

ENERGY POLICY

OF GUYANA

PREPARED BY
THE NATIONAL ENERGY POLICY COMMITTEE

July 1994

18th July 1994

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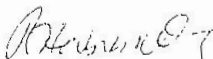
Dear-Mr Chandarpal


Energy Policy of Guyana

The Energy Policy Committee, which you established, is pleased to submit the draft document entitled, 'ENERGY POLICY OF GUYANA'. Attached, herewith, are three copies of the document. Additional copies would be made available to you on request. The Energy Policy Committee would be prepared to meet with you for any clarification, explanation and possible amendments of the said document.

Finally, we wish to thank you for your guidance and support throughout this exercise.

Yours sincerely


R Habibullah
Chairman
Energy Policy Committee


Dorega Persaud
Secretary
Energy Policy Committee

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Policy Committee

PART 1

FOREWORD

ENERGY POLICY PAPER FOR GUYANA – PART 1 – FOREWORD

1. FOREWORD

This document was prepared by a select committee, comprising technicians from key agencies in the Energy Sector in Guyana, which are responsible for energy research, petroleum exploration and development, preparation, implementation and management of energy projects and programmes, electricity generation, transmission and distribution and energy conservation. A list of the members of the committee is included at Appendix 1.

In preparing this document, the existing databases at the relevant agencies were used. Information was also obtained from major producers and consumers of energy on their plans and programmes for the next decade.

Due to the lack of precise data in some areas, it has been necessary to make several essential assumptions. It is important to recognize that the energy policy herein is a dynamic one and is subject to change as additional data and information on development programmes become available.

For the purposes of presentation, this document is divided into four sections:

- (i) EXECUTIVE SUMMARY – which highlights the main focus of the document.
- (ii) ENERGY SITUATION FOR THE PERIOD 1988 – 1992: - which provides relevant information/ data on the energy/ economic situation for the period 1988 – 1992. Data for 1993 were not available in time for inclusion in this document.
- (iii) FUTURE OUTLOOK 1994 – 2004: - which projects the energy demand / supply scenario for the period 1994 – 2004. It also includes the major policy options and the strategies to be pursued.
- (iv) IMPLEMENTATION / FINANCING – which describes the implementation schedule and possible financing mechanisms.

ENERGY POLICY PAPER FOR GUYANA – PART 1 – FOREWORD

The policy committee wishes to acknowledge the cooperation of several firms / organizations which provided vital information / data to facilitate the preparation of this document. These include:

- Linden Mining Enterprise (LINMINE)
- Berbice Mining Enterprise (BERMINE)
- Guyana Sugar Corporation (GUYSUCO)
- Guyana Electricity Corporation (GEC)
- Guyana Airways Corporation (GAC)
- Guyana Forestry Commission
- Georgetown Seafoods Ltd.
- Omai Gold Mines Ltd.
- Barama Company Ltd.
- Aroaima Mining Company Ltd.
- Ministry of Agriculture (Planning and Fisheries Dept.,)
- Texaco, West Indies Ltd.
- Bank of Guyana
- Licence & Revenue Department

PART 2

EXECUTIVE SUMMARY

2. EXECUTIVE SUMMARY

This Energy Policy Paper highlights the energy situation during the period 1988 – 1992, and the projections for the period 1994 – 2004. It also focuses on the strategies to be implemented to achieve the stated objectives, the implementation schedule and possible sources of financing.

Energy Situation for the Period 1988 – 1992

Between 1988 and 1992, final energy consumption increased by 3.2 % whereas per capita energy consumption increased by approximately 3.0 %.

During this period, petroleum products, bagasse and fuelwood provided the energy supply required. An analysis of the sectoral use of energy supply indicates that electricity generation, industry / mining, transportation, and the residential sectors represented the major users.

ENERGY BY SOURCE

SOURCE	1988	1992
Petroleum Products	55.9%	48.7%
Bagasse	19.0%	25.9%
Fuelwood	27.0%	25.4%

SECTORAL USE OF ENERGY

SECTOR	1988	1992
Electricity	21.3%	24.5%
Industry / Mining	32.1%	34.8%
Transportation	11.4%	9.67%
Residential	28.3%	25.7%
Agri / Fishing	6.3%	4.8%
Commercial / Public	0.4%	0.4%
Charcoal	0.2%	0.2%

The importation of petroleum products in 1988 was 3,364,000 barrels, representing a CIF value of US\$63.53 Million while in 1992 the corresponding figures were 2,691,000 barrels and US\$61.47 Million. A breakdown of average consumption for 1988 – 1992 shows that electricity generation (30%), industry / mining (33%), transportation (20%) and agriculture / fishing (11%) were the major sectoral users. Fuel Oil / Bunker ‘C’ (45%), diesel/ gasoil (30%) and premium gasoline (14.5%) were the major types of petroleum products.

The indigenous energy resources which contributed significantly to the energy supply were begasse (for co-generation in the sugar industry) and fuelwood (for the residential sector). Other resources (hydropower, woodwaste, rice-husk, wind, solar) while available, did not contribute significantly to the energy supply.

Future Outlook 1994 – 2004

The objectives of the National Energy Policy are:

- to provide stable, reliable and economic supply of energy
- to reduce dependency on imported fuels
- to promote where possible the increased utilization of domestic resources
- to ensure energy is used in an environmentally sound and sustainable manner.

Based on the demand forecast, the following are projected:

- (i) Final energy consumption is expected to grow as the economy grows. Between 1992 and 1998, total final consumption of energy is projected to increase by 7.3% while in 2004 an increase of 2.1% over 1998 is projected.
- (ii) Between 1992 and 1998, consumption of electricity is expected to increase annually by 6%. Thereafter, the growth rate is expected to be in the vicinity of 2.5% per annum.
- (iii) Final consumption of petroleum products is expected to grow annually at an average rate of just below 2% between 1992 and 1998. Thereafter, the average annual increase is projected below 1% up to 2004.

Strategies for Satisfying Energy Demand

To satisfy the energy demand forecast for 1998 and 2004 and the objectives outlined, the strategies to be adopted would include the promotion of and where feasible, the increased utilization of indigenous energy resources (bagasse, woodwaste, rice-husk, hydropower), more efficient utilization of energy, continued oil exploration activities and the establishment of energy farms to provide fuelwood.

ENERGY POLICY PAPER FOR GUYANA – PART 2 – EXECUTIVE SUMMARY

As a result of the strategies to be pursued, energy supply for 1998 will be provided by indigenous resources, 53.7% and imported petroleum products, 46.3%. By 2004, these figures are projected at 61.5% and 38.5%, respectively. Despite an overall increase in energy demand of 9.4% between 1992 and 2004, the use of imported petroleum products is projected to decline by 26% during this period. This decline does not take into account the effect of energy conservation measures to be pursued. It is essentially due to increased utilization of indigenous resources and thus less dependence on petroleum products for electricity generation. More specifically, power generation will increase from 50 MW in 1992 to 128 MW in 2004, with a corresponding reduction of the fuel bill in this sector from US\$17.9 Million in 1992 to US\$0.7 Million in 2004, representing a reduction of 95% of the Dollar value of the fuel bill in this sector.

Implementation Schedule / Financing

The various activities and time-frame envisaged for the achievement of the objectives of the National Energy Policy are included in the implementation schedule. The formation of the Energy Agency is absolutely necessary for the successful implementation of the Policy. The projected time-frame for the activities could vary depending on the efficiency with which related activities are carried out.

PART 3

ENERGY SITUATION FOR THE PERIOD

1988 – 1992

- 3.1 ECONOMIC GROWTH AND FINAL ENERGY CONSUMPTION
- 3.2 ENERGY SUPPLY BY SOURCE OF ENERGY
- 3.3 ENERGY SUPPLY AND SECTORAL USE
- 3.4 DOMESTIC ENERGY RESOURCES
- 3.5 ENERGY IMPORTS

3. ENERGY SITUATION FOR THE PERIOD 1988 – 1992

3.1 ECONOMIC GROWTH AND FINAL ENERGY CONSUMPTION

During the period 1988 to 1992, Gross Domestic Product (GDP) at constant factor cost (1988 prices) and total final energy consumption revealed an increasing trend. GDP increased from G\$3.6 Billion in 1988 to G\$3.792 Billion in 1992, reflecting an increase of 5.3%. This is illustrated in Fig. 3.1. In 1988, the total final energy consumption was 4,713,000 barrels of oil equivalent (BOE) and in 1992, it was 4,864,000 BOE as shown in fig.

3.2. This represented an increase of 3.2%

In addition, Fig. 3.3 indicates that per capita energy consumption increased during the period 1988 to 1992 from 6.2 BOE to 6.4 BOE, an increase of 3.2%.

3.2 ENERGY SUPPLY BY SOURCE OF ENERGY

The supply of petroleum products decreased from 3,252,000 BOE to 2,996,000 BOE for the period 1988 to 1992 (see Table 3.1), a decline of 7.9%. This decline could be explained by the dramatic reduction in the production of bauxite and the concomitant reduction in energy consumption in that industry, as well as a decline in consumption of motor gasoline due to the increased availability of mini buses and resultant reduced dependence on hire cars. In addition, relatively higher retail prices of gasoline due to decontrol and the devaluation of the Guyana dollar have led to more rational use of petroleum products.

Bagasse supply, which is directly related to sugar cane production, increased from 980,000 BOE in 1988 to 1,596,000 BOE in 1992.

Fuelwood supply, in absolute terms, is estimated to have increased by merely 1.2% between 1988 and 1992. However, during this period, as a percentage of total energy supply, fuelwood decreased by approximately 2%.

The percentage distribution of energy supply by source is illustrated in Table 3.1, and Figs. 3.4 and 3.5 for the years 1988 and 1992, respectively. In 1988, fuelwood and bagasse taken together represented 44% of total energy supply, compared with 51.3% in 1992. In fact, fuelwood and bagasse supply taken together increased by 25% in absolute terms during this period. Petroleum supply reduced by 7.9%.

3.3 ENERGY SUPPLY AND SECTORAL USE

Tables 3.2 and 3.3 and Figs. 3.6, 3.7, 3.8, and 3.9 provide data on the Sectoral Use of Energy supply for the years 1988 and 1992. From these tables and figures, it should be noted that Industry / Mining, electricity generation, residential and the transportation sectors accounted for 93.4% of the utilization of energy supply in 1988 and 94.6% in 1992. Each of the sectors mentioned is analysed below:

(a) Industry / Mining Sector

In 1988, Industry / Mining accounted for 32.1% of total use of energy as compared with 34.8% in 1992. Petroleum products represented 57.1% and bagasse 39.8% of energy utilized in this sector in 1988. For 1992, the corresponding figures were 41.1% and 55.9%

These figures indicate that, in the Industry / Mining Sector from 1988 to 1992, there was a relative increase in the utilization of bagasse and decreased utilization of petroleum products. As mentioned before, this was due to drastic reduction in bauxite production and a concomitant decline in the utilization of petroleum products in this Sector.

(b) Electricity Sector

In 1988, the electricity Sector accounted for 21.2% of total use of energy as compared with 24.5% in 1992. Petroleum products represented 80% and bagasse 20% of resources used to generate electricity in 1988. By 1992, these figures changed to 70.8% and 26.5%, respectively.

In the Electricity Sector, petroleum products have been the major source of energy (70% - 80%). During this period there was approximately 10% decrease in the utilization of petroleum products and increased bagasse utilization of 64%. It must be noted that increased utilization of bagasse was mainly due to inefficient utilization of this energy source.

(c) Residential Sector

In 1988, the Residential Sector accounted for 28.3% of total use of energy as compared with 25.7% in 1992. Fuelwood represented 90.9% and petroleum products 9.1% of energy utilized in this sector in 1988. By 1992, these figures changed to 91.2% and 8.8%, respectively.

(d) Transportation / Agriculture and Fishing Sectors

In 1988, the Transportation / Agriculture and Fishing Sectors accounted for 17.4% of total use of energy as compared with 14.4% in 1992. Petroleum products represented the only energy source used in these two sectors.

3.4 DOMESTIC ENERGY RESOURCES

The only fossil fuel occurring in Guyana is Petroleum. However, these resources have not yet been quantified and there is no commercial exploitation at this time.

Economic potential for hydropower is estimated to be in the region of 7000MW. This resource is not being exploited currently but clearly, the solution to the country's long term power needs lies in hydro-energy.

Forests cover approximately 75% or 16 million hectares of the country's land area. However, active encouragement of increased fuelwood consumption would have to be tempered by environmental concerns. In-situ woodwaste from the Timber Industry remains a viable potential source of energy. At the current time, two lumber enterprises generate a total of 3 MW of power from woodwaste for their industrial uses.

Bagasse is currently utilized, albeit inefficiently, for the co-generation of steam and electricity in the sugar industry. An analysis of the true potential of this energy source has been carried out and efforts are being made to maximize the benefits.

Rice Husk is also a viable potential source of energy and is currently used by two rice millers for steam and electricity generation (approximately 1 MW). This resource needs to be developed further.

Currently, solar and wind play a very minimal role in Guyana's energy spectrum, but their potential contribution cannot be disregarded in the long term.

Biogas digesters provide methane gas for cooking and refrigeration. In the residential sector, the impact is more social and environmental rather than economic. The cost of construction of these digesters must be

reduced considerably for any major economic impact in the residential sector. For large commercial and agricultural enterprise, this technology can be cost-effective.

3.5 ENERGY IMPORTS

Fig. 3.10 and fig. 3.11 provide information on the utilization of the major energy sources in the various sectors during the period under review, 1988 and 1992. In the case of petroleum products, approximately 94% of all the imported fuels is being used by the electricity (30%), transportation (20%), industry / mining (33%) and agri / fishing (11%) sectors.

Petroleum products totaling 3,364,100 bbls, were imported in 1988 compared with a figure of 2,691,000 bbls for 1992, an overall decrease of 20%. Table 3.4 and fig. 3.12 provide detailed data indicating that fuel oil (44% - 46%) diesel / gasoil (30%) and premium gasoline (13% - 15%) represented 91% and 90% of the total petroleum imports for 1988 and 1992, respectively.

In value terms, US\$63,530,200 was expended on petroleum products in 1988 and US\$61,471,700 in 1992, and overall decrease of 3.2%. Table 3.5 and Fig. 3.13 provide detailed data indicating that the CIF value of fuel oil (30% - 36%), diesel / gasoil (34% - 36%) and premium gasoline (16% - 18%) represented 86% and 84% of the total CIF value of the imported fuel products in the years 1988 and 1992, respectively.

Table 3.6 provides financial data indicating that in the value terms, electricity (24.7% - 29.2%), industry / mining (27.1% - 24.5%), transportation (29.1% - 21.2%) and agriculture / fishing (13.0% - 10.5%) sectors, represented 86% and 85% of the total fuel bill in 1988 and 1992, respectively.

Therefore, any strategy to reduce the dependency on imported fuels, must be directed at evaluating, optimizing and reducing the utilization of these products in the four sectors.

Figs. 3.14 and 3.15 show the sectoral use of petroleum products for 1988 and 1992. Figs 3.16 and 3.17 indicate in value terms the use of fuel products in various sectors. Fuel oil provided the energy supply for mainly the electricity sector (49.5% - 56.8%) and industry / mining sector (50.3% - 42.1%) gasoline for the transportation (85.8% - 91.5%) agri / fishing (14.2% - 8.5%) and diesel for the transportation (22.1% - 10.9%) agri / fishing (31.1% - 24.3%) industry / mining (26.1% - 32.2%) and electricity (20.1% - 32.7%) sectors.

PART 4

FUTURE OUTLOOK

1994 – 2004

- 4.1 ENERGY DEMAND FORECAST
- 4.2 MAJOR POLICY OPTIONS
- 4.3 ENERGY RESOURCE AND SUPPLY PROSPECTS
- 4.4 STRATEGIES FOR SATISFYING ENERGY DEMAND
- 4.5 ENERGY SUPPLY AND SECTORAL USE
- 4.6 IMPACT OF STRATEGIES ON IMPORTED PETROLEUM PRODUCTS

4. FUTURE OUTLOOK 1998 – 2004

4.1 ENERGY DEMAND FORECAST

(A) FORECAST ASSUMPTIONS

The demand forecasts used in this document were based on the following:

- (1) Information provided by Management in the various sectors in future plans.
- (2) Implicit growth rates for variables for which data was available e.g. population estimates and best judgement where data was not available e.g. economic growth.
- (3) 1992 was used as the base year.

1. Electricity

- (i) Estimates based on GEC's projected customers' demands
- (ii) Estimate of consumption of Bunker "C" for electricity generation by LINMINE in 1996 was taken from Jacob's Report on the Bauxite Industry. Efficiency of conversion implicit in 1992 figures was applied. It was assumed that this will hold constant for 1998 and 2004.
- (iii) Electricity produced by **GUYSUCO** in 1992 held constant for 1998 and 2004.
- (iv) Electricity produced by BERMINE assumed to increase from 5500 BOE in 1992 to 6200 BOE in 1998 to cater for projected increased production. 6200 BOE held constant for 2004.

- (v) Electricity demand by others placed at 31,000 BOE in 1998 and assumed to grow 5% by 2004.

2. Transportation

- (i) Consumption of gasoline, which is used mainly for passenger transportation, assumed to increase at the rate of population growth.
- (ii) Projections for consumption of aviation kerosene (jet fuel), provided by GAC.
- (iii) Consumption of diesel, which is used mainly for freight transportation, assumed to increase at a rate of 5% per annum up to 1998 and 3% per annum thereafter. This is intended to approximate to the rate of growth of the economy.

3. Industry and Mining

- (i) Consumption of Bunker “C” by **LINMINE** and Aroaima assumed to remain constant.
- (ii) Consumption of Bunker “C” by **BERMINE** increased based on projected increase in production.
- (iii) Consumption of diesel by **LINMINE** and Aroaima assumed to remain constant.
- (iv) Consumption of diesel by **BERMINE** increased based on projected increase in production.
- (v) Consumption of diesel for “other” industry and mining assumed to grow at 5% per annum up to 1998.

- (vi) Consumption of petroleum products for 1998 held constant for 2004.
- (vii) Consumption of Bagasse and Fuelwood held constant at 1992 figures.

4. Residential

- (i) Consumption of fuelwood held constant.
- (ii) Consumption of petroleum products assumed to grow at the rate of population growth.

5. Commercial and Public

- (i) Utilization of petroleum products held constant at 1992 figures.

6. Agriculture and Fishing

- (i) Consumption by shrimping trawlers assumed to be constant.
- (ii) Consumption for sugar and rice cultivation also assumed constant.

(B) SUMMARY OF THE DEMAND FORECAST

Based on projections made the following may be highlighted:

- (1) Final consumption of energy is expected to grow as the economy grows. Between 1992 and 1998, total final consumption of energy is projected to increase from 4864 thousand BOE to 5165 thousand BOE, or by 7.3%. In 2004, total final energy consumption is expected to be 5369 thousand BOE, an increase of 2.1% over 1998.
- (2) Between 1992 and 1998, consumption of electricity is expected to grow at an annual rate of 6%. Thereafter, the growth rate is expected to be 2.5% per annum.
- (3) Final consumption of petroleum products is expected to grow at an average rate of just below 2% per annum between 1992 and 1998. The average annual growth rate of final consumption of petroleum products between 1998 and 2004 is expected to be less than 1%.

4.2 MAJOR POLICY OPTIONS

Analysis of the figures in the current situation and future outlook indicates that Guyana continues to rely heavily on imported fossil fuels. A broad objective of the energy policy therefore will be to seek to reduce dependency on imported petroleum. To this end, a two-prong approach is envisaged based on energy conservation (or increased efficiency of use) and energy substitution (replacement of imported fuels by indigenous sources).

ENERGY POLICY PAPER FOR GUYANA – PART 4 – FUTURE OUTLOOK 1994 – 2004

The major policy options to achieve the objectives are:

1. Rationalisation of the Energy Sector.
2. Development of indigenous new and renewable sources of energy.
3. Exploration and development of indigenous oil and gas resources.
4. To promote energy conservation through the efficient and rational utilization of energy while pursuing sustainable economic development.
5. To ensure stable supply of energy at the lowest possible cost.
6. Provide fiscal incentives and encourage joint-venture programmes to achieve (1) to (5) above.

4.3 ENERGY RESOURCES AND SUPPLY PROSPECTS

(A) Energy Resources

The implementation of the Guyana Energy Policy will require, *inter alia*, further and rational development and/or utilization of the following sources of energy:

(1) Indigenous

New and Renewable Sources of Energy (NRSE)

ENERGY POLICY PAPER FOR GUYANA – PART 4 – FUTURE OUTLOOK 1994 – 2004

(i) Hydropower

DESCRIPTION	RANGE OF POWER (Kw)	HEAD IN METRES		
		LOW	MED.	HIGH
MICRO	UP TO 50	15	15 – 20	H > 50
MINI	50 TO 500	20	20 – 100	H > 100
SMALL	500 TO 5000	25	25 – 130	H > 130
LARGE	> 5000	25	25 – 130	H > 130

(ii) Biomass which include

- Bagasse
- Rice Husk
- Woodwaste
- Wood
- Plant and animal residue

(iii) Fossil-Based indigenous resources

(iv) Others which include

- Solar
- Wind
- Industrial and non-industrial by-products
- Tidal

(2) **Imported**

Fossil based fuels and lubricants

(B) **SUPPLY PROSPECTS**

Specific and conclusive data relating to most of the various indigenous energy sources are readily available. The extent to which these resources can therefore make an impact at the macro level must be quantified. It is necessary to formulate an appropriate plan to pursue the development of these resources by evaluating the resource potential, the necessary technology and financing required to implement these programmes.

Following are details pertaining to the supply prospects:

(1) **Petroleum-based Fuels**

The petroleum-based fuels which are imported and utilized in Guyana are motor Gasoline, dual purpose Kerosene, Diesel/Gasoil, Fuel Oil/Bunker “C”, aviation Gasoline and Liquefied Petroleum Gas (LPG). Since diesel and fuel oil will continue to account for a substantial amount of the national fuel bill and provide the best opportunity for substitution, every effort should be made in order to reduce the nation’s dependence on these fuels in order to achieve significant savings. There should be simultaneously, continued exploration for indigenous resources and implementation on conservation measures.

(2) **Hydropower (large, small, mini and micro)**

Hydropower programme is intended to solve the long term energy problems of Guyana through national development of water-resources and to generate electricity by the construction of hydropower stations (micro, mini, small or large) for the supply of power for the following uses:

- (i) industrial
- (ii) commercial
- (iii) domestic
- (iv) recreational
- (v) others

In the development of a river basin, the following factors will be considered:

- hydropower
- navigation
- irrigation
- sedimentation control
- flood control
- recreation
- municipal and industrial water supply (i.e., water quality control)
- fisheries
- others

(3) BIOMASS

(i) Bagasse

Studies have shown that there is sufficient bagasse at the Albion and LBI Sugar Estates to generate 20MW and 10MW of electricity, respectively. The development of this source of energy should be undertaken, through the installation of generating plants at Albion and LBI to supply electricity to the national grid.

(ii) Woodwaste

Woodwaste is currently used by two private companies to generate approximately 1.5MW of power for their operations. Immediate steps should be taken to encourage utilization of woodwaste in concentrated sawmilling area (e.g., Crabwood Creek) and for large operations like Demerara Timbers Limited (DTL), Barama for power generation. This power could be used in industrial applications with the excess to be supplied to the national grid. The isolated sawmills can establish systems for self-utilization and any excess can be utilized by the surrounding communities.

(iii) Fuelwood

The statistics show that fuelwood is used widely for domestic purposes. However, the supply of fuelwood is not organized nationally. Producing heat energy, from the energy source, generates significant savings through substitution for electricity, kerosene and LPG. Serious and immediate efforts, therefore, should be made towards the development of an organized fuelwood industry to satisfy the national demand of this energy source, in an environmentally friendly manner, with particular attention to the rural communities.

(iv) Rice-Husk

Two companies are currently utilizing rice husk for power-generation and for processing. The available potential has been evaluated, and efforts should be made to establish central generating plants in areas where there is a high concentration of mills. In both cases, industrial and domestic uses are envisaged.

(v) Biogas (from animal waste, vegetable matter, distillery waste)

There are about eighty-five (85) biogas digesters which were built since 1985 in the country, with volumes varying in sizes from 8, 12, 16 to 20 cu. metres. Biogas technology has been identified as part of the solution to the energy problem in Guyana. However, more education, cheaper design costs and proper surveys need to be conducted to ensure that the technology is widely utilized among farmers for cooking, lighting and refrigeration.

(4) Wind Energy

The absence of sufficient information and data on the wind regime has restricted utilization of wind energy along Guyana's coastland as well as in the hinterland areas. Efforts should, therefore, be undertaken to determine the wind regime with a view to assessing the power potential of wind mills. The establishment of wind farms should be evaluated in terms of cost effectiveness.

(5) Solar Energy

Adequate information on solar radiation in Guyana has been collected. However, the high cost of photovoltaic (PV) systems has limited the size of units being used. At the moment, there are twenty-one (21) PV systems operational in Guyana, ranging from 0.5 Kw to 10 Kw output units. The systems are being used by Health-Centres in remote areas for lighting and refrigeration. The utilization of these systems in remote areas must be encouraged where the need exists, providing they constitute a cost effective option. The use of fixed convection and natural convection solar systems should also be encouraged for the processing of agro-based commodities and in the fishing industry.

4.4. STRATEGIES FOR SATISFYING ENERGY DEMAND

To satisfy the projected energy demand up to 2004, the following major strategies would be adopted:

- (1) more efficient utilization of bagasse with a view to supplying power to the national grid
- (2) increased utilization of woodwaste and rice-husk for electricity generation
- (3) development of major hydropower facilities
- (4) more efficient utilisation of petroleum based products and energy generally through conservation measures
- (5) provision of fiscal incentives and appropriate legislation to support energy development programmes
- (6) establishing energy farms to provide fuelwood source for household uses
- (7) continuation of oil exploration activities

- (8) development of small, mini/micro hydropower, solar and wind technologies for remote and isolated communities.

4.5 ENERGY SUPPLY AND SECTORAL USE

It is projected that final energy consumption in 1998 will be 5,165,000 BOE and in 2004, 5,369,000 BOE and the final consumption of petroleum products to be 3,100,000 bbls in 1998 and 3,500,000 in 2004. These are illustrated in Figs. 4.1 and 4.2. Based on the strategies outlined above, Tables 4.1 and 4.2 indicate that the total supply of energy by source in 1998 and 2004 will be 6,226,000 BOE and 5,755,000 BOE, respectively. It is projected that Guyana will be less dependent on imported petroleum products in 2004 than in 1992. A decrease of approximately 26% is projected. Increased exploitation of domestic energy resources, namely bagasse, and hydropower, for generation of electricity for the national grid, would contribute heavily to this reduced dependency. Table 4.3 and fig. 4.3 and 4.4 have indicated energy supply will be provided for in 1998 by indigenous resources (53.7%) and imported petroleum products (46.3%). In 2004, the energy supply will be provided by indigenous resources (61.5%) and petroleum products (38.5%).

In terms of energy supply and sectoral use, Figures 4.5, 4.6, 4.7, 4.8, 4.9 and 4.10 illustrate the trend predicted for 1998 and 2004. More specifically, the following can be observed.

(1) Industry / Mining Sector

During the period 1998 – 2004, the Industry and Mining Sector will utilize 35.1% to 40.0% of total energy supply. In 1998, petroleum products would represent 45.7% and

bagasse 51.5% of energy supply in this sector. In 2004, contribution from these two resources will change to 43.8% and 53.4%, respectively. This sector is projected to remain the largest consumer of energy. The trend of an increase in the contribution by bagasse and decrease in the use of petroleum products will continue, eventually stabilizing in 2004.

(2) Electricity Sector

It is projected that the electricity Sector would utilize 23.7% of energy supply in 1998 and 14.9% in 2004.

In 1998, petroleum products would represent 55.0% and indigenous resources 45.0% of energy supply in this sector. In 2004, it is projected that these figures would change to 7.0% and 93.0%, respectively. In this sector, dependence on petroleum products will decrease by 48% during the period 1998 – 2004. More efficient utilization of bagasse will increase the contribution from this energy source. Hydro-energy (49%) will be the major source of electricity generation by this time.

(3) Residential Sector

It is projected that the Residential Sector would utilize 25.5% of energy supply in 1998 and 27.7% in 2004. Fuelwood would provide 90.8% and petroleum products 9.2% of the energy supply in 1998 and 90.5% in 2004, respectively.

Fuelwood is expected to remain the important energy source in this sector.

(4) Transportation, Agriculture and Fishing Sectors

The Transportation, Agriculture and Fishing Sectors are projected to use 15.3% of energy supply in 1998 and 17.2% in 2004. As in previous years, petroleum products are projected to be the only source of energy supply in these sectors.

(5) Charcoal Production

This will remain relatively constant during the period 1992 – 1998 and 2004 and will have a marginal impact (0.1% - 0.2%) on sectoral use of energy supply.

4.6 IMPACT OF STRATEGIES ON IMPORTED PETROLEUM PRODUCTS

Overall, the strategy applied will result in the increased utilization of indigenous resources with the consequential decrease in energy supply from petroleum products from 48.7% in 1992 to 38.5% in 2004, despite an overall increase in final consumption of energy of 9.3% over the same period. This decrease in energy from petroleum products does not include new energy conservation opportunities to be taken. Tables 4.4, 4.5, 4.6, 4.7, 4.8 and Figures 4.11, 4.12 and 4.13 show the sectoral use of petroleum products in 1998 and 2004 and the corresponding expenditure associated with the importation of these products. In total, fig. 4.13 indicates expenditure in 1992 to be US\$61,471,700 decreasing to a value of US\$49,715,650 in 2004. This projected decrease in the utilization of petroleum products would be due largely to increase and more efficient utilization of local resources for electricity generation.

Electricity Sector

The Guyana Electricity Corporation (GEC) generation balance for the Berbice / Demerara interconnected system is shown in Fig. 4.14. Based on this generation plan, in 1992, 36% of the energy supply from petroleum product was used to generate electricity, while 27% will be used in 1998 and 2.8% in 2004. In power output terms, in 1992 all power generation (50 MW) came from petroleum products while in 2004, only 15% (22 MW out of 128 MW) will be generated by petroleum products. Based on 1992 prices, the fuel bill for electricity generation will decrease for US\$17,943,447 in 1992 to US\$11,903,371 in 1998 reaching a figure of US\$661,743, in 2004 while at the same time increasing the generating capacity from 50 MW to 128 MW. Although the savings will represent 36% of the total fuel bill, the availability of large quantities of reliable power at low generating cost would have a major impact on the industrial development of the country.

Other Sectors:

Industry / Mining, Transportation, Agri / Fishing:

The utilization of petroleum products for the other sectors will remain basically the same. The utilization of currently known indigenous resources cannot replace fossil fuel in these sectors. Over the next ten years, to reduce the dependency on such fuels for these sectors the following MUST be pursued.

- continued oil exploration activities
- promotion of efficient utilization of these products at the sectoral level through energy conservation, fiscal incentives and enactment of appropriate legislation.

PART 5

IMPLEMENTATION AND FINANCING

5.1 IMPLEMENTATION SCHEDULE

5.2 PROJECT FINANCING

5. IMPLEMENTATION AND FINANCING

This section focuses on a projected implementation schedule and possible sources of financing.

5.1 IMPLEMENTATION SCHEDULE

The various activities and the time-frame envisaged for the achievement of the objectives of the national energy policy are included in the implementation schedule which is presented below. It is self explanatory and covers the period 1994 to 2004.

It is important to point out that by the end of the third quarter of 1994, an appropriate energy agency should be established and the required regulatory framework for the energy sector should be formulated. This is absolutely necessary for the successful implementation of the national energy policy.

In respect of the implementation of the various projects, the main activities would include:

- Data Collection
- Analysis of Data
- Requesting Proposals
- Evaluation of Proposals
- Selecting the Best Proposals
- Project Commencement and Execution
- Commissioning

The projected time-frame for the activities in the implementation schedule could vary, depending on the response to the request for proposals and the efficiency with which the other activities could be carried out.

5.2 PROJECT FINANCING

Financing the projects identified for implementation is an extremely crucial aspect of our energy policy. It is expected that the energy agency to be established would collaborate with the other relevant local agencies / organizations in promoting investments and securing financing for the projects. Financing of these projects could be pursued through various international institutions / countries which include:

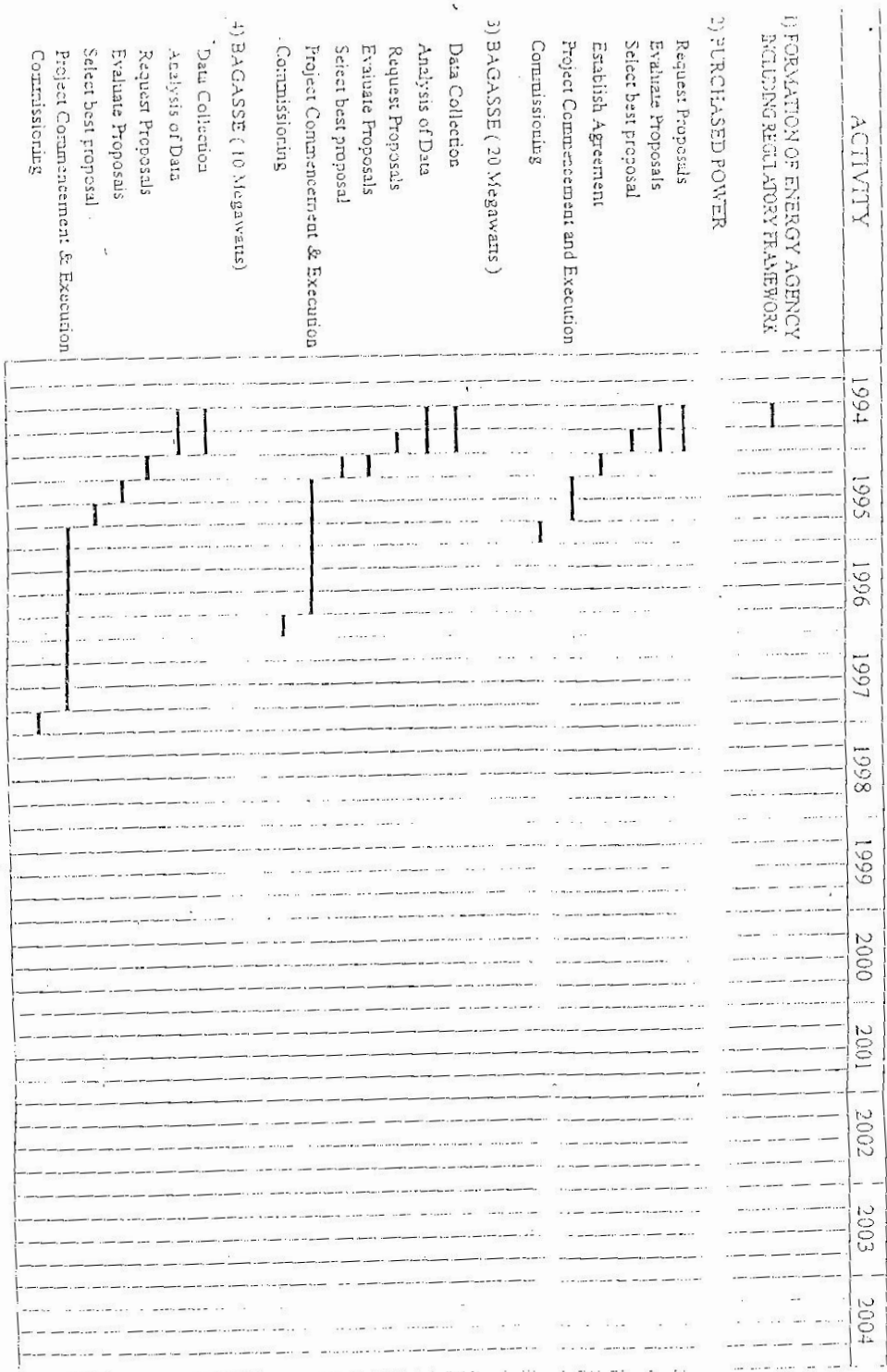
- Caribbean Development Bank (CDB)
- World Bank
- Inter-American Development Bank (IDB)
- Organisation of American States (OAS)
- Canadian International Development Agency (CIDA)
- O L A D E
- Overseas Development Administration (ODA) of the United Kingdom
- European Economic Community (EEC)
- Japan International Development Organisation Ltd. (JAIDO)
- Government of Japan Grant Aid Programme
- Lines of Credit from countries like Venezuela, Brazil, Germany, Italy
- Direct Investment by American, Canadian, British, Venezuelan, Brazilian, Italian, Germany, Australian, Companies / Investors on a Finance, Build, Own, Operate and Transfer (FBOOT basis)
- Guyanese Companies / Investors in Joint Venture schemes, again on a FBOOT basis.

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The types of financing that could be made available are listed below:

- Direct short-term / long-term loans at approximately IDB interest rates
- Technical assistance schemes / programmes
- Grants and schemes / programmes
- Grants
- Short-term / long-term credits (Lines of Credit)
- 100% direct investment by Foreign Companies
- Partial direct investment by Guyanese Companies in Joint-Venture Schemes.

IMPLEMENTATION SCHEDULE



[illegible]

IMPLEMENTATION SCHEDULE (Contd.)

[illegible]

TABLES:	3.1 – 3.6
	4.1 – 4.8

TABLE 3.4

BREAKDOWN OF ENERGY CONSUMPTION BY PRODUCT

1988 - 1992

REPORTING UNIT = 000'S BARRELS (bbls)

PRODUCTION \ YEAR	1988	1989	1990	1991	1992
AVGAS	16.1	13.3	8.1	8.1	15.2
DUAL PURPOSE KERO	220.0	212.5	206.07	193.7	220.1
PREMIUM GASOLINE	466.1	447.4	443.0	393.0	419.9
REGULAR GASOLINE	N.I.	N.I.	N.I.	N.I.	N.I.
FUEL OIL	1,592.9	1,068.8	1,207.0	1,229.0	1,191.8
KEROSENE	N.A.	N.A.	N.A.	N.A.	N.A.
DIESEL \ GASOIL	1,025.7	727.5	867.3	828.5	810.7
L.P.G.	63.0	50.9	51.0	35.8	33.4
TOTAL	3,364.1	2,701.9	2,782.4	2,688.1	2,691.1

COMMENTS : Guyana imported both Premium and Regular Gasoline up to 1985. However, from 1986 onwards only premium Gasoline has been imported. Domestic Kerosene was imported up to April 1986. However, since May 1986 this need has been supplied from Dual Purpose Kerosene.

DPK is the same as jet fuel; Data does not include Offshore imports; N.A. - No imports; NB - include the "Offshore" breakdown.

SOURCE : GNEA Records.

TABLE 3.5

CIF VALUE OF IMPORTED PETROLEUM PRODUCTS

1988 - 1992

PRODUCTION \ YEAR	1988	1989	1990	1991	1992
AVGAS	812.4	610.0	407.8	427.7	764.4
TURBO FUEL	5,209.1	5,759.7	7,248.3	5,902.2	6,604.7
PREMIUM GASOLINE	10,651.4	11,840.8	13,946.5	12,074.8	11,568.4
REGULAR GASOLINE	N.A.	N.A.	N.A.	N.A.	N.A.
FUEL OIL	22,923.3	18,638.8	24,637.5	21,011.2	18,654.9
KEROSENE	N.A.	N.A.	N.A.	N.A.	N.A.
DIESEL \ GASOIL	21,469.7	18,657.0	27,688.4	24,278.8	22,469.7
L.P.G.	2,177.7	1,888.0	2,567.8	1,445.3	1,409.6
TOTAL	63,530.2	57,394.3	76,196.3	65,140.00	61,471.7

Source : GNEA Records.

N.A. : Not Applicable

TABLE 3.1

ENERGY SUPPLY BY SOURCE

1988 - 1992

ENERGY SOURCE	1988		1992	
	10 ³ BOE	% OF TOTAL	10 ³ BOE	% OF TOTAL
Petroleum Products	3252	56	2996	49
Bagasse	980	17	1596	26
Fuelwood *	1543	27	1562	25
TOTAL	5775	100	6154	100

* OLADE Estimates.

GNEA Records

TABLE 4.1

ENERGY SUPPLY AND SECTORAL USE

1998

SECTOR	BAGASSE	FUELWOOD	RICE HUSK	PETROLEUM PRODUCTS	TOTAL	% OF TOTAL SUPPLY
Electricity Generation	475	95	95	811	1476	23.7
Charcoal Production	N.A.	13	N.A.	N.A.	13	0.2
Transportation	N.A.	N.A.	N.A.	652	652	10.5
Industry & Mining	1121	65	N.A.	1000	2186	35.1
Residential	N.A.	1444	N.A.	146	1590	25.5
Commercial and Public	N.A.	N.A.	N.A.	13	13	0.2
Agriculture and Fishing	N.A.	N.A.	N.A.	296	296	4.8
TOTAL	1671	1671	95	2918	6226	100

N.A. : Not Applicable

TABLE 3.6

IMPORTATION OF PETROLEUM PRODUCTS

1988 AND 1992

SECTORAL DISTRIBUTION	FUEL TYPE	CIF VALUE (US\$)	TOTAL FOR SECTORS	CIF VALUE (US\$)	TOTAL FOR SECTORS
		1988		1992	
ELECTRICITY	Bunker 'C'	11347033	15720049	10595953	17943447
	Diesel \ Gasoil	4733016		7347494	
INDUSTRY \ MINING	Bunker 'C'	11530420	17203814	7853713	15088860
	Diesel \ Gasoil	5678394		7235147	
TRANSPORTATION	Premium Gasolene	9138901	13947043	10585086	13034251
	Diesel \ Gasoil	4808142		2449165	
AGRICULTURE \ FISHING	Diesel \ Gasoil	6766209	8278708	54600864	6443478
	Premium Gasolene	1512499		983314	

ENERGY SUPPLY AND SECTORAL USE

1988

UNIT = 10³ BOE

SECTOR	BAGASSE	FUELWOOD	PETROLEUM PRODUCTS	TOTAL	% OF TOTAL SUPPLY
Electricity Generation	245	N.A.	979	1224	21.3
Charcoal Production	N.A.	8	N.A.	8	0.2
Transportation	N.A.	N.A.	657	657	11.4
Industry & Mining	735	57	1053	1845	32.1
Residential	N.A.	1479	148	1627	28.3
Commercial and Public	N.A.	N.A.	10	10	0.4
Agriculture and Fishing	N.A.	N.A.	362	362	6
TOTAL	980	1544	3218	5742	100

SOURCE: GNEA Records

TABLE 3.3

ENERGY SUPPLY AND SECTORAL USE

1992

UNIT = 10³ BOE

SECTOR	BAGASSE	FUELWOOD	PETROLEUM PRODUCTS	TOTAL	% OF TOTAL SUPPLY
Electricity Generation	400.0	40.0	1,069.0	1,509.0	24.5
Charcoal Production	N.A.	13.0	N.A.	13.0	0.2
Transportation	N.A.	N.A.	593.0	593.0	9.6
Industry & Mining	1,196.0	65.0	880.0	2,141.0	34.8
Residential	N.A.	1,444.0	140.0	1,584.0	25.7
Commercial and Public	N.A.	N.A.	18.0	18.0	0.4
Agriculture and Fishing	N.A.	N.A.	296.0	296.0	4.8
TOTAL	1,596.0	1,562.0	2,996.0	6,154.0	100.0

SOURCE: GNEA Records

NB: Figures exclude OMA and Illegal Importation of Petroleum Products (Figures Rounded)

TABLE 4.3

ENERGY SUPPLY BY SOURCE

1998 - 2004

ENERGY SOURCE	1998		2004	
	10 ³ BOE	% OF TOTAL	10 ³ BOE	% OF TOTAL
Petroleum Products	2918	46.3	2217	38.5
Bagasse	1671	26.5	1596	27.7
Fuelwood	1617	25.7	1522	26.5
Rice Husk	95	1.5	-	-
Hydropower	-	-	420	7.3

TABLE 4.2

ENERGY SUPPLY AND SECTORAL USE

2004

SECTOR	BAGASSE	FUELWOOD	RICE HUSK	HYDRO ENERGY	PETROLEUM PRODUCTS	TOTAL	% OF TOTAL SUPPLY
Electricity Generation	378	N.A.	N.A.	420	62	860	14.9
Charcoal Production	N.A.	13	N.A.	N.A.	N.A.	13	0.1
Transportation	N.A.	N.A.	N.A.	N.A.	694	694	12.1
Industry & Mining	1218	65	N.A.	N.A.	1000	2283	40.0
Residential	N.A.	1444	N.A.	N.A.	152	1596	27.7
Commercial and Public	N.A.	N.A.	N.A.	N.A.	13	13	0.1
Agriculture & Fishing	N.A.	N.A.	N.A.	N.A.	296	296	5.1
TOTAL	1576	1522	N.A.	420	2217	5755	100

N.A.: Not Applicable

TABLE 4.4.

SECTORAL USE OF PETROLEUM PRODUCTS

1998

UNIT: 000'BOE

SECTOR	L.P.G.	GASOLENE	KEROSENE AVJET	DIESEL OIL	FUEL OIL	TOTAL
Electricity Generation				179	632	811
Transportation		376	118	158		652
Industry and Mining				438	562	1000
Residential	18		128			146
Commercial and Public	3				10	13
Agriculture and Fishing		33		263		296
TOTAL	21	409	246	1038	1207	2918

TABLE 4.5

SECTORAL USE OF PETROLEUM PRODUCTS

2004

UNIT: 000'BOE

SECTOR	L.P.G.	GASOLENE	KEROSENE AVJET	DIESEL OIL	FUEL OIL	TOTAL
Electricity Generation				17	45	62
Transportation		392	120	182		694
Industry and Mining				438	562	1000
Residential	19		133			152
Commercial and Public	3				10	13
Agriculture and Fishing		33		263		296
TOTAL	22	425	253	900	617	2217

TABLE 4.6

CIF VALUE OF PETROLEUM PRODUCTS - 1998

(000'S U.S.\$)

SECTOR	L.P.G.	GASOLINE	KERO \ AVGET	DIESEL	BUNKER	TOTAL	% OF TOTAL
Electricity	0.00	0.00	0.00	3,121.32	8,792.04	11,913.37	20.0
Transportation	0.00	11,212.32	3,639.60	3,275.34	0.00	18,127.260	30.5
Industry \ Mining	6.00	0.00	0.00	9,079.74	8,334.46	17,414.20	29.3
Residential	1,103.32	0.00	3,973.23	0.00	0.00	5,076.45	8.5
Commercial \ Public	306.45	0.00	0.00	0.00	192.79	499.24	0.9
Agriculture \ Fishing	0.00	984.06	0.00	5,451.99	0.00	6,436.05	10.8
TOTAL	1,409.67	12,196.38	7,612.83	20,928.4	17,319.29	59,465.57	100.0
Price \ BOE	61.29	29.82	30.33	20.73	14.83		
% of Total	2.4%	20.5%	12.8%	35.2%	29.1%	100.0%	

TABLE 4.7

CIF VALUE OF PETROLEUM PRODUCTS - 2004

(000'S US\$)

SECTOR	L.P.G.	GASOLINE	KEROSENE AVIATION	DIESEL	BUNKER 'C'	TOTAL	% OF TOTAL
Electricity	0.00	0.00	0.00	296.44	365.30	661.91	1.3
Transportation	0.00	11,878.18	3,639.60	3,897.24	0.00	19,415.02	39.1
Industry \ Mining	0.00	0.00	0.00	9,079.74	8,334.46	17,414.20	35.0
Residential	1,164.51	0.00	4,124.88	0.00	0.00	5,289.39	10.6
Commercial \ Public	306.45	0.00	0.00	0.00	192.79	499.24	1.0
Agriculture \ Fishing	0.00	984.06	0.00	5,451.99	0.00	6,436.05	13.0
TOTAL	1,470.96	12,862.24	7,764.48	18,725.38	8,892.59	49,715.65	100.0
Price/BOE	61.29	29.82	30.33	20.73	14.83		
% of Total	3.0%	25.8%	15.6%	37.7%	17.9%	100.0%	

TABLE 4.8

PROJECTION ON IMPORTATION OF PETROLEUM PRODUCTS

1998 AND 2004

SECTORAL DISTRIBUTION	FUEL TYPE	CIF VALUE (US\$)	TOTAL FOR SECTORS	CIF VALUE (US\$)	TOTAL FOR SECTORS
		1998		2004	
Electricity	Bunker 'C'	8,792,043	11,903,371	363,304	661,743
	Diesel\Gasoil	3,121,328		296,439	
Industry \ Mining	Bunker 'C'	8,334,460	17,414,200	8,334,460	17,414,200
	Diesel\Gasoil	9,079,740		9,079,740	
Transportation	Premium Gasoline	11,121,320	18,127,260	11,598,190	19,435,030
	Diesel\Gasoil A.V. Jet	3,275,340 3,639,600		3,897,240 3,639,600	
Agriculture \ Fishing	Diesel\Gasoil	5,451,990	6,436,030	5,451,990	6,436,030
	Premium Gasoline	984,060		984,060	
Residential	L.P.G.	1,103,220	5,076,450	1,164,510	5,289,390
	Kerosene	3,973,230		4,121,880	
Commercial \ Public	L.P.G.	306,450	499,240	306,450	499,240
	Bunker 'C'	192,790		192,790	

SOURCE : GNEA Records. N.B.: As 1992 Prices.

FIGURES: 3.1 - 3.17

4.1 - 4.14

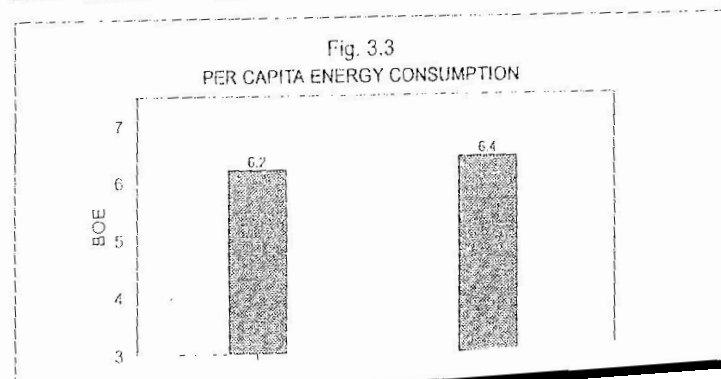
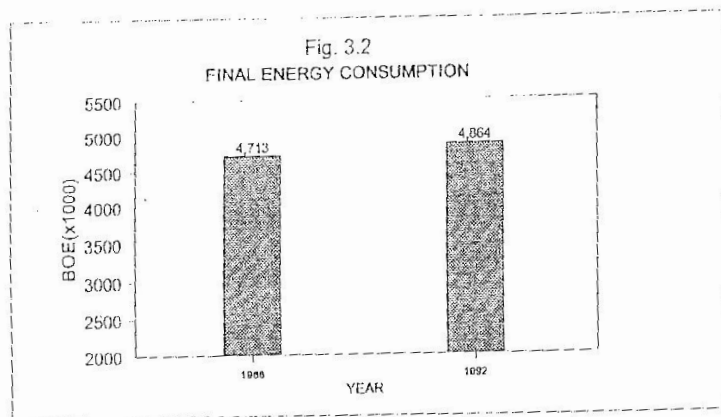
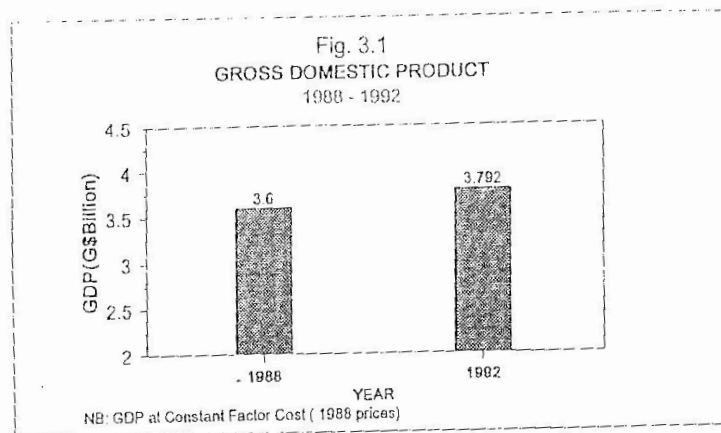


Fig. 3.4
ENERGY SUPPLY BY SOURCE
1988

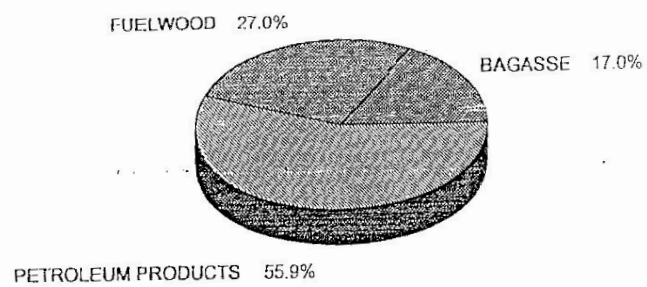


Fig. 3.5
ENERGY SUPPLY BY SOURCE
1992

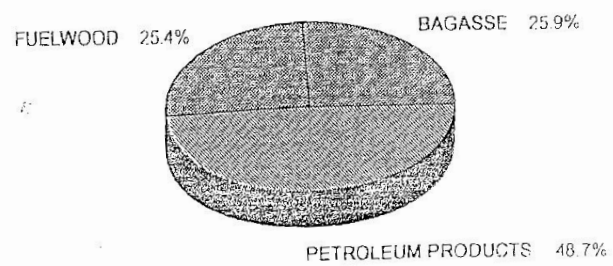


Fig. 3.6
SECTORAL USE OF ENERGY SUPPLY
1988

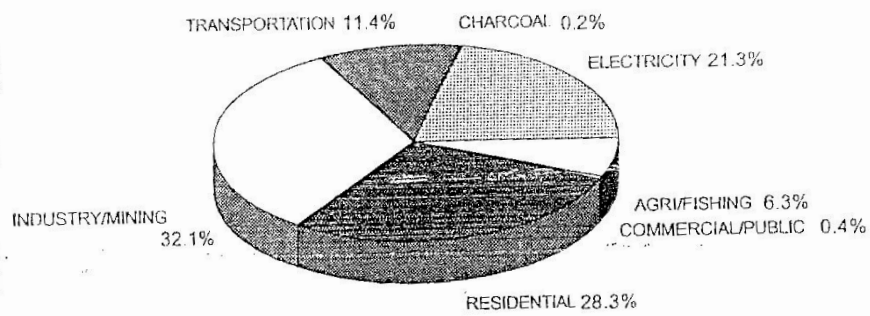


Fig. 3.7
SECTORAL USE OF ENERGY SUPPLY
1992

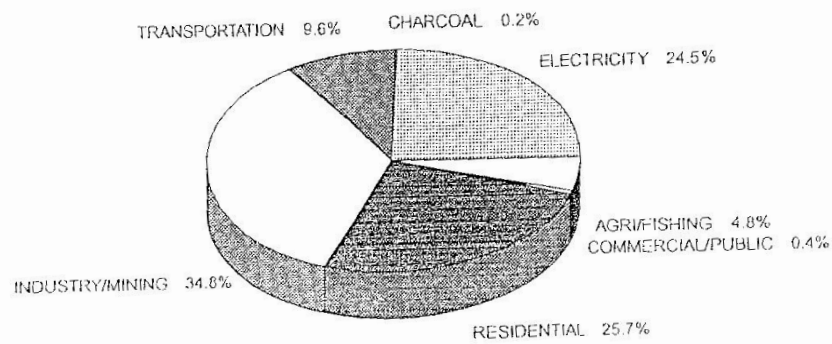


Fig. 3.8
SECTORAL USE OF ENERGY SUPPLY
1988

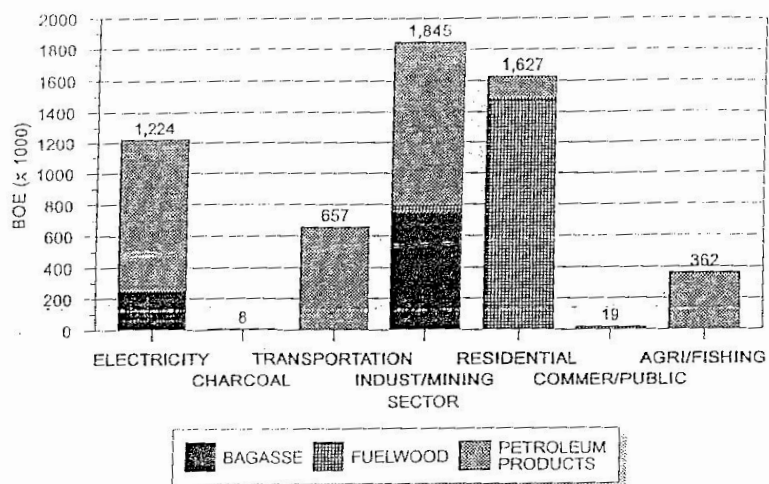


Fig. 3.9
SECTORAL USE OF ENERGY SUPPLY
1992

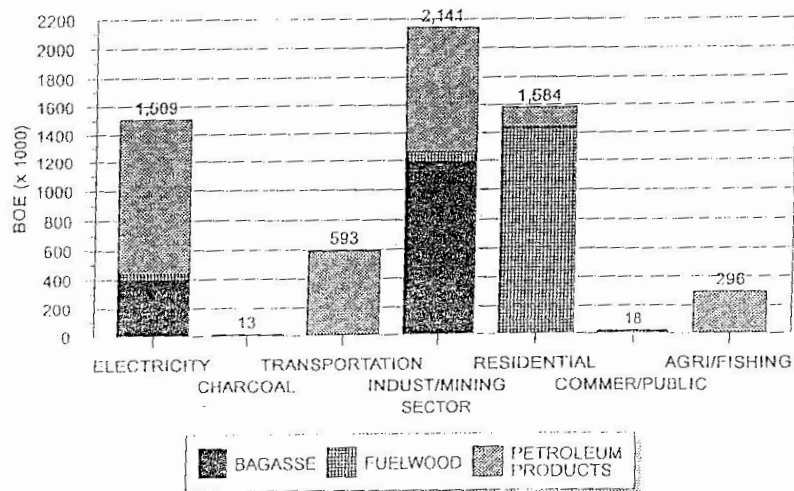


Figure 3.10

ENERGY SUPPLY AND SECTORAL USE

1988

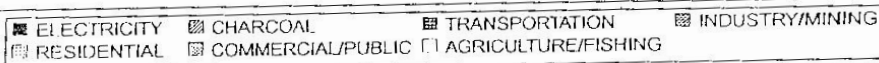
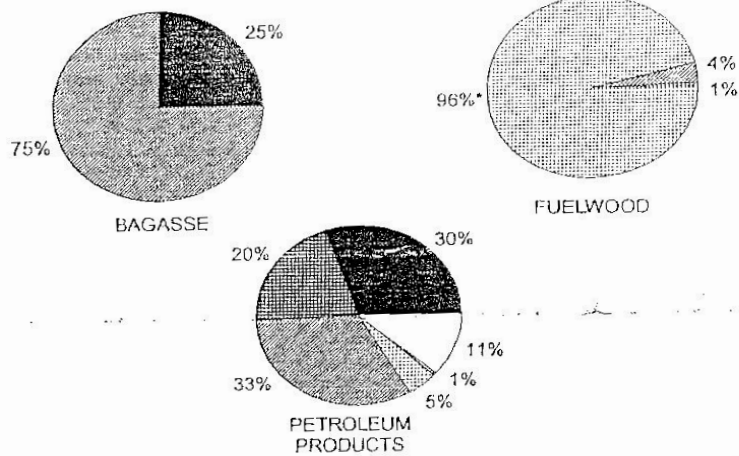


Figure 3.11

ENERGY SUPPLY AND SECTORAL USE

1992

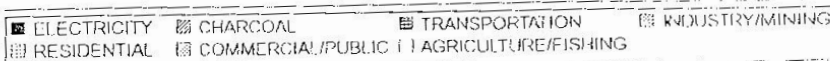
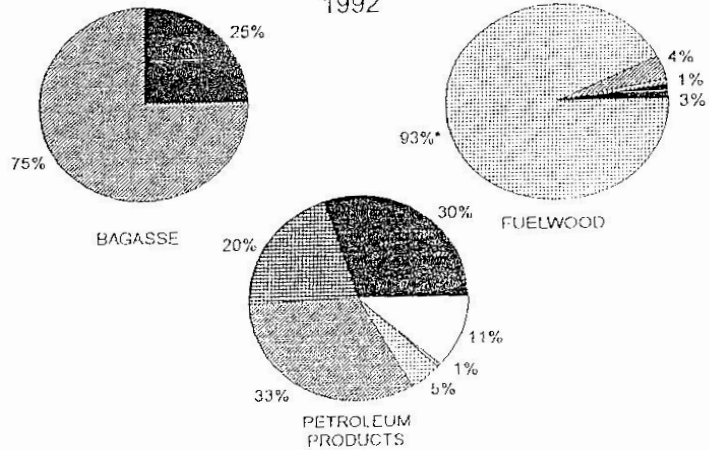
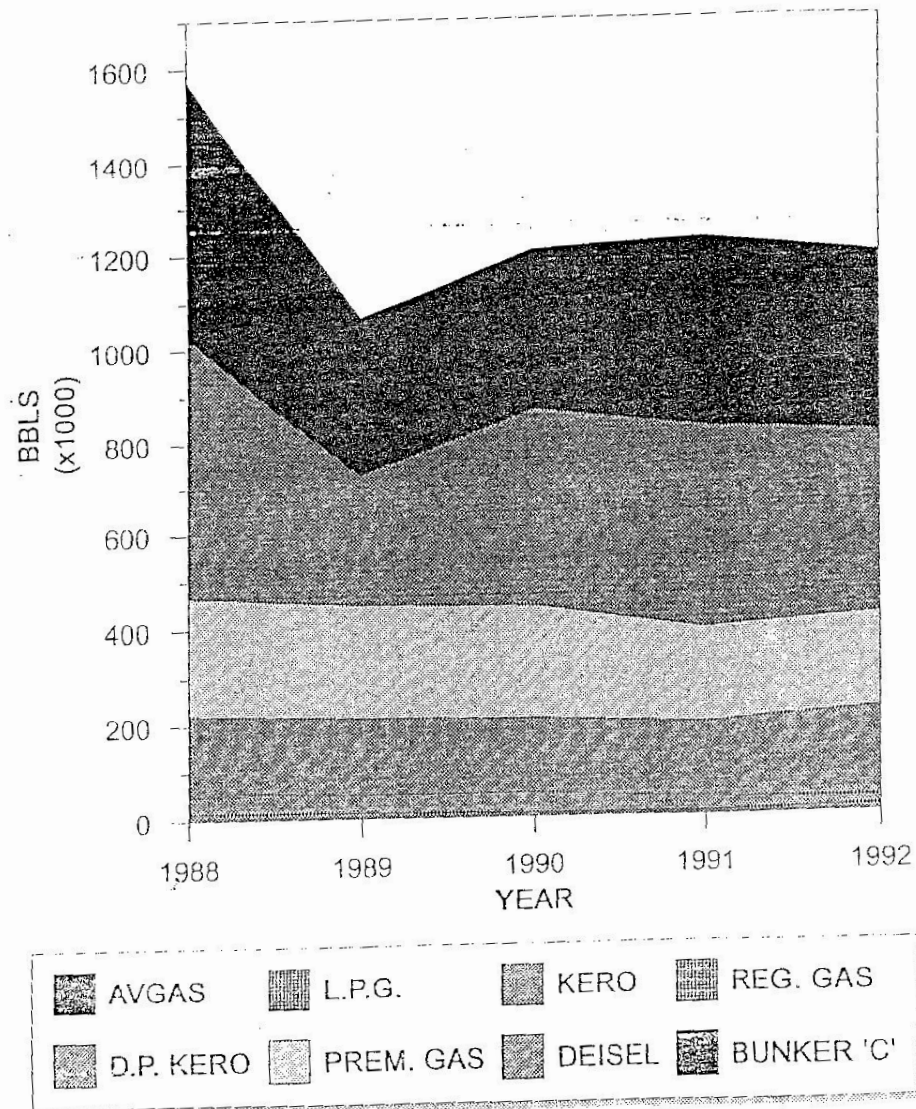


Fig 3.12
FUEL CONSUMPTION BY PRODUCT
 1988 - 1992



A 3D stacked area chart illustrating the cost of various fuels in US\$ (x1000) from 1988 to 1992. The Y-axis represents the cost in thousands of US dollars, ranging from \$0 to \$50,000. The X-axis represents the year, from 1988 to 1992. The chart shows that the cost of fuels generally increased over the five-year period, with Diesel and Bunker 'C' being the most expensive, followed by Premium Gas, D.P. Kero, Reg. Gas, Kero, L.P.G., and Avgas.

Fuel Type	1988	1989	1990	1991	1992
DEISEL	~\$10,000	~\$12,000	~\$15,000	~\$18,000	~\$20,000
BUNKER 'C'	~\$5,000	~\$6,000	~\$8,000	~\$10,000	~\$12,000
PREM. GAS	~\$3,000	~\$4,000	~\$5,000	~\$6,000	~\$7,000
D.P. KERO	~\$2,000	~\$3,000	~\$4,000	~\$5,000	~\$6,000
REG. GAS	~\$1,000	~\$1,500	~\$2,000	~\$2,500	~\$3,000
KERO	~\$500	~\$700	~\$900	~\$1,100	~\$1,300
L.P.G.	~\$200	~\$300	~\$400	~\$500	~\$600
AVGAS	~\$100	~\$150	~\$200	~\$250	~\$300

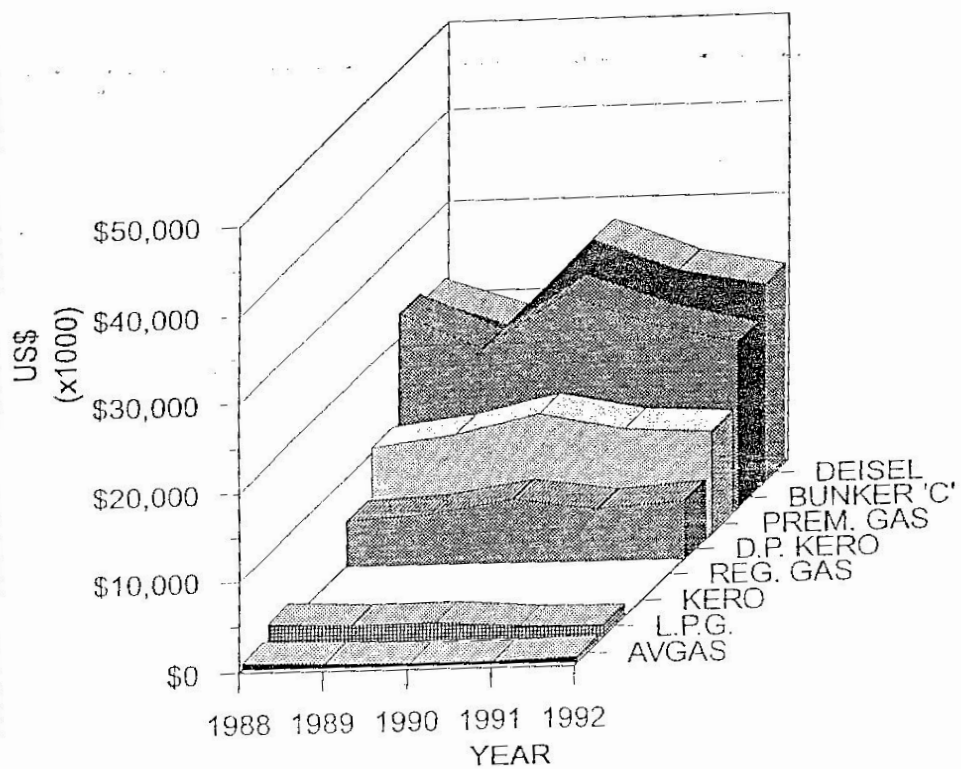


Fig. 3.14
SECTORAL USE OF PETROLEUM PRODUCTS
1988

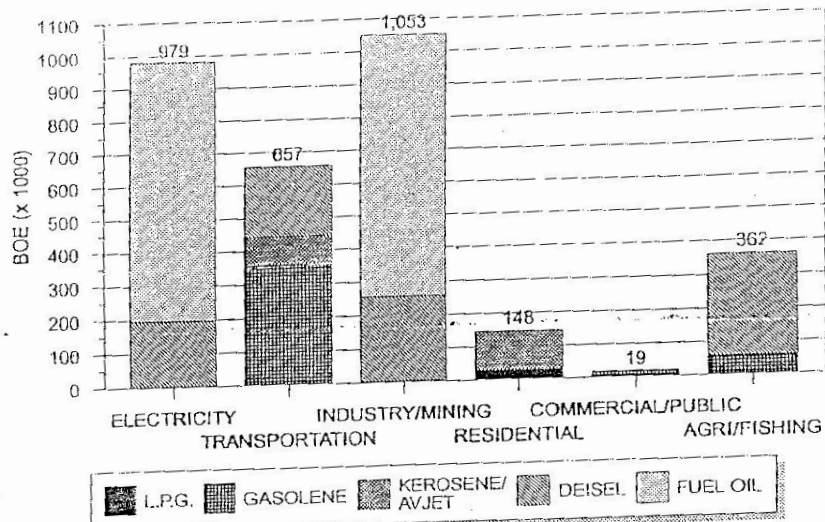


Fig. 3.15
SECTORAL USE OF PETROLEUM PRODUCTS
1992

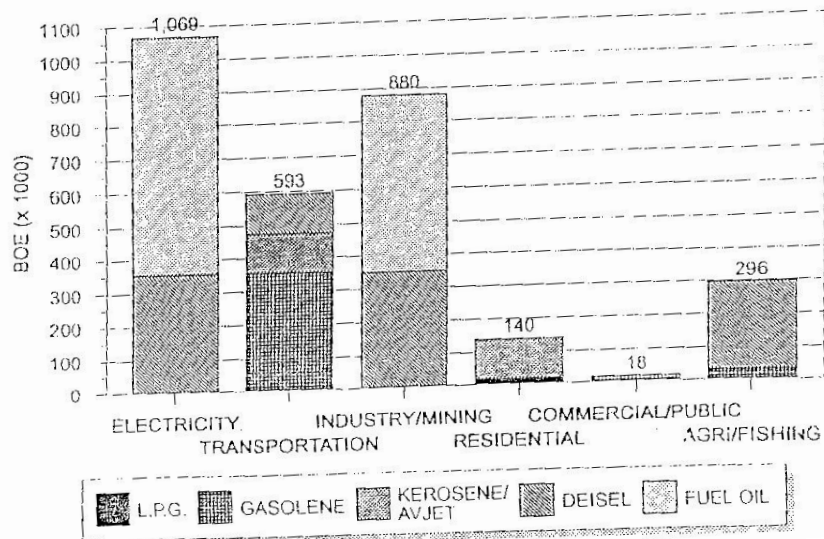
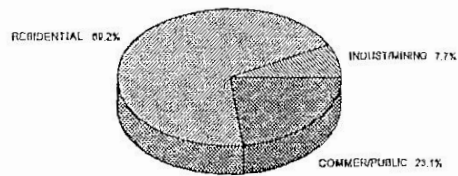
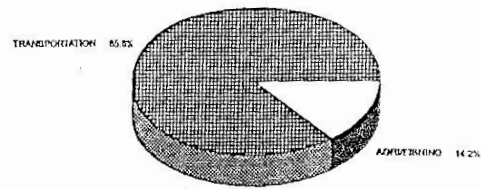


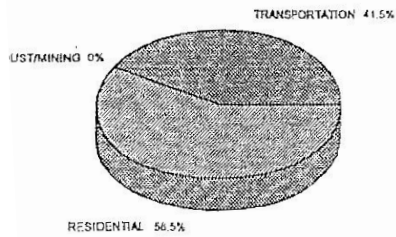
Fig 3.16.
SECTORAL USE OF ENERGY SUPPLY
IN VALUE TERMS
1988



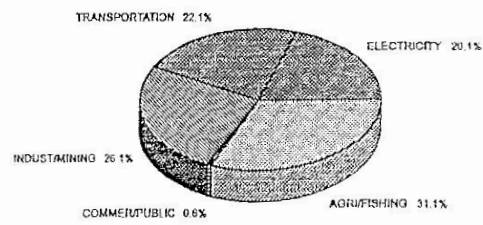
L.P.G.



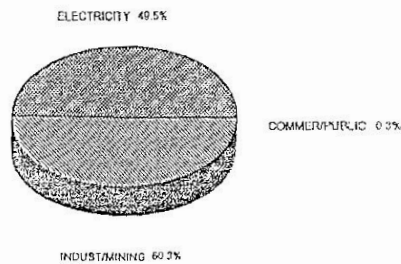
GASOLINE



KEROSENE/JET



DIESEL



BUNKER 'C'

Fig. 3.17
SECTORAL USE OF PETROLEUM PRODUCTS
IN VALUE TERMS.

1992

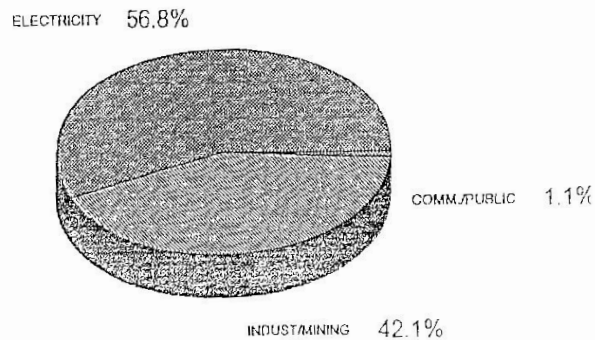
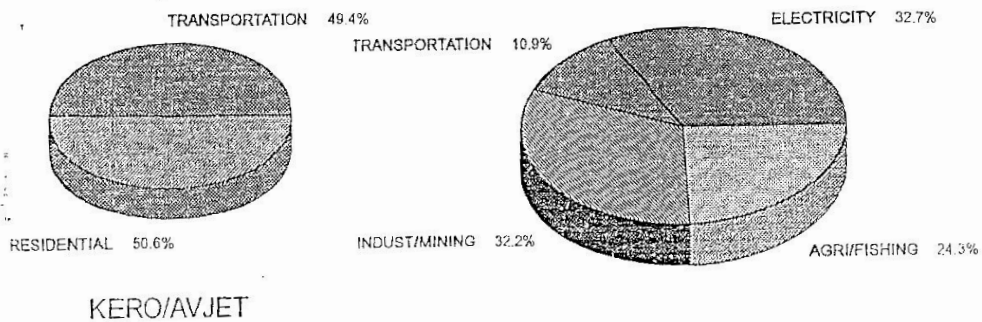
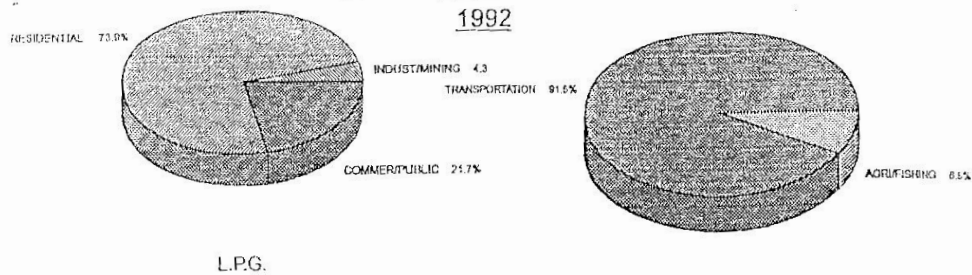


Fig. 4.1
FINAL ENERGY CONSUMPTION

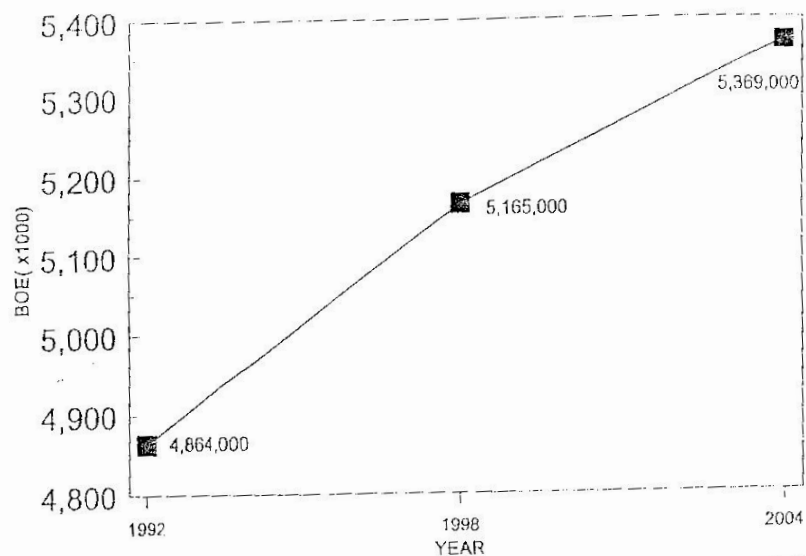


Fig. 4.2
FINAL CONSUMPTION OF PETROLEUM PRODUCTS

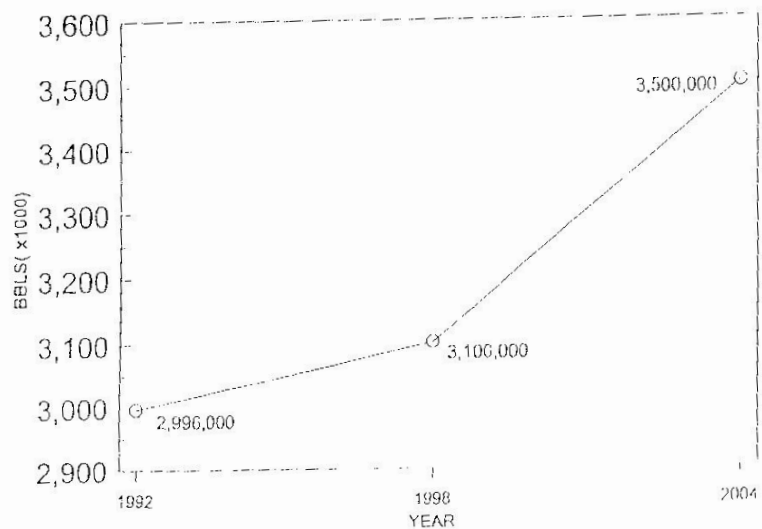


Fig. 4.3
ENERGY SUPPLY BY SOURCE
1998

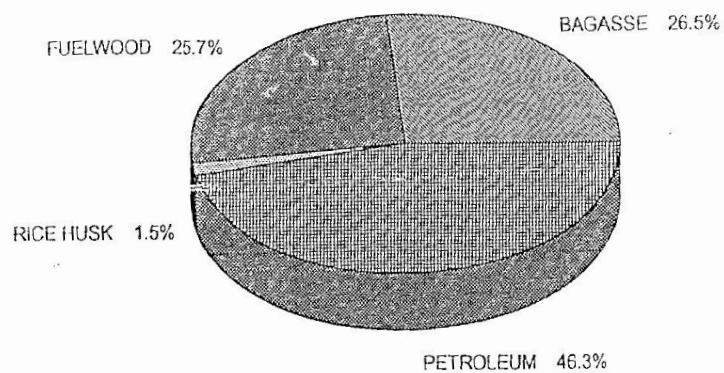


FIG. 4.4
ENERGY SUPPLY BY SOURCE
2004

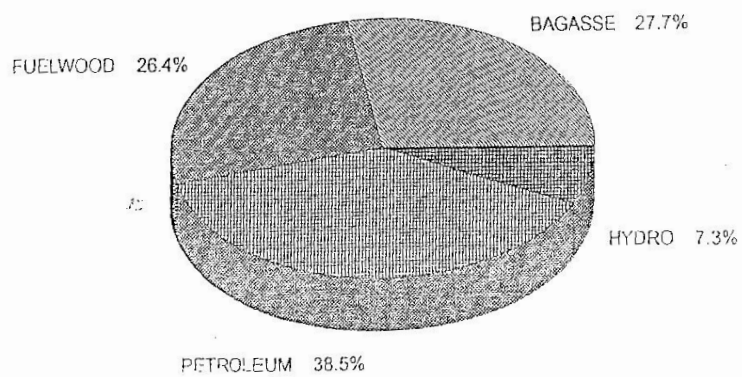


Fig. 4.5
SECTORAL USE OF ENERGY SUPPLY
1998

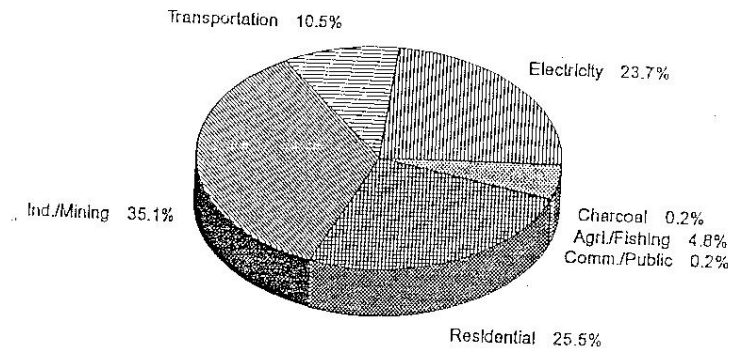


Fig. 4.6
SECTORAL USE OF ENERGY SUPPLY
2004

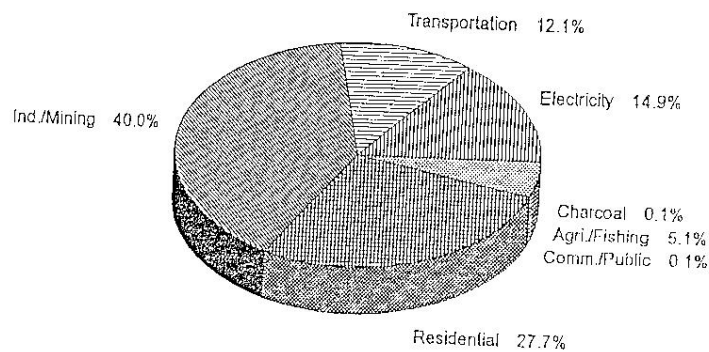


Fig. 4.7
SECTORAL USE OF ENERGY SUPPLY
1998

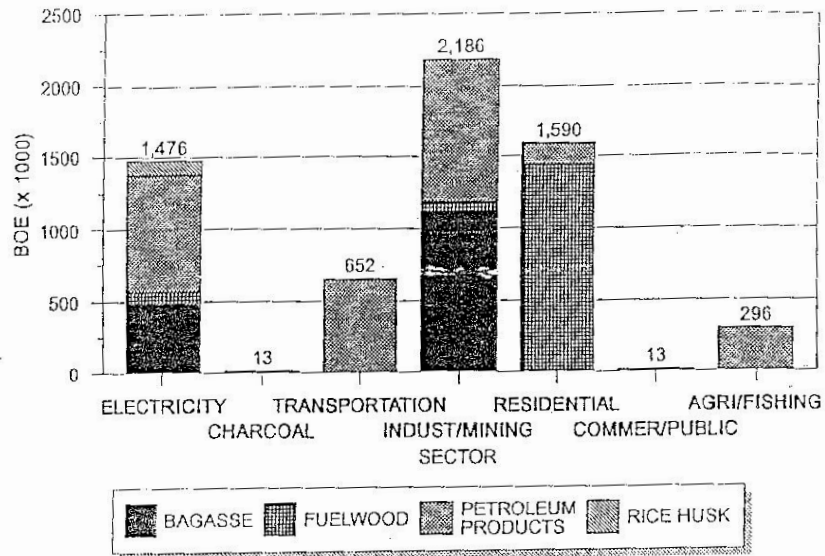


Fig. 4.8
SECTORAL USE OF ENERGY SUPPLY
2004

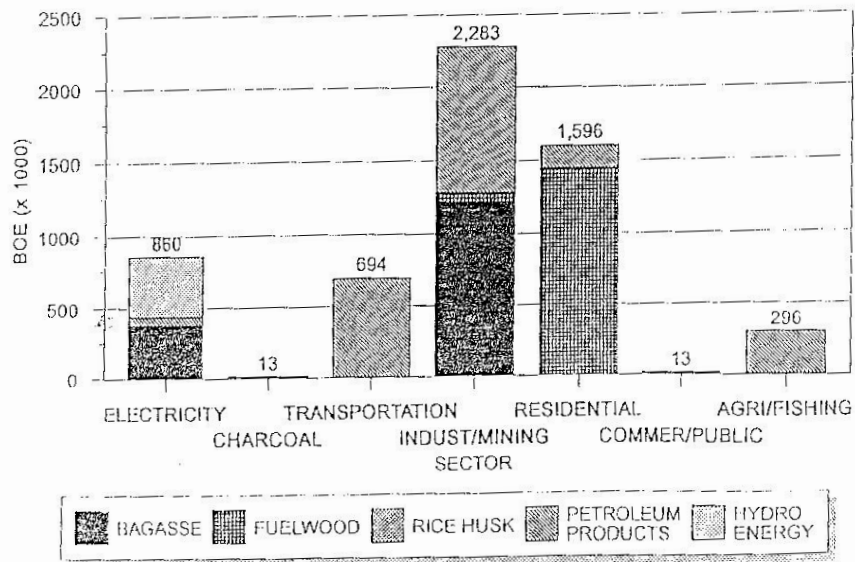
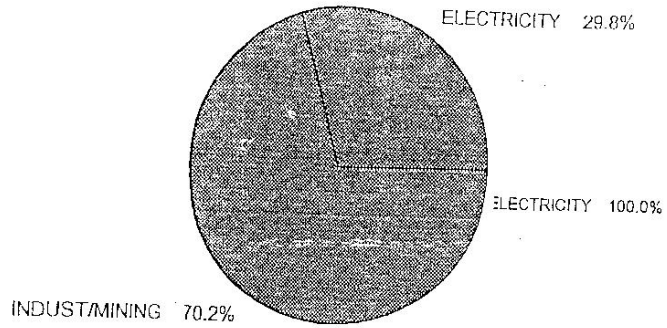
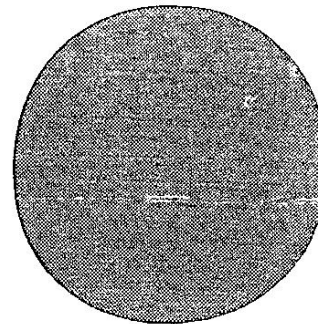


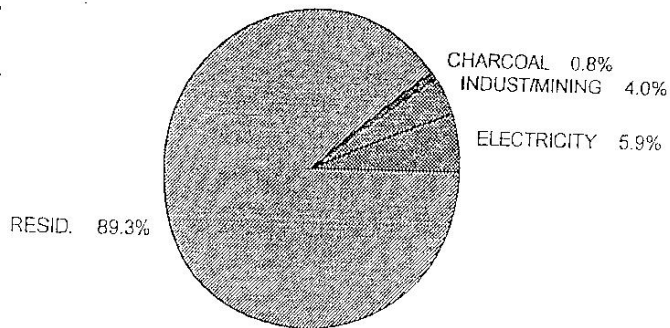
Fig 4.9
ENERGY SUPPLY AND SECTORAL USE
1998



BAGASSE

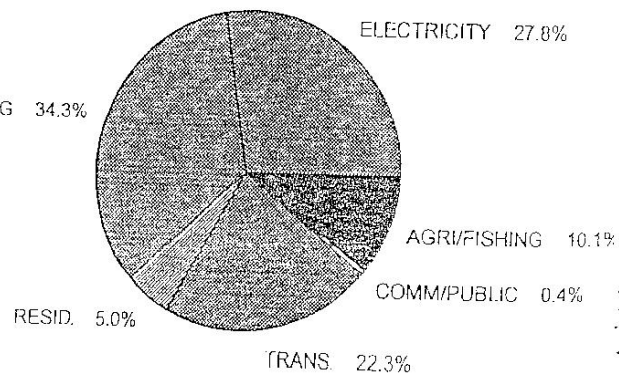


RICE HUSK



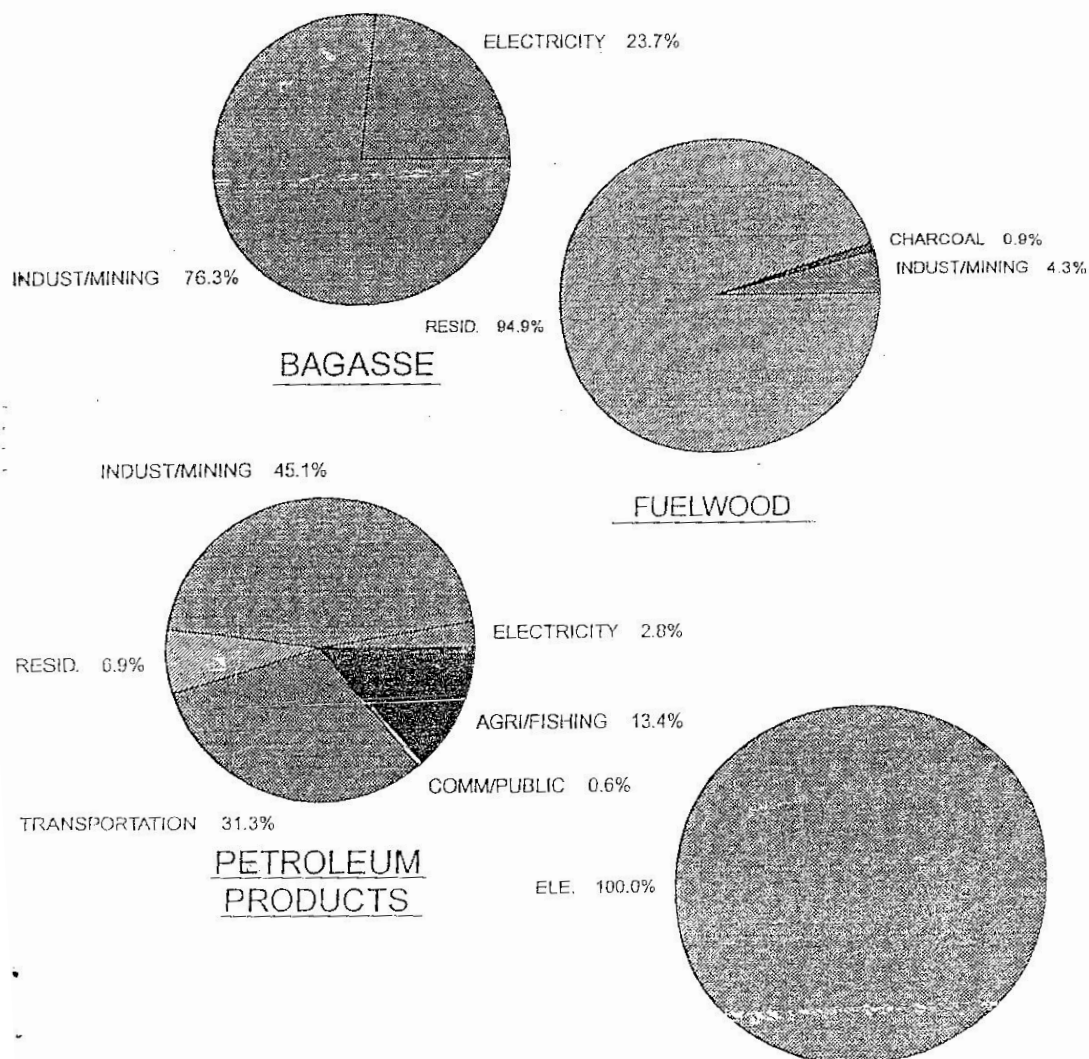
FUELWOOD

DUST/MINING 34.3%



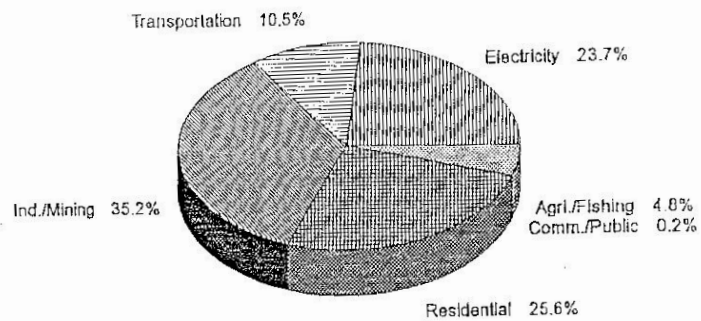
PETROLEUM
PRODUCTS

Fig. 4.10
ENERGY SUPPLY AND SECTORAL USE
2004



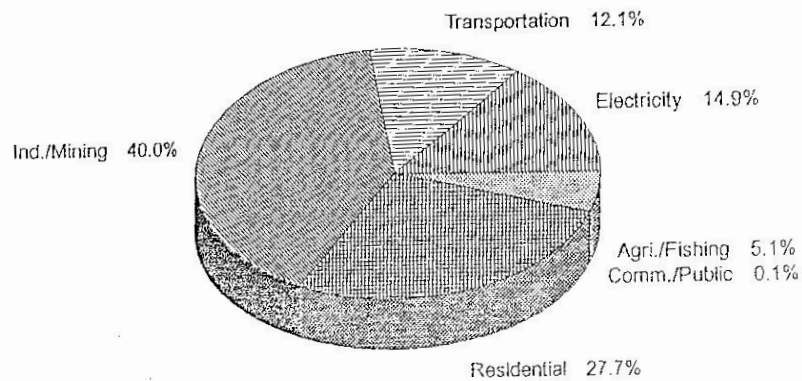
N.B. RESID. = RESIDENTIAL.
ELE. = ELECTRICITY.

Fig. 4.11
SECTORAL USE OF PETROLEUM PRODUCTS (PROJECTED)
1998



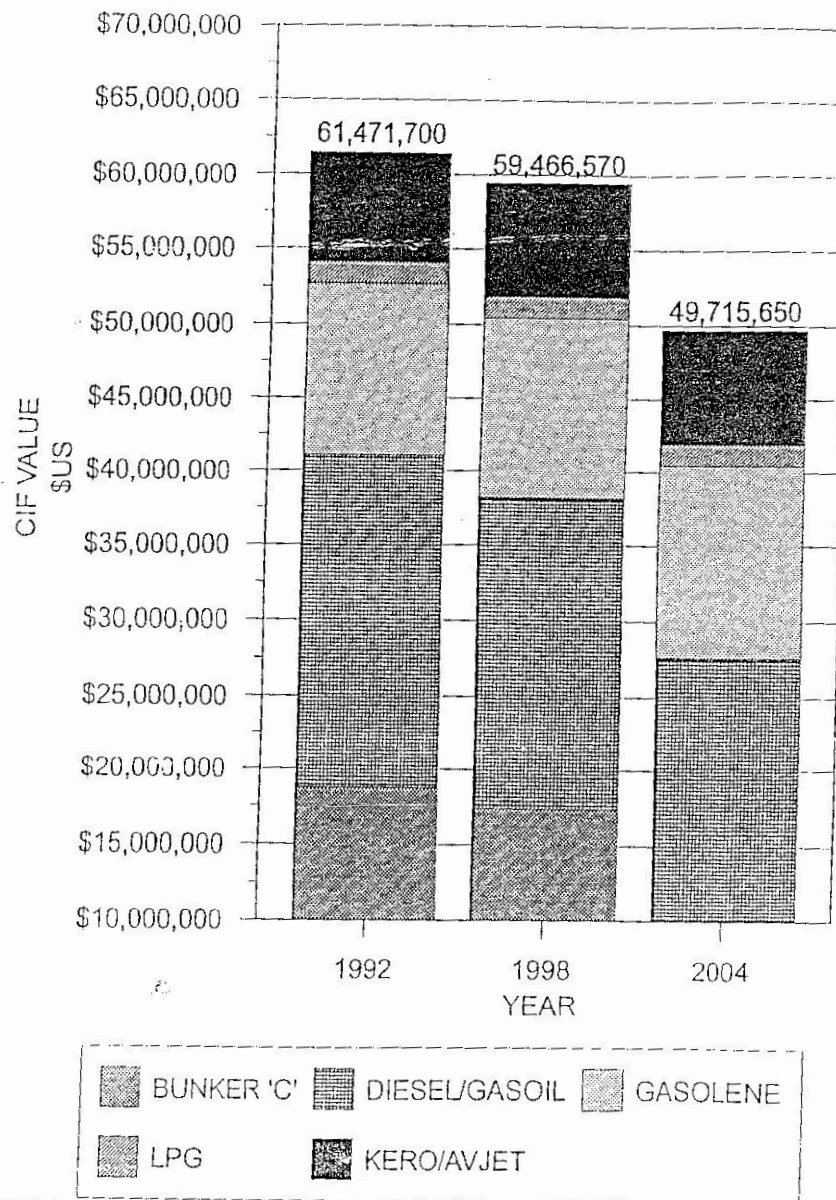
N.B. - Based on price

Fig. 4.12
SECTORAL USE OF PETROLEUM PRODUCTS (PROJECTED)
2004



N.B. - Based on price

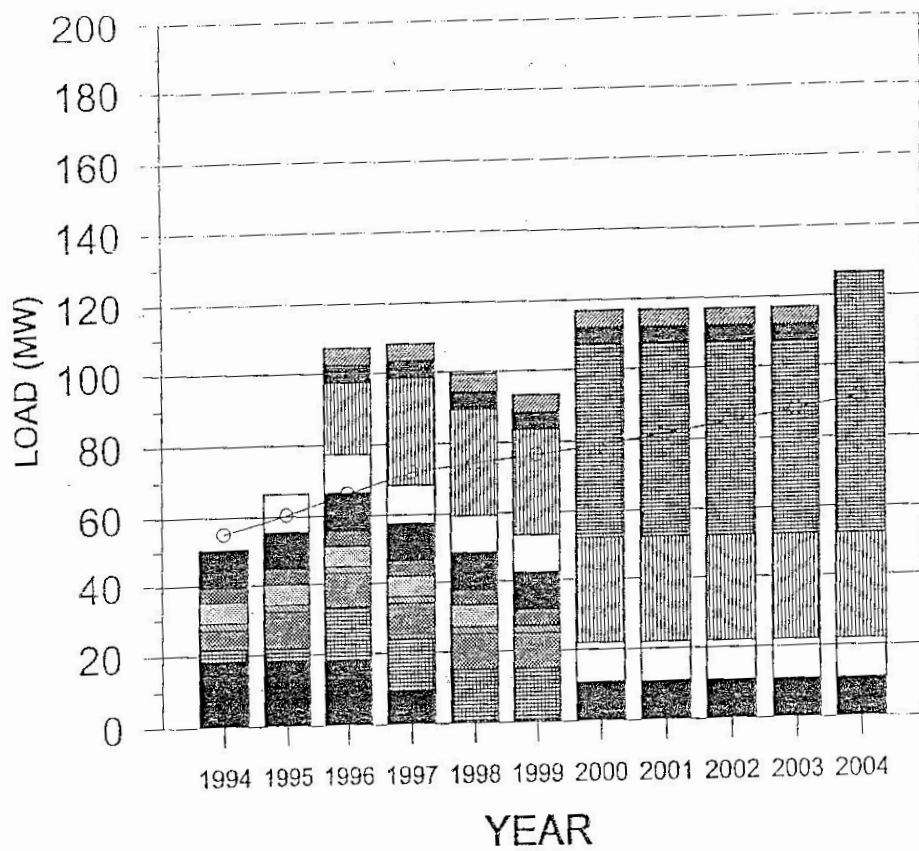
Fig. 4.13
CIF VALUE OF MAJOR TYPES OF IMPORTED PETROLEUM PRODUCTS
1992, 1998, 2004



Values for 1998 and 2004 based on 1992 prices.

Fig. 4.14

GEC - BERBICE/DEMERARA INTER-CONNECTED SYSTEM
GENERATION BALANCE
WITH ADDITIONAL GENERATION 1994-2004



K/STON	GOE	CAN	ONV	BARGE	VERS.	WARTSILA	GT'S
LOAD	PURCHASED POWER	BAGASSE	DIESEL	HYDRO	WOODWASTE	RICE HUSK	
-O-							

! Wood Waste-5MW(1996);Wartsila-11MW(1994);Pur. Power-11MW(1995)
Bagasse -20 MW (1996);Bagasse -10 MW(1997);Rice Husk-5MW(1996)
*55 MW Hydro in 2000;20 MW Hydro in 2004

APPENDIX 1

APPENDIX 1

LIST OF MEMBERS OF ENERGY POLICY COMMITTEE

ROSHANDEEN HABIBULLAH (Chairman)	-	Director Institute of Applied Science and Technology
DOORGA PERSAUD (Secretary)	-	Head (Ag.) Natural Resources Planning Unit Guyana Natural Resources Agency
JOSEPH O'LALL	-	Executive Chairman Guyana Natural Resources Agency
BRIAN SUCRE	-	Commissioner Guyana Geology and Mines Commission
MARK BENDER	-	Chief Executive Officer Guyana National Energy Authority
MAURICE VEECOCK	-	Director Hydropower Unit Guyana Natural Resources Agency
RAYMOND DUNDEE	-	Specialist Engineer Hydropower Unit Guyana Natural Resources Agency
RABINDRANAATH SINGH	-	Divisional Manager Corporate Planning and Projects Guyana Electricity Corporation
NEERMAL REKHA	-	Economist 111 Guyana National Energy Authority