategies in Botswana was done between May 2000 and June 2001 with the aim of assessing the fuelwood use patterns and how dependence on fuelwood can be reduced. The recommendation was that other energy sources should be availed where feasible.

9.32 Measures aimed at discouraging Government institutions from using firewood were also undertaken. By the end of the plan period, Prisons, BDF and 90% of primary schools in Gaborone had

switched to other sources of energy such as LPG and electricity. The majority (90%) of the rural population continues to depend on fuelwood. To address this problem, a community fuelwood management project to empower communities on how to sustainably utilize their wood resources was conceptualised and will be implemented in NDP 9.

New and Renewable Sources of Energy (NRSE)

9.33 The National Photovoltaic Rural Electrification Programme, funded by the Government, started in 1997. The overall goal of the Program is to provide photovoltaic energy to rural households and institutions on affordable financial terms. The Rural Industries Promotions Company (Botswana) (RIPCO (B)) implements the Programme through its operational arm, the Rural Industries Innovation Centre (RIIC). Since its inception the Program has made over 300 installations throughout the country mostly for household use although a few are used for income generating activities such as shops and poultry farms.

9.34 Specific objectives of the Programme are:

- To disburse loans at prime rate of interest to rural households of Botswana for the purpose of purchasing PV lighting systems.
- To promote PV lighting systems of various sizes in Botswana.
- To improve the standards of living in rural areas.
- To enhance the reputation of the systems as a renewable energy source, the reputation of the local PV companies and rural people's ability to pay.

9.35 Despite the existence of a financing mechanism for PV electrification the uptake remained low indicating that there are barriers to the widespread adoption of the technology. The Botswana Government and UNDP/GEF started investigations into identifying and removing barriers hindering the widespread use of solar energy for power generation in Botswana. These will be continued during NDP 9.

9.36 The Botswana and Japanese Governments (through the Japanese International Cooperation Agency) are jointly implementing a PV Master Plan project which will come up with an institutional framework as well as strategies to optimize the implementation of solar electrification. This project started in 2000 and will be completed with the formulation of PV master plan in the year 2003.

9.37 Since the beginning of NDP 8, workshops on the maintenance of solar water heating systems have been held annually to teach technicians from Councils how to maintain the systems. Standards for Photovoltaic and Solar Water Heating systems were also developed by BOBS.

9.38 During NDP 8 investigations on the wind resource were initiated and will be continued in NDP 9. Preliminary results show that wind speeds in Botswana are mainly adequate for localised water pumping.

9.39 A project funded through SADC for Financing Energy Services for Small Scale Users (FINESSE) was supposed to be implemented in Botswana but never continued as the program failed to attract private sector investment in South Africa, Malawi and Lesotho where it was initiated.

Energy Efficiency and Conservation

9.40 Projects undertaken/initiated during NDP 8 were aimed at educating and

informing consumers; improving energy efficiency in Government institutions; promoting the rational use of energy in buildings and local capacity in energy management. NDP 8 projects included:

- Energy audits of Tlokweng College of Education and Nyangabgwe Referral Hospital.
- Public awareness and information program
- Developing Energy Efficiency and Energy Conservation in the Building Sector which will continue into NDP 9

9.41 In March 2001, the faculty of Engineering and Technology of the University of Botswana was appointed official training partner for the SADC Industrial Energy Management Project. Since then the University has been delivering pre-service courses and in-service training programmes in energy efficiency and conservation.

9.42 During NDP 8, regional cooperation continued to grow in the energy sector as evidenced by the number of initiatives undertaken, which included:

- SADC - Southern African Power Pool
- SADC Industrial Energy Management Project
- SADC Regional Energy Planning Network (REPN)
- SACU - Petroleum products imports (Inter-state Oil Committee)
- Cross border power connections- with RSA and Namibia.
- SECT-TU – SADC Energy Commission –Technical Unit

ENERGY SECTOR POLICY AND STRATEGY FOR NDP 9

Energy Policy

9.43 The NDP 9 energy policy will aim at providing a least cost mix of supply reflecting total life cycle costs and externalities such as environmental damage. The policy will also strive to integrate gender equality issues in development planning, project monitoring and evaluation as aspired under the Women in Development Programme and the National Gender Programme Framework. The following factors will be taken into consideration:

- The need to reduce the risk of exposure to excessive electricity imports.
- The need to reduce vulnerability to supply disruptions of petroleum products.
- Continued Government funding for projects to promote social equity and justice.
- Energy prices should include and reflect the associated environmental costs.
- Energy utilities operate as monopolies and therefore require Government monitoring to safeguard interests of consumers and investors.
- The limited ability of consumers to react to energy price fluctuations in the short-term.
- Localised shortages of fuelwood.

Energy policy objectives for NDP 9:

9.44 The objectives of NDP 9 policy are:

a) ***Economic Efficiency***

- Energy services should be supplied at least cost to the economy. This implies that the energy supply industry should operate efficiently.
- Energy should be used efficiently.
- The energy supply industry should be financially sustainable.

b) ***Energy Security***

- All users to have security in their access to energy.

c) ***Social equity***

- Adequate and affordable energy services to households

and community services should be provided where it is economically feasible.

d) ***Environmental Quality and Sustainability***

- ♣ Energy extraction, production, transport and use should not damage the environment or people's health and safety
- ♣ Sustainable energy usage must be implemented.

e) ***Gender Equity***

- ♣ Sustainable development through the integration of women and gender issues into all facets of the energy provision process

Energy Planning and Management

9.45 Integrated Energy Planning (IEP) will be continuously applied throughout the plan. This will necessitate the training of more officers in energy planning and energy resource management during the plan period.

9.46 NDP 9 will continue implementation of recommendations of studies undertaken during NDP 8. Annual data collection will be necessary for updating the energy database and ultimately the production of energy statistical bulletins, forecasts, projections, scenario analysis and project proposals. EAD will be strengthened and restructured into an effective institution with its authority commensurate with the responsibility that it has.

The Role of Government

9.47 The role of Government in the energy sector will be to facilitate, monitor, regulate and provide leadership to protect producers and consumers of energy. Government will also provide a conducive environment in energy operations to ensure accessibility, affordability and awareness of available energy sources. EAD through its extension wing will intensify extension services (educational campaigns) to keep the public informed on national energy issues and programmes. The use of media will also be broadened during this Plan to educate and inform the nation. To reach the majority of the population, Kgotla and Full council meetings will also be addressed to ensure that the public is well informed on energy matters, thus enhancing informed choices.

Household Energy

9.48 Urban households have a higher connection rate of electricity at 43%, as compared to 18% for rural households. This could be attributed to the high connection costs in the rural areas. Fuelwood, which is less expensive and in some cases perceived as "free" is the major source of energy for this sector. Paraffin is also a common source of energy. Current trends show that the use of LPG has increased in this sector and is gradually gaining strength as a fuel for cooking.

9.49 In line with Government policy of sustainable economic diversification, employment creation and poverty alleviation and also in view of the energy pattern stated above, NDP 9 energy policy for households is to:-

- ♣ Ensure adequate supplies of fuelwood
- ♣ Increase access to electricity and make it more affordable.
- ♣ Beneficiate coal and make it accessible and affordable
- ♣ Ensure the availability of appropriate energy sources to meet household's needs and promote rational least cost choices.

- ♣ Ensure adequate and affordable supplies of paraffin and LPG.

9.50 Strategies for achieving these objectives will include:

- ♣ Electrification for the urban poor and continuation of rural electrification
- ♣ Continuation of the Rural Collective Scheme and the Solar Electrification Financing Scheme
- ♣ Promotion of sustainable fuelwood management practices and appropriate combustion equipment
- ♣ Encouraging and promotion of community management of natural resources.
- ♣ Supporting introduction and use of other fuels and appliances.
- ♣ Dissemination of information on available energy sources and use.
- ♣ Investigate the price controls for LPG

Petroleum Products

9.51 Botswana imports all her petroleum products from the Republic of South Africa (RSA), except for small quantities that come from Namibia to supply Ghanzi and parts of the Kgalagadi Districts. While Government monitors and coordinates the national petroleum requirements, the actual procurement and distribution of the products is the responsibility of the oil companies. During NDP 9, the oil industry will continue to play a major role in product procurement and distribution. The oil industry will also continue to improve and extend its distribution network to cover the remote parts of the country. The NDP 9 energy policy for the petroleum sub sector is to:

- ♣ Maintain adequate strategic stocks based on risks of supply disruptions.
- ♣ Improve safety aspects and distribution of illuminating paraffin and LPG.
- ♣ Introduce higher quality petroleum products subject to the development trends in the region.

9.52 Botswana as a landlocked country has difficulties in diversifying sources and routes of supply for petroleum products to complement the RSA route. Previous attempts have not been successful because of unreliability of supply. Investigations into identifying possible routes and sources in other countries such as Angola, Namibia and Mozambique will be undertaken.

9.53 Government will continue to maintain strategic fuel stocks that could sustain the economy for about 90 days in case of disruptions. The strategic stock holding requirements will be reviewed and decided by Government whenever necessary. By setting up testing facilities within the new strategic storage reserves, the EAD will also ensure that products supplied are of acceptable specifications. The current arrangement whereby Government manages and operates the strategic storage facilities through oil companies will be continued.

9.54 Government will also continue to monitor and control the retail prices for petrol, diesel and illuminating paraffin due to the limited number of players in the local petroleum market and to regulate prices. Areas which were not gazetted, like the Ghanzi and Kgalagadi Districts, will be considered for gazetting for price control purposes. In line with these policy intentions, staff capacity and capability will be developed in the Energy Affairs Division to improve staff competency in addressing issues relating to petroleum policy and pricing issues.

9.55 Illuminating paraffin is widely used in Botswana by low income households for lighting and cooking purposes. Appropriate strategies for the distribution of illuminating paraffin and LPG, especially in rural areas where there are no service stations, will be developed. Safety standards will also be improved.

Electricity

9.56 The BPC power and energy-sourcing configuration (i.e. the generation/import mix) stands at 45/55. This ratio is projected to be 30/70 by the year 2009 if no generation expansion is put in place. The Morupule Power Station (4 x 33 MW) is nearing its maturity and will not be able to sustain the base load of the national demand for the duration of the plan period. Meanwhile, the current supply agreement with the South Africa power utility, Eskom, from which the BPC is contracted to purchase 75% of its imports, expires in 2007. Continued dependence on imports without a reasonable generation capacity within the country is likely to act as a barrier in power pool negotiations for better tariffs and could relegate the country to a price taker position in the trading of power through the power pool. Therefore, national generation capacity must be increased during the plan period. On the other hand, keeping in line with the Botswana Power Corporation Act that requires the Corporation to conduct its affairs on sound commercial basis, tariffs will periodically be reviewed to reflect the cost of providing the energy services. Policy objectives for electricity sub-sector include:

- ♣ Achieving a balance between electricity imports and local generation.
- ♣ Improving electricity sector efficiency.
- ♣ Increasing access to electricity.
- ♣ Improving the commercial operations of the electricity supply industry.

9.57 Planned measures to achieve this policy are:

- ♣ Expansion of the Morupule Power Station.
- ♣ Procuring power from the Southern African Power Pool or other sources for optimal least cost mix of supply.
- ♣ Participating in Short Term Energy Markets.
- ♣ Retaining sufficient financial reserves within BPC in order to finance investment in national generation and new infrastructure including operation and maintenance.
- ♣ Pursuing innovative pricing structures to minimize negative effects of high costs of locally generated electricity.
- ♣ Extension of the transmission and distribution network.
- ♣ Introducing regulatory mechanism in the electricity supply industry.

Centralised Power Supply System

9.58 In remote areas where there is no grid power and where the demand in Government institutions justifies it, DEMS operates Centralised Power Supply Systems (CPSS) to supply electricity to these Government institutions. BPC will continue to take over and run CPSS on behalf of Government where there is adequate electricity demand from non-governmental consumers. EAD, in conjunction with DEMS and BPC, will coordinate the provision of this service so that duplication is avoided. Cross-border bulk power transmission lines will be constructed to supply villages which are remote from the national grid network, where justifiable.

Rural Electrification

9.59 During NDP 9, Government will continue to provide power supplies to more villages through a combination of grid extension, PV and diesel electrification, where appropriate. Thirty (30) villages that are less than twenty kilometers from electrified villages will be connected. The extension of the transmission network to seventy-five (75) villages will be carried out to make electricity more accessible and affordable to more households. Standard costing has

already been put in place in some of the villages. It is intended that by the end of NDP 9, all villages in the country will have standard costing on an individual basis. This will be reviewed during the Plan period and if feasible, made uniform through out the whole country (i.e. all villages could have a uniform connection cost). However villages to be connected will have to satisfy a number of parameters such as:

- ♣ Proximity of the village to existing infrastructure, including cross border supply.
- ♣ Geographical spread of the projects (i.e., equitable sharing of the national resources).
- ♣ Electricity grid coverage in each district.
- ♣ Project technical feasibility.
- ♣ Estimated Project Internal Rate of Return.

Coal

9.60 Botswana has large coal resources estimated at 212 billion tonnes, of which 3.3 billion tonnes are measured reserves. There is only one operating mine, the Morupule Colliery, with an annual production of about one million tonnes. The coal is semi-bituminous with a relatively high percentage of ash and sulphur and thus needs to be cleaned in order to improve its overall quality and reduce its negative environmental impacts. Government intends to exploit this large resource to meet its energy requirements in a cost effective and environmentally sustainable manner. The NDP 9 energy policy for the coal sub sector is to:

- ♣ Promote the use of coal in Government institutions, industries, commerce and households where appropriate.
- ♣ Improve coal quality and distribution network system.
- ♣ Promote the alternative uses of coal and its by-products.

9.61 Planned measures to achieve the objectives will include:

- ♣ Construction of more coal depots in other parts of the country.
- ♣ Introducing financing mechanism for efficient coal fired equipment for households.
- ♣ Promoting technical standards for coal burning equipment.
- ♣ Providing advisory services to coal users.
- ♣ Constructing coal beneficiation, briquettes manufacturing, and gasification plants.
- ♣ Investigating alternative uses of coal

9.62 The introduction of a national financing scheme for domestic coal fired stoves and the development of a coal briquettes program, will improve the quality of life of the vulnerable groups in the community, such as women and children, who usually travel long distances in search of fuelwood which is getting expensive and depleted. This will also help reduce environmental degradation by curbing felling of trees for firewood.

Biomass (Fuelwood)

9.63 Fuelwood resources will continue to be an important energy source especially in rural areas. There are localised shortages particularly around major population centres. The majority of rural households are usually headed by women and policies have to be targeted at them in order to be more effective. Proper fuelwood management would reduce collection time and distance travelled. The NDP 9 energy policy for the fuelwood sub sector is to:

- ♣ Ensure a sustainable use of fuelwood.
- ♣ Inventorise and monitor woody biomass resources.

9.64 Strategies to address these will include:-

- ♣ Establishing a biomass data-base
- ♣ Monitoring and controlling fuelwood use by Government institutions.
- ♣ Introducing efficient fuelwood stoves
- ♣ Promoting community based natural resource management

New and Renewable Sources of Energy

9.65 Solar energy is the most abundant renewable energy source in Botswana. Wind energy, is "believed" to have little potential, however a wind resource-mapping programme is under way to improve knowledge on wind speeds at height of more than 2 meters. This will further define the potential role of wind application for water pumping and electricity generation. The NDP 9 energy policy for renewable energy is to:

- ♣ Promote the use of solar energy for both power generation and water heating where economically feasible.
- ♣ Integrate grid and non-grid technologies for rural electrification.
- ♣ Promote collaboration with international organizations such as Global Environmental Facility (GEF) and United Nations Development Programme (UNDP).
- ♣ Promote research and development on new and renewable sources of energy.

9.66 The measures for achieving these policy objectives include:

- ♣ Identification of appropriate institutional framework.
- ♣ Continuing Solar Electrification Financing Scheme.
- ♣ Developing and implementing strategies to remove barriers to widespread use of solar energy.
- ♣ Providing assistance to women and children by providing bright light through solar PV in un-electrified rural areas.

Energy Efficiency and Conservation

9.67 Improving energy efficiency and conservation is cost effective, offers a chance to defer new investment and helps to reduce energy related pollution. During NDP 9, Government will continue to support and encourage improved energy efficiency and conservation in all sectors of the economy. Planned measures to achieve the policy objectives are:

- ♣ Carrying out information and educational campaigns.
- ♣ Conducting energy audits of energy intensive industries and Government institutions
- ♣ Promoting energy efficient design and operation of buildings.
- ♣ Developing and implementing a national energy management plan.

Regional Cooperation

9.68 During NDP 9 existing bilateral and regional cooperation will continue and new ones identified.

9.69 Implementation of the SADC Regional Energy Planning Network project on information and experience exchange (Project no.AAA 0.8) started with training in March 2002 and completed in November 2002. The training covered energy data collection and analysis, energy management, energy policy, regulations etc. Cooperation on this issue is highly essential since planning, be it regional or local, is dependent on information/data for its reliability. Retention of trained personnel for this activity will be crucial for sustainability purposes.

HIV/AIDS

9.70 Recognising the impact that the HIV/AIDS pandemic will have on the sector, the following responses will be undertaken during the period of NDP 9 to stem the tide of the epidemic:

- To develop a sector HIV/AIDS policy
- Mainstreaming HIV/AIDS into Ministry's strategic and annual plans
- Mainstream HIV/AIDS into contractors through pre- licensing conditions
- Inclusion of HIV/AIDS workplace programme in Tender documents as precondition for approval of projects.
- Provide information and linkages on service delivery points for Sexually Transmitted Infection (STI) management, Voluntary Counselling and Testing (VCT) and other prevention activities.
- Provide information on care and support service delivery points for both infected and affected partners.
- Strengthening of inter and intra partner linkages, collaboration and networking among entities in the ministry.