PART III DETAILED DISCUSSIONS

Chapter 3 Economic Development & Future Prospect

(1) Trends of Macro Economy

Mauritius achieved considerable economic development in the 1980s. The country rapidly moved from a mono-crop economy and low per-capita income, as a result of drastic changes in the economic structure which permitted diversification of the economic base of the country and development of sectors like EPZ, tourism and financial services. Table 3.1 shows growth rate of Mauritius GDP.

Table 3.1 GROWTH RATE OF GDP

	1976-80	1981-85	1986-90	1991-95	1996 Esti.
P	0.9	4.4	6.7	5.6	5.8
Agriculture	-0.9	8.0	1.0	-0.4	4.3
of which Sugar	-12.0	8.9	-0.4	-3.6	9.0
Mining	-	-	5.3	6.9	6.0
Manufacturing	2.7	8.3	8.8	5.4	6.3
of which Sugar	-12.0	7.7	-0.4	-3.3	9.0
EPZ	14.7	16.3	11.6	5.3	7.0
Elec. Gas & Water	8.5	9.9	5.6	7.9	7.5
Construction	-1.0	1.7	12.0	4.7	4.0
Transport and Communication	4.4	4.3	8.3	7.7	6.7
Wholesale, Retail & Trade	3.8	3.1	11.1	6.9	7.9
of which Rt.Hotels	6.7	7.2	13.3	5.9	16.0
Gov. Services	3.4	1.6	2.7	4.3	3.5
Other Services	6.3	4.2	6.4	8.6	4.5
GDP Deflator	14.3	7.4	10.8	6.7	6.3
CPI	18.6	9.1	7.5	7.1	7.0

Sources : Mauritius Central Statistical Office ; Ministry of Economic Planning & Development

Per-capita GDP in Mauritius reached US$ 3000 in 1995. This figure is higher than the $300 for Madagascar, $700 for the Philippines, $1000 for Indonesia, and $2000 for Thailand. On the other hand, Mauritius must overcome three considerable constraints in its development process. The first constraint is the shortage of domestic savings for necessary investments. Future economic growth mainly depends on productivity promoted through capital-intensive investment. The country will need large-scale

investment in every economic field, but this will increase pressure on money markets and jeopardize the balance of payments. The second constraint confronting Mauritius is human resources development in either quality or number of labor force. The third constraint facing Mauritius is institutional rigidity. In the former development process, the nation's institutional framework functioned well, and contributed to social stability, but some surely impede future developments.

Now Mauritius is expected to integrate itself within the international economy and follow the trend of deregulation.

(2) Financial Market Situation

Mauritius has a well-developed banking system. The Bank of Mauritius, the central bank has speeded up the liberalization of exchange control and interest rate, and has embarked on a phased program of monetary policy reforms since July 1991. Interest rate is reflecting demand-supply relations of the money market. In autumn 1994 it jumped sharply, but it has decreased since January 1995 up to now. The level of interest rate is about two times higher than UK or France. Main reason is higher inflation and strong demand of money comparatively. There are two problems of the present monetary management. First, government borrowing still increases competing to private borrowing. Second, net foreign asset is decreasing as a whole.

Chapter 4 Development Process and Current State of the Energy Sector

(1) Energy Supply and Demand Structure

Table 4.1.1 shows the country's energy balance in 1995. From the table, major findings in energy supply and demand conditions in the country are summarized as follows.

a) Total primary energy supply (TPES) in 1995 was 930,000 tons including jet fuel exported, of which locally produced energy accounted for 32% and the remaining 68% represented imported energy sources. The percentage of imported energy has been steadily on the rise during the past decade (1986 - 1995).

b) Among primary energy sources, LPG shows the highest rate of growth. However, it is essentially imported in small quantities and accounted for only 4% of total primary energy supply in 1995, although consumption increased nearly tenfold during the decade. In this meaning, energy sources recording relatively high growth rates with significant quantities are fuel oil that is mainly used for power generation and gasoline consumed by the transportation sector (see Figure 4.1).

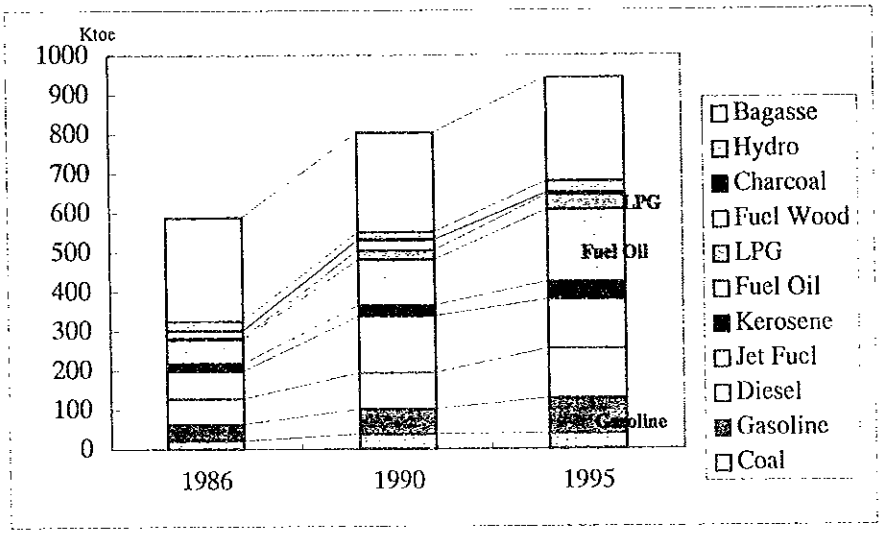
c) New energy initiatives have started in solar heaters which are increasingly used as a source of hot water, but the use of wind and solar energies as community energy supply systems is limited to small-scale, experimental projects. It will take years to come before it has some influence in the nation's energy balance.

d) Domestic energy sources include bagasse, hydropower, charcoal, and fire wood. However, their supply remained almost unchanged during the past decade due.

Table 4.1 1995 MAURITIUS ENERGY BALANCE

(in TOE)

	Coal	Gasoline	Diesel	Jet Fuel	Kerosene	Fuel Oil	LPG	Fuel Wood	Charcoal	Hydro	Bagasse	New Energy	Electricity	Total
Primary Energy Supply														
Domestic Production								4,940	962	29,568	262,370			297,840
Import	39,113	90,675	121,510	125,041	44,639	175,436	36,396							632,810
Total Primary Energy Supply	39,113	90,675	121,510	125,041	44,639	175,436	36,396	4,940	962	29,568	262,370			930,650
Export				- 125,041										- 125,041
Stock Change														
Domestic Primary Energy Supply	39,113	90,675	121,510	-	44,639	175,436	36,396	4,940	962	29,568	262,370			805,609
Energy Conversion & Own use														
Electricity Generation	- 18,779		- 2,625		- 33,625	- 137,171				- 10,752	- 47,689		76,987	- 173,654
Own use & Losses										- 18,816			- 983	- 19,799
Final Energy Consumption	20,334	90,675	118,885	-	11,014	38,266	36,396	4,940	962	-	214,681		76,004	612,157
Industry Sector	20,334		17,428			38,266	2,754	1,482			214,681		28,005	322,950
Transport Sector		90,675	101,458											192,133
Commercial Sector							3,402		592				19,550	23,544
Residential Sector					11,014		30,240	3,458	370				28,448	73,530



Source: CSO

Figure 4.1 GROWTH OF PRIMARY ENERGY CONSUMPTION

e) The electricity sector is only one major sector responsible for energy conversion. As of 1995, 76.7% of energy input by the sector were imported energy sources. Domestic energy sources are hydropower and bagasse, however, consensus is building up that hydropower development is considered to be socially and economically infeasible. Thus, the more effective use of bagasse is only one area where domestic energy input can be increased.

f) Total energy consumption in 1995 was 613,000 TOE. The industrial sector including the sugar refinery industry is the largest energy consumer, accounting for 52.8%, followed by transportation (31.4%), household (12.0%), and industry (3.8%).

(2) Existing Electric Power Facilities

The historical trend of electric power demand and supply in Mauritius is summarized in Figure 4.1. Sales of electricity has continuously increased from 318 GWh in 1985, to 895 GWh in 1995. The average growth rate of sales per annum during 1985-1995 was 9.8%.

Sales for domestic sector was accounting for 37% of the total sales, followed by the industrial sector was 34%, the commercial sector was 25%, and the irrigation sector was a

minor user of electricity.

Table 4.2 indicates the historical trend of energy production in the past 10 years in Mauritius. Production of electricity also has continuously increased from 390 GWh in 1985, to 1,046 GWh in 1995. The average growth rate of energy production per annum during 1985-1995 was 9.4%. Thermal has increased from 173 GWh to 787 GWh, and the average growth rate per annum during 10 years was 13.2%. In case of Hydro, it has increased from 114 GWh to 134 GWh, but for the last 10 years, amount of production is different every year due to annual precipitation. Production of Thermal was accounting for 75 % of the total production, followed by Hydro and bagasse were 12-13 % respectively.

Table 4.2 SALES OF ELECTRICITY IN TE PAST 10 YEARS (GWh)

Year	Domestic	Commercial	Industrial	Irrigation	Others	Total
1985	138	73	96	5	6	318
1986	143	82	119	7	6	357
1987	154	92	142	7	6	401
1988	167	102	162	11	7	449
1989	180	109	184	7	7	487
1990	199	126	213	14	7	559
1991	220	149	232	14	9	624
1992	249	168	245	16	10	688
1993	274	185	258	15	11	743
1994	296	207	277	18	12	810
1995	334	230	308	17	6	895
1996	Forecasted					1008

Source : CEB annual report

Table 4.3 ELECTRICITY PRODUCTION IN THE PAST 10 YEARS (GWh)

Year	Thermal	Hydro	Other	Total
1985	173	114	103	390
1986	213	109	115	437
1987	243	139	104	486
1988	339	98	106	543
1989	310	147	125	582
1990	484	84	97	665
1991	538	74	124	736
1992	567	112	129	808
1993	654	102	111	867
1994	746	75	122	943
1995	787	134	125	1,046
1996	Forecasted			1,164

Source : CEB annual report

Monthly peak load curves in the past 10 years and typical daily load curves in the past 10 years are shown in Figure 4.3 through 4.4 and maximum power supply in the past 10 years is shown in Table 4.3.

In general, the maximum value of monthly peak load is recorded in November or December (the hottest season) in Mauritius, and also the minimum value of monthly peak load is recorded in June or July (coldest season).

As shown in daily load curves, the daily peak takes place between 18:00 and 20:00. Electricity consumption in this zone is so high due to water heater demand for taking a shower in the household. The electric power consumption in the day time is supposed to be raised by industrial or commercial sector demand, the load difference between the day-time and evening time might be lightened relatively.

Table 4.4 indicates installed capacity in the past 10 years and Table 4.5 shows the capacity of each station as of end 1995 in Mauritius. The installed capacity has continuously increased from 249 MW in 1985, to 393 MW in 1996. The average growth rate per annum during 10 years was 4.0 %.

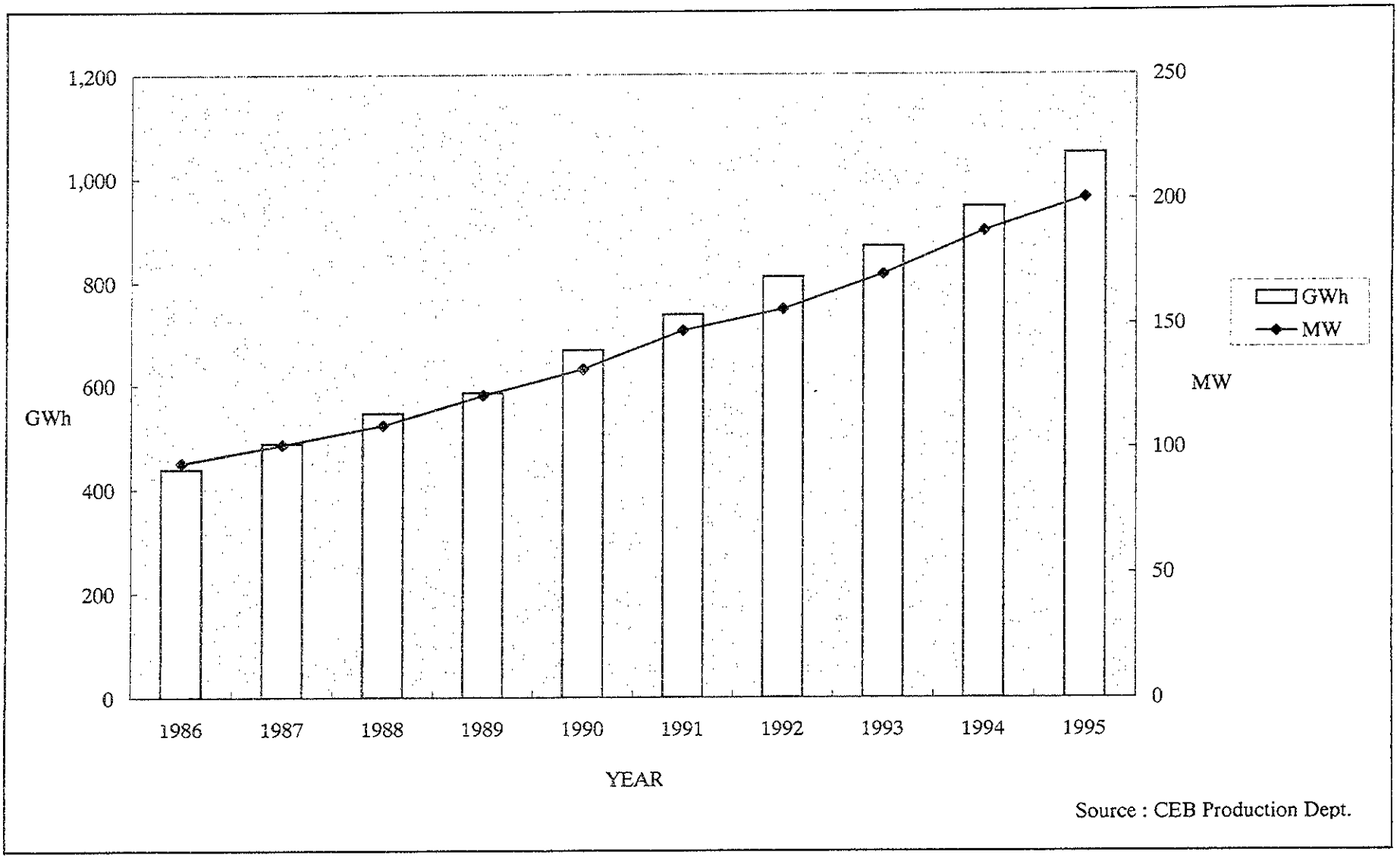


Figure 4.2 ELECTRICITY CONSUMPTION

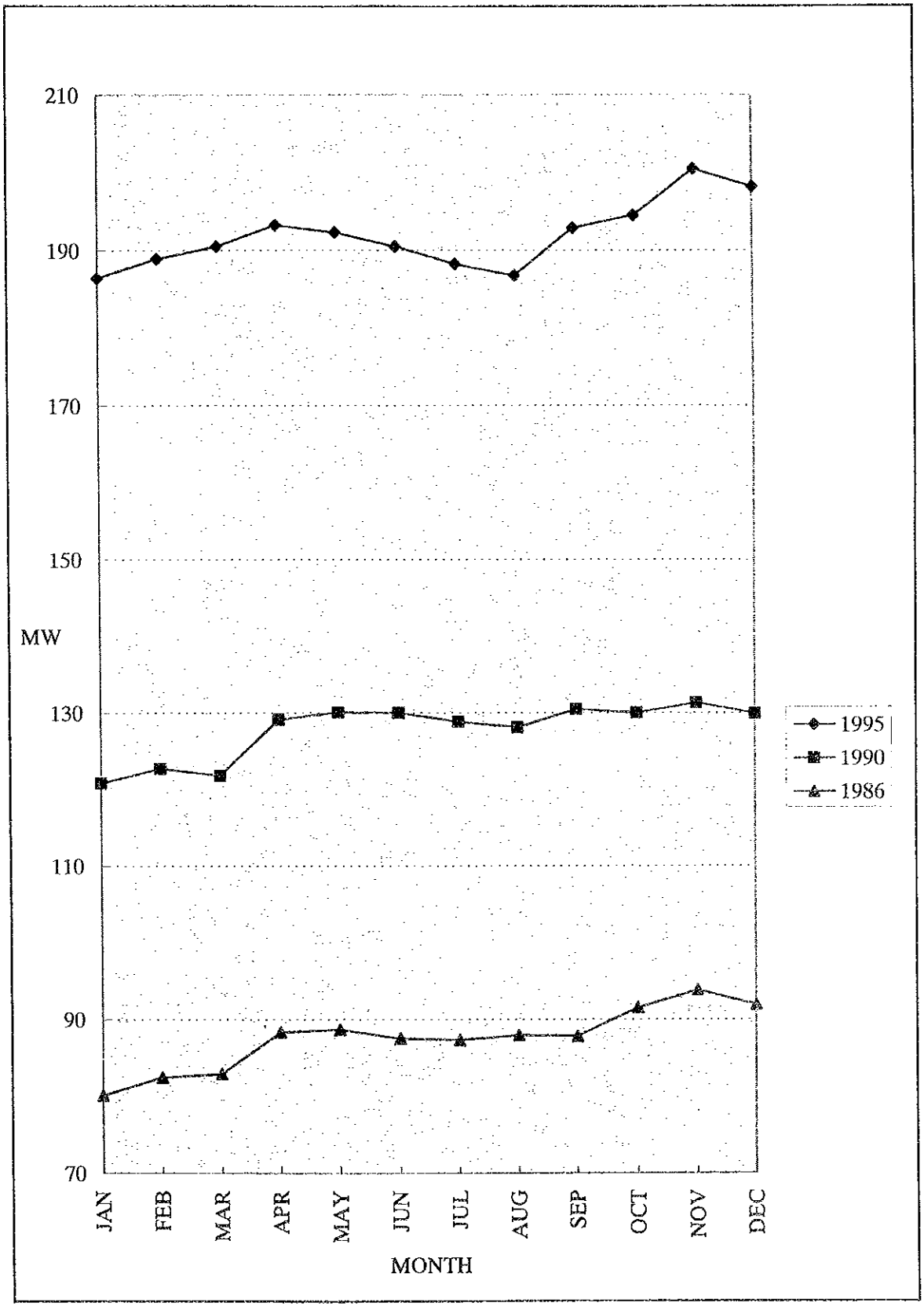


Figure 4.3 MONTHLY PEAK LOAD CURVE

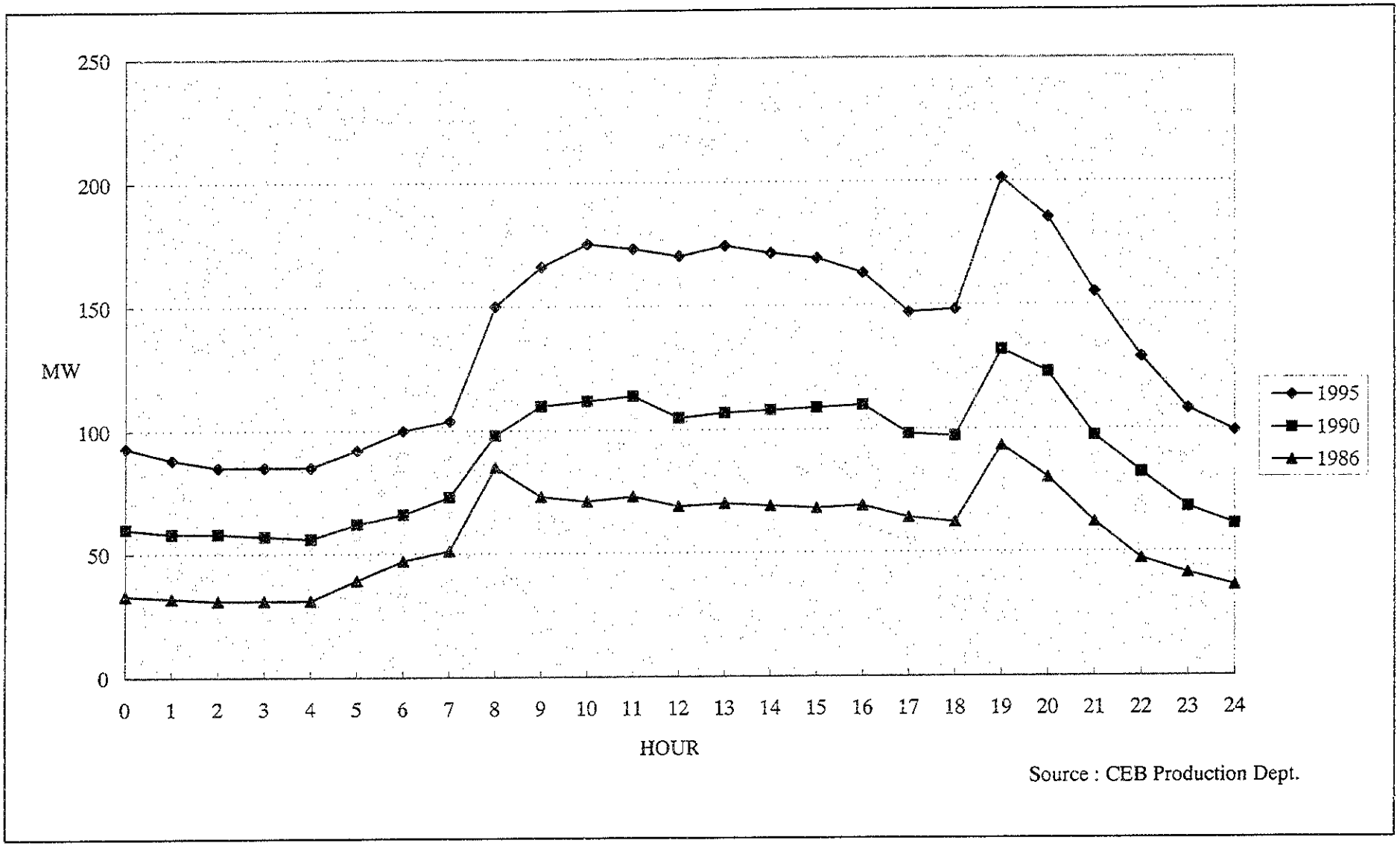


Figure 4.4 DAILY LOAD CURVE

Table 4.4 INSTALLED CAPACITY IN THE PAST 10 YEARS (MW)

Year	Thermal	Hydro	Other	Total		
1985	146	54	49	249		
1986	146	54	49	249		
1987	146	54	49	249		
1988	169	59	49	277	Nicolay 1	23MW
1989	189	59	49	297		
1990	189	59	49	297	Nicolay 2	23MW
1991	212	59	49	320		
1992	224	59	49	332	F-G 1	24MW
1993	227	59	53	339	F-G 2	24MW
1994	227	59	53	339		
1995	253	59	52	364	Nicolay 3	34MW
1996	282	59	52	393	F-G 3	29MW

Source : CEB annual report

Around 10 years ago, growth rate of power demand was not so high in comparison with these days, but from now on, construction of new power station will be necessary every year according to a sharp increase of demand. End of 1996 also, 29 MW was commissioned at Fort-George No.3 as scheduled in spite of delayed construction start.

Transmission Facilities and Substation

CEB has adopted 66kV for its transmission lines and consists of nearly 140km. The system load is dominated the west of Mauritius where exist Port - Louis and Curepipe. These area can not cope with present peak load conditions, especially transmission line between St. Louis and Wooton and, in future, Nicolay to Belle Vue will become same conditions.

The Present Condition of Storage Facilities

With increasing stored quantity, the existing petroleum products storage facilities located in the inner part of the port area. That storage tanks for gasoline, kerosene (jet fuel) and LPG shall be relocated to the new area and others shall be modernized by applying latest international design standards.

CEB has own facilities for electric power generation fuels except kerosene for gas turbine generator and distributes to each power station by pipeline. Kerosene is supplied by oil companies utilizing lorry truck. Storage of power generation fuel shall be applied same standard as CEB and born by power generation company.

Table 4.5 CAPACITY OF EACH STATION AS OF END 1996 (MW)

Plant	Capacity (MW)		
	Name plate	Nominal	Effecient
Hydro CEB			
Champagne	30	28	
Ferney	10	10	
Tamarind Falls	11.1	8	
Le Val	4	4	
Reduit	1.2	1.2	
Cascade Cecile	1	1	
Magenda	0.94	0.8	
La Ferme	1.2	1.2	
Total Hydro	59.44	54.2	10
Thermal CEB			
St.Louis	72	60	60
Fort-Victoria	54	47.6	46
Nicolay	80	80	80
Fort-Grorge	77	77	77
Total Thermal	253	234.6	263
Total CEB	312.44	288.8	273
Hydro Purchases			
Riche En Eau	0.2	0.2	0.2
Bois Cheri	0.1	0.1	0.1
Total Hydro Purchase	0.3	0.3	0.3
Thermal Purchases			
F.U.E.L.	21.7	18	12
Savannah	1.3	1.2	
Medine	10	8	
Belle Vue	0.8	0.8	
Constance	1	1	
Britannia	0.6	0.5	
Beau Champ	1.25	1.1	
Mon Desert Alma	1.4	1.4	
Mon Loisir	1.1	1.1	
Beau Plan	0.4	0.4	
Riche en Eau	5	2.5	
Union St.Aubin	2.3	1.8	
Mon Tresor Mon Desert	5	5	
Total Thermal Purchase	51.85	42.8	12
Total Purchase	52.15	43.1	12
Grand Total	394.59	361.9	285

Note

1:Source CEB annual report

2:Efficientcapacity is a firm capacity without scheduled outage

Potential of Development of New Energy

Mauritius has rich sunshine and its location is ideal for solar energy utilization. The following is a rough estimate of the potential of solar energy:

It is generally estimated that the usable solar energy is 1 kW/m^2 on the earth's surface. From the record of sunshine hours the annual mean daily sunshine time is 6.7 hours. With a conversion efficiency of 10%, the daily mean power generation is 0.67 kWh/m^2, and annual mean power generation is 245 kWh/m^2. From the view point of calorific value, annual mean value is 2.1 x 10^5 $kcal/m^2$. With a total national land area of 1,950 km^2, the potential over the entire country is 477.8 billion kWh. With 10% of this assumed available for use, 47.8 billion kWh is, therefore, available.

With the presence of the southeastern trade wind, Mauritius is ideally located for wind power generation. At present, there is no project related to wind energy power generation, but Bel Ombre, Gris Gris, Grand Port and Saint Antoine are viewed as highly possible locations.

As energy resources other than the above, in view of the ocean surrounding this island nation, various types of ocean energy sources are possible. Of these, wave energy deserves the greatest attention due to the feasibility it affords.

Considering the utilization of biomas excluding Bagasse and Wood, investigation on the production of biogas from animal wastes, such as cow dung, chicken droppings and pig manure, were started in 1975.

Waste power generation is another possible energy resource. At present, approximately 500 tons of waste are disposed daily in Mauritius. In the future, with the development of industry, the rising of the nation's living level and the expansion of the tourist industry as the basic industry of Mauritius, a great increase in the volume of waste is expected.

Chapter 5 Bagasse Energy Utilization

(1) Present Status of Bagasse Energy Utilization

One of the problem of energy sectors of Mauritius is the highly dependence on the imported energy resources. Current international energy market including petroleum market is considered as supply surplus and its price is stayed at low level. Therefore the high dependency on imported energy resources are not causing the drawback to the development of the country. However, when the future prospect of shortage of crude oil supply in the world and its price rise is considered, the highly dependence on imported energy will cause significant impact to the required foreign exchange and the energy cost in the country.

Further, the current international concern on the green house effect gas accumulation in the atmospheric environment place the emphasis on the reduction of fossil fuel consumption.

The development of indigenous renewable fuel can achieve both the reduction of importing fossil fuel and the reduction of green house effect gas generation in the country.

Under these circumstances the utilization of energy of bagasse, which abundantly obtained in Mauritius as the by-product of sugar production, as the renewable indigenous energy is in the lime-light.

In AD 1995 and AD 2005 the consumption of total primary energy consumption in Mauritius are estimated as 556,812 TOE and 786,080 TOE respectively. On the other hand, the production of bagasse in the country is estimated as 1.6 million tons in near future. This amount of bagasse is equivalent to 300,000 TOE as caloric value, but the low efficiency in converting to effective energy the replaceable energy by this amount of bagasse is estimated as around 200,000 TOE/year. In any case, the effective use of this bagasse energy make possible to supply about 25% of the total primary energy requirement of the country in AD 2000. It is considered that the extensive effort for effective utilization of bagasse energy must be continued. It is our understanding that the first phase of BEDP program is to be completed by AD 2000, but the succeeding effort to

improve the efficiency of energy conversion must be made from now on.

In 1995 the electric power exported to the national grid was 125 GWh, which is equivalent to 36,000 TOE energy with the assumption of 30% conversion efficiency.

Currently the commercial electricity production from bagasse in the world is rather limited in the area remote from economic power supply system such as a sugar producing area in Brazil. The condition of Mauritius, where the large scale economic power generation is not possible, and total power demand is small (130 MW average demand) the power production from bagasse is quite feasible. From the early 1980's, the Government of Mauritius obtaining assistance from the international institutions continue the intensive effort to implement Bagasse Energy Development Project (BEDP). The BEDP project has the merit of improving the profitability of the sugar industry, which is very important sector of the country industries, by effective use of bagasse and the part of sugar mill facilities, and therefore the Government is positively supporting the realization of BEDP.

At present, it is expected that the total BEDP power capacity will reach 80 MW in AD 2000.

(2) The Potential Problems Associated with BEDP

As it is described above, the BEDPs are developing steadily, but there are a few potential problems are identified.

a) Coal Utilization by BEDP

The current BEDP project has contract with CEB, which include the supply capacity, operation mode and power purchase price, the purchase price is determining by the CEB's avoided cost by the purchase power from BEDP and at the same time considering that the BEDP can obtain adequate profit from their operation.

The BEDP project must have a minimum economic scale to reduce the kWh cost below the CEB avoided cost. In addition, the financial feasibility of BEDP project is improved by the continuation of power supply during off-cropping season of sugar

cane by utilization of coal as replacement of bagasse. Therefore, the recent BEDP project is directing intensive use of coal to maintain the financial viability of the project.

In another word, the Bagasse cum Coal project is now changed to coal base power plant using bagasse as supplement fuel. Under the current size of power generation system of Mauritius, the size of one unit generator is limited to around 30 - 40 MW because of dynamic stability of the total generation system. This condition is advantageous to the BEDP project, which has limitation on the quantity of available economical bagasse.

However, in the future, when the total demand of generation system increase, a large modern power plant of GTCC & Coal Power, 150 - 200 MW, is introduced to the country, the cost competitivity of highly coal dependent BEDP project will lose cost competitivity with the large plant unless the BEDP technology renovated significantly to improve the energy efficiency.

In order to solve this problem, the continuous effort to improve economic competitivity of BEDP project in future must be made.

There are a few possibility of such improvement. It is our understanding that the future sugar mills of Mauritius will have larger scale, three - four times of present level, and the scale up of BEDP will be economically possible. The adequate integration of sugar mill expansion and scale-up of the BEDP will make possible long term development.

(b) Integration of BEDP and IPP

At present, the Government of Mauritius strongly wishing the participation of private entrepreneur to the power generation sector of the country. The Independent Power Producer (IPP) Scheme is considered as the first step of Electricity Privatization Policy and necessary actions are being proceeded.

Here, we identify a potential problem in relation to the position of BEDP and IPP to

CEB.

The circumstance of BEDP project and that of IPP is identical as the power suppliers to CEB, but only the BEDP has close relation with the sugar manufacturing industry.

It is considered that the long term policy to define the position of BEDP and IPP in the total power generation system of the country must be established urgently. According to that policy, the purchase price of power from individual BEDP and IPP must be determined in the fair and transparent way.

It is very important the introduction of BEDP and IPP must contribute the cost reduction of power generation of the whole country. The clarification of CEB of power generation cost, transmission cost and distribution cost must be proceeded to make possible the assessment of future avoided cost of power generation of whole country which will be the first step of the future privatization of whole the power sector. (Reference: Para 1.2.2, 2.3.3 for Recommendation and future prospect).

Chapter 6 Energy Policy and Institutional Framework

(1) Outline of Energy Policy

In Mauritius, there are only three laws regulating the energy sector, Electricity Act of 1939, Central Electricity Board (CEB) Act of 1964 and Petroleum Act. And as part of the domestic energy resource development plan which has formally been adopted as national policy, Bagasse Energy Development Programme (BEDP) is being implemented. Other new energy resource development initiatives include a existing wind power generation project and a subsidy programme on use of solar heaters. Nevertheless, it is not clear how these individual programmes and projects are linked to the national energy policy. In other words, the country has still to develop a comprehensive and coordinated energy policy.

At present, a government agency responsible for energy policy making, supervision and guidance of the energy industry in the country is the Ministry of Local Government and Public Utilities (MLGPU), which is generally referred to as the Ministry of Energy, an abbreviation of the former name which was changed to the present name in December last year (Note[1]). Even an energy policy administration, a number of agencies, including the Ministry of Industry and Commerce (MIC), the Ministry of Finance (MOF), the Ministry of Agriculture and Natural Resources (MANR) or the Mauritius Sugar Authority (MSA), are assuming some roles in the fields of energy price policy and bagasse utilization program. Clearly, the success of MLGPU's future tasks such as promotion of IPPs in the electricity sector hinges upon coordination with related agencies. In this sense, a major challenge is to develop the environment where MLGPU can secure and maintain the leadership and fulfill required functions it assumes.

Note [1]: The name of government agencies in Mauritius has been frequently changed. In December 1995 when implementation of this study was agreed between the two government, MLGPU was called the Ministry of Energy, Water Resources and Postal Service, which was renamed to the Ministry of Energy and Water Resources in March 1996, then to the present name in December.

(2) The Present Activity and Task of CEB

The overall trend on the balance sheets from 1992 to 1995 is shown in the following Table 6.1.

Table 6.1 CEB BALANCE SHEETS

	1992	1993	1994	1995
Assets				
Current Assets:				
Cash	34,080,025	89,801,104	111,994,046	79,230,813
Stocks	147,970,490	187,349,604	274,902,574	308,005,742
Prepayments	22,780,027	36,176,934	50,237,669	49,552,235
Accounts receivable	280,518,923	306,136,648	350,945,234	376,423,836
Capital works in progress	375,779,896	23,209,606	230,171,919	363,055,922
Investment	0	0	3,500,000	0
Total Current Assets	861,129,361	642,673,896	1,021,751,442	1,176,268,548
Noncurrent Assets:				
Fixed Assets	9,866,411,415	10,643,606,826	10,890,579,793	11,382,996,215
Accumulated Depreciation	(4,708,905,639)	(5,040,223,540)	(5,403,349,369)	(5,762,304,884)
Total Noncurrent Assets	5,157,505,776	5,603,383,286	5,487,230,424	5,620,691,331
Total Assets	6,018,635,137	6,246,057,182	6,508,981,866	6,796,959,879
Liabilities and Shareholders' Equity				
Current Liabilities:				
Accounts payable	92,156,645	177,400,658	207,477,356	153,061,676
Bank Overdrafts	72,833,294	56,285,817	17,900,402	0
Current Portion of Long Term Loans	205,418,559	174,804,512	149,526,098	124,768,746
Total Current Liabilities	370,408,498	408,490,987	374,903,856	277,830,422
Noncurrent Liabilities:				
Long term Loans, Net of current Portion	2,781,135,852	2,808,548,450	3,050,026,860	3,371,471,158
Total Noncurrent Liabilities:	2,781,135,852	2,808,548,450	3,050,026,860	3,371,471,158
Shareholders' Equity				
Common Stock	2,700,311,234	2,740,453,845	2,806,295,816	2,844,889,939
Other reserves	0	670,856,197	670,856,197	670,856,197
Retained Earnings	166,779,563	(382,292,297)	(393,100,863)	(368,087,837)
Total Shareholders' Equity	2,867,090,797	3,029,017,745	3,084,051,150	3,147,658,299
Total L. & E.	6,018,635,147	6,246,057,182	6,508,981,866	6,796,959,879

Total assets have been increasing steadily from 1992 to 1995 because of the solid investment in new power plants. Noncurrent liabilities also have been increasing because of the heavy borrowing on the new plants such as Fort George #2. In 1993, the extraordinary item of about 670 mil. Rs. was declared in Other Reserves. This is the accumulated on Government loans which were written off in the Board's books in 1992, and will be used to issue equity shares to the Government of Mauritius in the event of a change in the legal status and capital structure of CEB. It is also important to note that

the cyclone in 1994 gave a serious damages to the CEB facilities, causing nearly 6.5 mil. Rs. additional cost for the repair.

The overall financial position is flimsy, being influenced by the level of electricity tariff, change in exchange rate, and the natural condition like cyclone. The profitability level is lower than the market interest level, not even covering the inflation rate in the country. The procurement of funding is dependent on the huge amount of borrowings. The sales are not enough to cover the loan payment, the interest payment and the exchange loss. The continuation of this heavy borrowing may be fatal factor for the company.

(3) Energy Pricing Policy

At present, almost all of sales prices of energy products are fixed by the government as official prices. Figure 6.1 shows gasoline, diesel and kerosene price trends in the domestic market. Note that the latest applicable prices quoted on December 21, 1996 are Rs.14.15/litre for gasoline (premium), Rs.7.65 for diesel oil, and Rs.5.65 for kerosene. Major characteristics of the energy pricing system in Mauritius are summarized as follows:

1) Petroleum prices including gasoline are controlled by selling them via STC. Thus, international market prices are not directly reflected in domestic prices.
2) With relatively small domestic demand, the number and amount of imports are limited for all the petroleum products, which CIF prices are inevitably higher than those applied to major consuming countries.
3) As most of petroleum products are sold at official prices, there is virtually no price competition within the domestic market.
4) While energy prices are generally close to international levels, the high tax rate (45%) makes the fuel oil price much higher than international prices (Note[2])(see Figure 6.2). On the other hand, the gasoline price is not as high as the fuel oil price despite the fact that the gasoline tax accounts for 65% of retail price (Figure 6.3).

Note[2] Overall, the tax rate for fuel oil is lowest among petroleum products, while that in OECD countries is around 15% on average

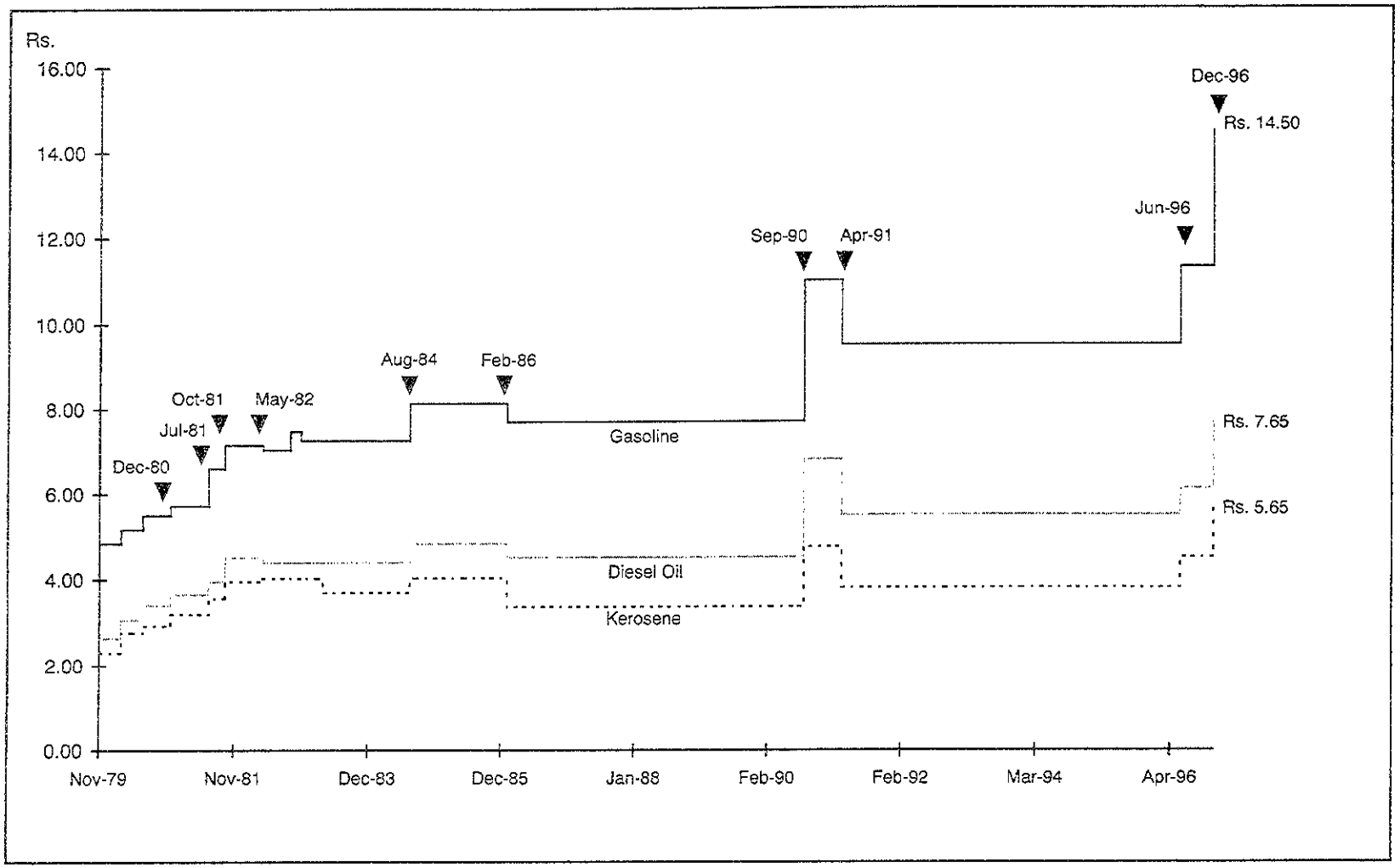


Figure 6.1 TRENDS IN PETROLEUM PRICES (RETAIL PRICES)

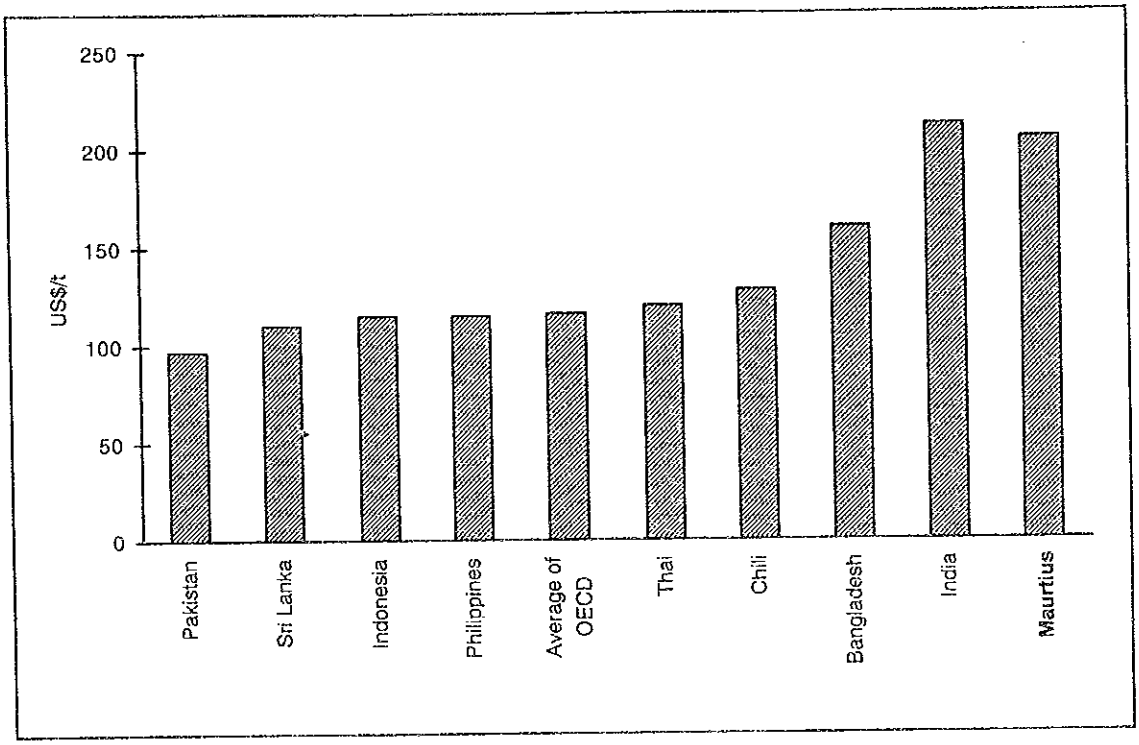


Figure 6.2 PRICE COMPARISON OF FUEL OIL (1989)

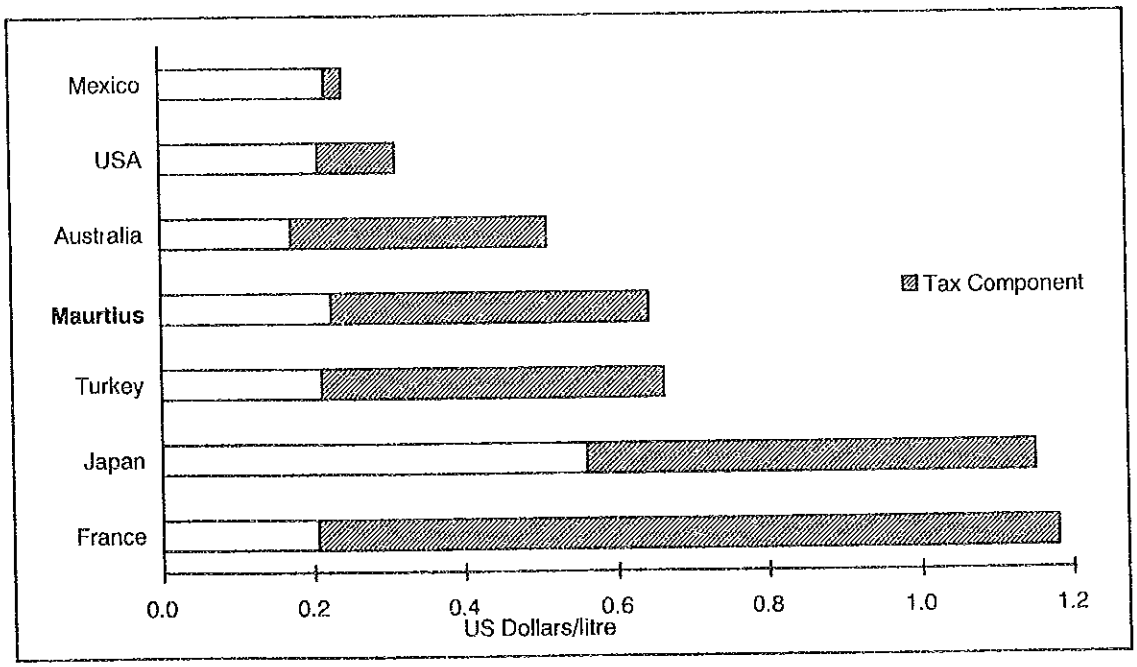


Figure 6.3 GASOLINE PRICES AND TAXES (US DOLLARS/LITER)

THIRD UARTER 1995

Taxation System Related to Energy Items

Tax revenues from petroleum products in Mauritius still account for approximately 10% of the total government revenue. The taxation system covering petroleum products is decided through discussion among the Ministry of Finance, ministries in charge of energy product items, and other related government agencies. Since the modification of the taxation system in June 1996, there are two kinds of taxes imposed on petroleum products, import duty (ad valorem) and sales tax.

Table 6.2 TAX RATE ON PETROLEUM PRODUCTS AND COAL

	Import Duty (ad valorem)	Sales Tax
Gasoline	220% NP 200% P	8%
Diesel Oil	75% NP 55% P	8%
Kerosene	0 0	0
Fuel Oil	75% NP 55% P	8%
LPG	0 0	0
Coal	35% NP 15% P	8%

Note: NP = Non Preferential Tariff
P = Preferential Tariff
Sales Tax = Only for Inland Sales
Source: State Trading Corporation

In summary, petroleum product prices in Mauritius are fixed and maintained by controlling tax rates including import duties and profit margins of STC which solely controls the domestic distribution system. The STC's margin is essentially a difference between the CIF-based price and STC transfer price to domestic retailers, the latter being determined through prior consultation with MTS. As a result, variation of the CIF price produces profit or loss on STC. In reality, profit is more often incurred than loss to create additional cost impacts on domestic users.

Electricity Tariff

Overall electricity tariff level in Mauritius is not reflecting enough financial level to cover the operating costs of CEB. The tariff has been revised only twice during the last decade and the increased rate does not cover the financial costs incurred by CEB.

Major characteristics of electricity tariff are summarized as follows:

Firstly, the price for commercial use is higher than the average, those for industrial and domestic use are below the average. Second, the disparity features can be found in the block rate system: the domestic households are subject to the increasing block rates, while the decreasing rates are used for EPZ consumers. Third, the resulting increased percentage for the revised rate for domestic consumers is higher than those of other consumers, especially of irrigation consumers.

Enhancement of revenue/revision of energy tariff

While the current tariff system is based on the principle of prime cost and has been applied for a long period, some features will have to be re-assessed and reviewed as follows.

- Establishment of clear and transparent procedure for price revision
- Determination of appropriate profit for CEB from a long term viewpoint
- Elimination of discriminatory tariff system among final consumers
- The discriminatory aspect in the electricity tariff system should be eliminated
- Consideration of low income consumers
- Reasonable allocation of costs to pricing system <Demand and running charge for each level and category of consumer>
- Introduction of Time-of-day rate

(4) Present Status of Environmental Management in Mauritius

The Government is proceeding with its program of environment management based on the Environment Protection Act of 1991. In particular, an environmental impact assessment (EIA) is mandatory for all new projects that could influence the environment, as a

condition of obtaining Government approval.

The Government evaluation is conducted on an individual project basis, and therefore sometimes takes a very long time; sometimes, the transparency of the evaluation is also questioned.

When strong complaints are received from residents near an industrial facility, the Government acts as a mediator, attempting to bring both sides to a settlement. Laws and regulations required for better environmental management are being prepared, but systematic measurements of present levels of atmospheric and water pollution have not as yet been conducted.

The environmental provisions for thermal power plants can be divided, among others, into the provisions for air pollution to remove particulate, sulfur oxide (SOx), nitrogen oxide (NOx) from combustion of fossil fuel; those for water pollution to treat and purify waste water from operations of power generating equipment; those for coal ash to process and dispose; those for the attenuation of undesirable noise which is emitted to outside of the power plant; those for the warmed water discharged into the outer seas (river) to reduce the temperature difference between the influent and effluent water as much as possible; and those for the disappearance of greenery to strike a balance between the appearance of the power plant and the environment.

Figure 6.4 shows the provisions for environmental protection in an ordinary thermal power plant.

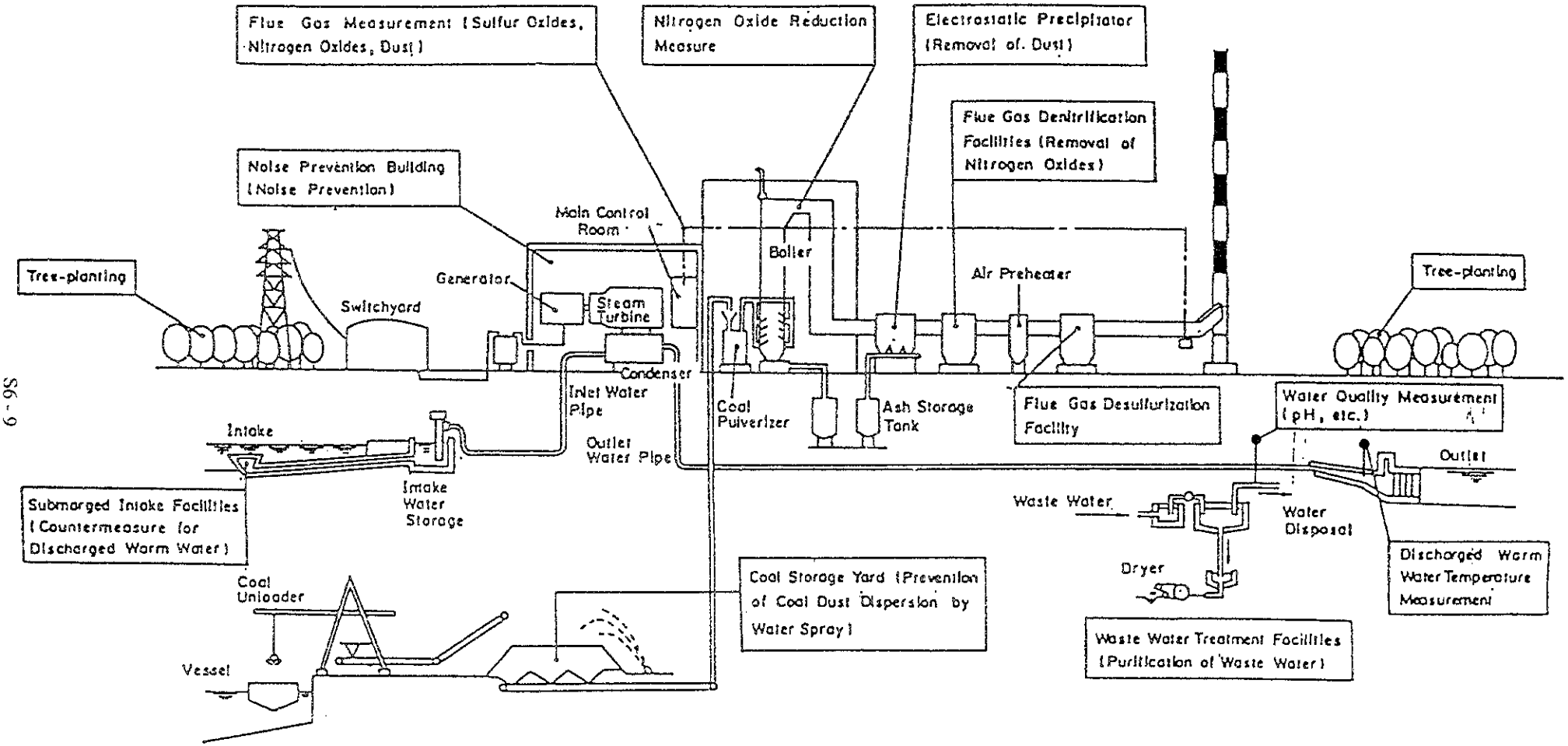


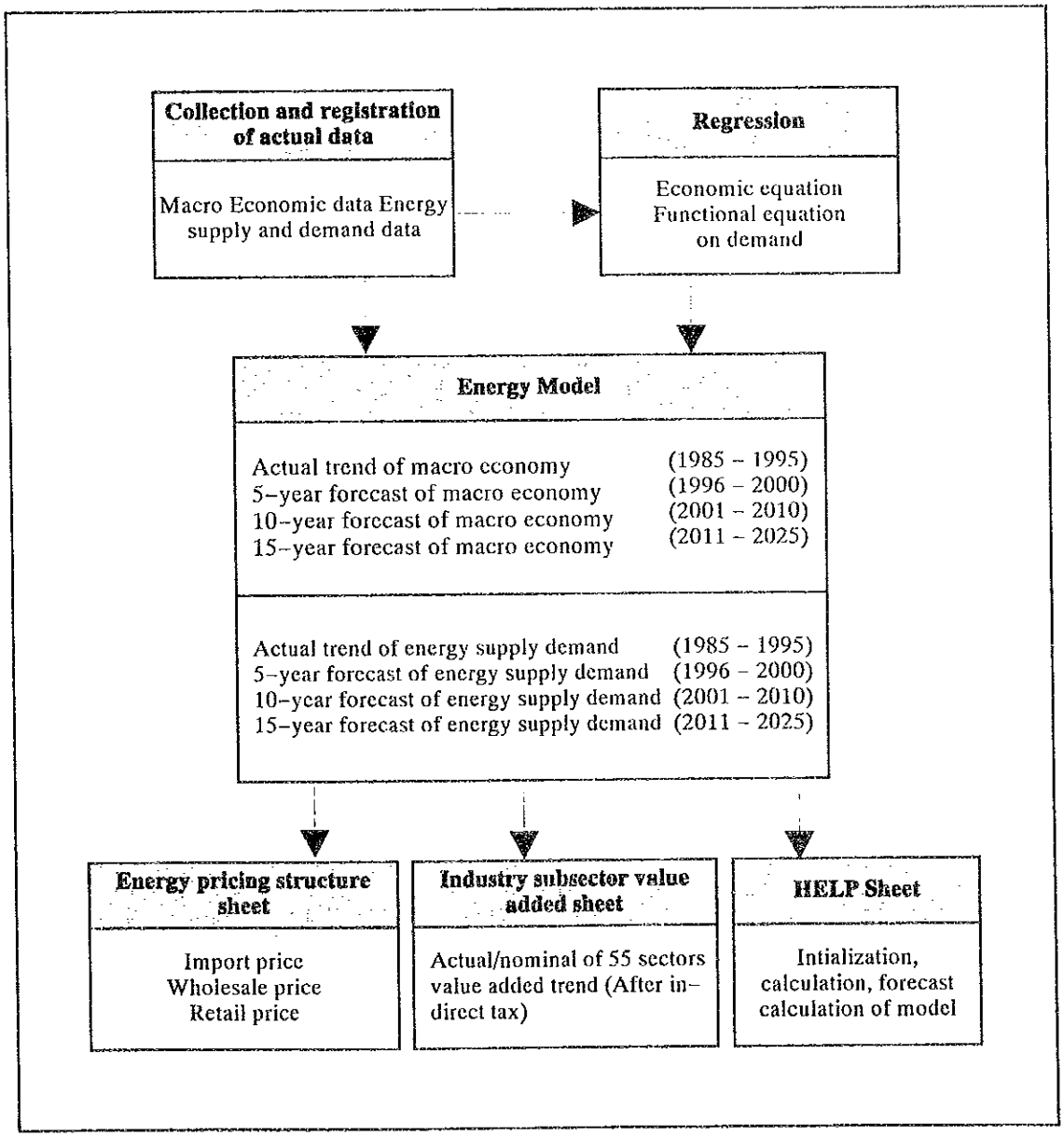
Figure 6.4 ENVIRONMENTAL PROTECTION COUNTERMEASURES FOR THERMAL POWER PLANT

Chapter 7 Energy Demand and Supply Forecast Model

(1) Development of Energy Demand Forecast Model

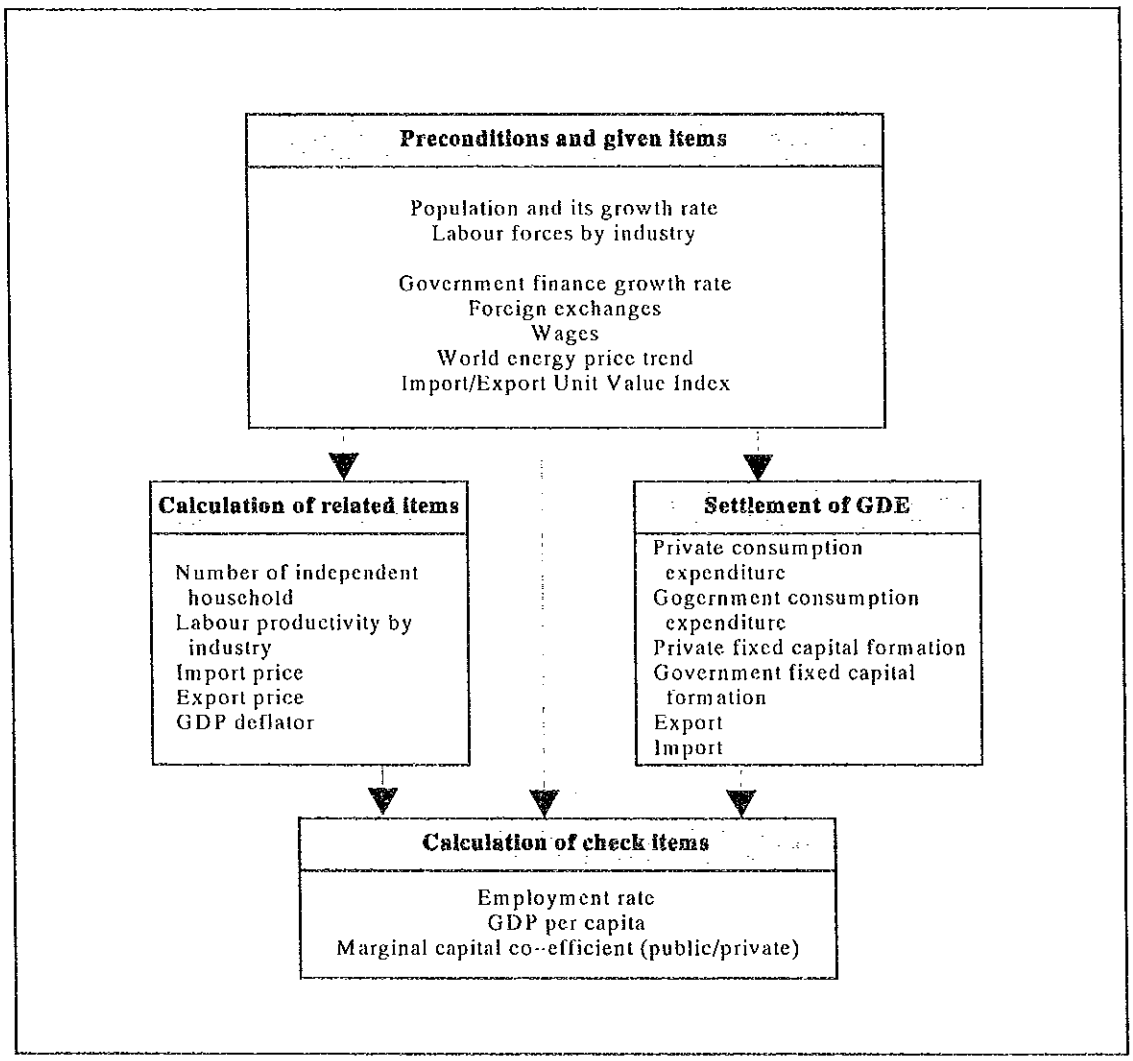
Energy demand forecast model in this project comprises from macro economic forecast portion and from energy demand forecast portion. Overall structure and its each portion are shown in the chart below.

1) Overall flow of model



2) Macro Economic Frame

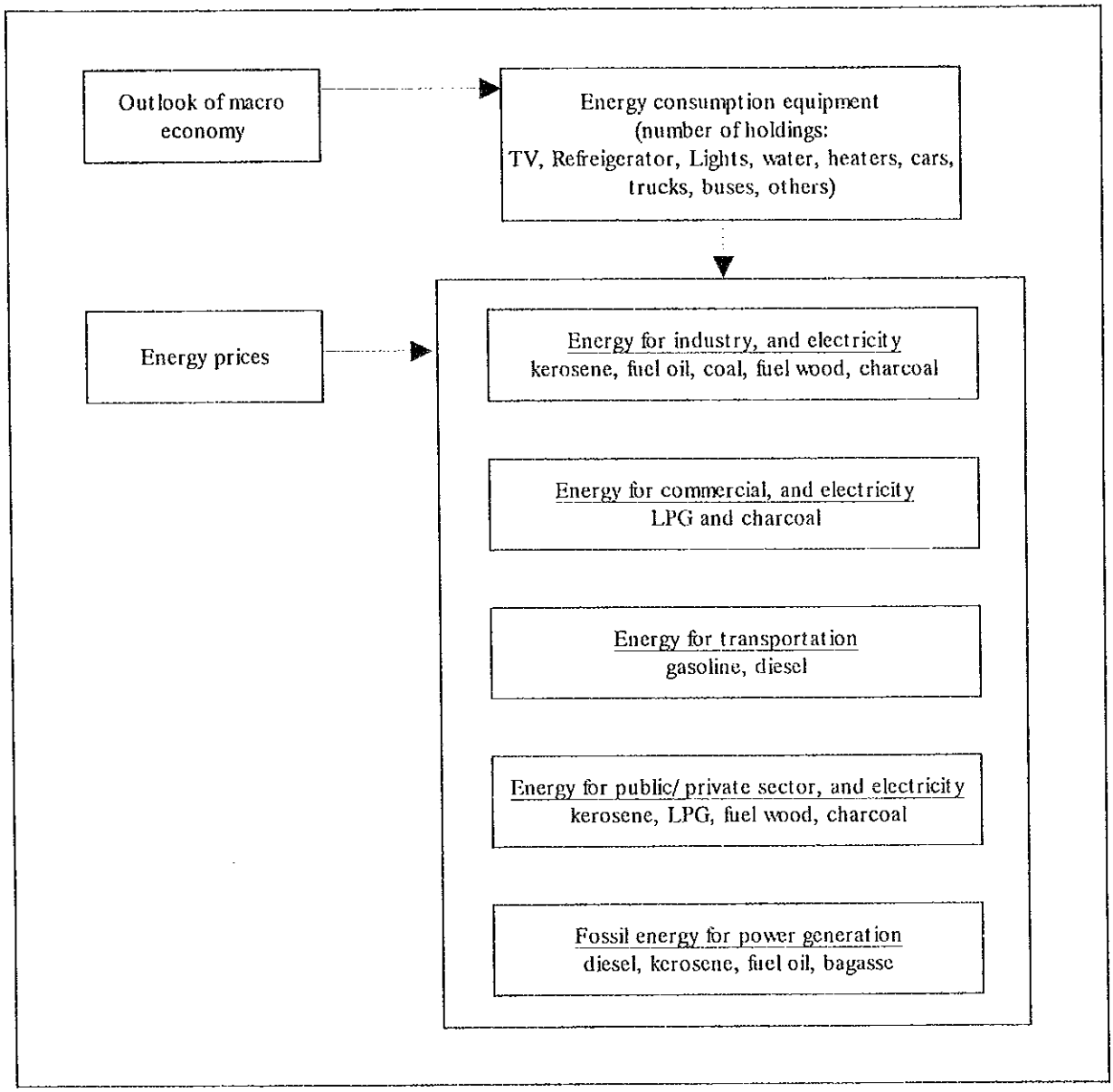
Structure of macro economic frame is shown below. Since final objectives of this model is to forecast on demand of energy, macro economic forecast portion has been kept to a minimum frame for extraction and confirmation of internal/external variables for the use of energy demand forecast.



3) Frame of Energy Demand Forecast

Structure of energy demand forecast frame is shown below. Final objectives in this frame are to calculate demand perspectives of fossil energy (gasoline, diesel, kerosene, fuel oil), bagasse and electricity, however, the structure of this demand forecast is also able to

analyze influences to macro economy and energy policy as well as energy prices.



(2) Main Assumptions for Long-term Energy Demand Forecast

1) Base Case

Economic Assumptions

a) The sugar sector stagnates its development beyond 2000.

b) It takes EPZ's restructuring for two decades up to 2010 and revitalizes again since then.

c) New businesses of free port and offshore banking, and established tourism grow steadily.

d) Actual working hours are extended by 6 hours a weak during 2010 and 2025.

e) Wage increases by 5% a year.

f) Taking into consideration that industrial goods' prices in the developed countries increases 2.2-2.3% a year, inflation in the Republic of South Africa for an indicator of Mauritius import price is 10% a year, by 3% less than past 10 years.

g) Exchange rate of Mauricia rupees and South Africa's Rand is depreciated by 2% a year against US dollar.

h) Budget revenue and expenditure are neutral to the economy, which means that the component ratios of them and its deficit over the GDP do not change.

Energy Assumptions

a) Current crude oil price and coal price in a world market increase 3% and 1.8% respectively until 2010; 4% and 2.4% beyond 2010.

b) Taxes on imported energy sources do not change.

c) Electricity tariff is adjusted by price changes of local fuel and coal.

d) Energy conservation is materialized in industry, transportation and domestic sectors.

e) Current tendency of electricity shift of energy sources continues in each sector.

f) Load factor in the power generation improves to 63.0% since 2006 from 57.0% in 1995. Loss ratio in the generators and power transmission improves to 13.0% since 2010 from 15.4% in 1995.

2) High Case

a) Economic growth will be higher owing to shorter period for EPZ' restructuring, considerable success of free port & offshore services, tourism boom and rapid increase of foreign workers.

b) Inflation in the Republic of South Africa increases by 13% a year due to revived world inflation.

c) Wage increases by 6% a year.

d) Current crude oil price and coal price in a world market increase 2%, 1.2% up to 2010, and increase 3% and 1.8% respectively beyond 2010.
e) Energy conservation is not materialized in each sector.
f) Electricity shift of energy sources is accelerated in each sector excluding transportation.

3) Low Case

a) Economic growth is lower due to fruitless restructuring of EPZ, poor activities of free port & offshore services and slow-down of tourism.
b) Inflation in the Republic of South Africa increases by 7% a year owing to lower world inflation.
c) Wage increases by 4% a year.
d) Actual working hours do not change.
e) Due to a low profitability of oil businesses, crude oil price and coal price in a world market increases 4% and 2.4% a year respectively until 2010; 5% and 3.0% a year beyond 2010.
f) Electricity tariff increases by 30% equivalent of inflation adding to normal adjustment.
g) Energy conservation is accelerated in industry and transportation sectors.

4) Other Cases

Many variations can be conceivable by different assumptions and their combinations. Some simulations were executed at the workshop during the third staying in Mauritius.

(3) Outcomes of Economic and Energy Demand Forecast up to the Year 2025

Table 7.1 shows that expected average growth rates of each economic sector from 1985 to 2025 are depicted according to the three scenarios provided on the previous chapter.

As shown the average annual growth rate of GDP for the last 10 years between 1985 and 1995 was 6.1%. Likewise, the growth rates in forecast for the first 5 years from 1996 to 2000 will be 5.4 %, the next 10 years 5.3 % and the last 15 years 5.1%. The average

growth rate during the entire 30 years is 5.2 %. The second table of Table 7.1 indicates the high growth case, which marks 5.7 % for the 30 years period, and the last table indicating the low growth case at 4.9 % on average.

As depicted on the related chapter on the present situation and future of the macro economy, it would be not easy, however, to make investment, private and public, as much as expected to incur anticipated economic growth toward the next century. The high growth case bases the realization of the high investment anticipated, resulting in high energy consumption, and the low case bases the low level of investment and resulting low energy consumption. Thus, the likelihood of the high case is less than that of the low case. The economic growth rate for the entire period in forecast, the next 30 years, will be around 5 %, as common sense suggests.

Figure 7.1 shows energy demand by type of energy sources on primary energy supply basis, including the energy inputs for electricity generation. The country is now at a period of steady economic growth. As well known, the economic growth corresponds with electrification ratio. The energy inputs for electricity is 40 % in 1995 on the base case, will rise to over 60 % in the year 2025. The high growth case, on the contrary, marks 63 % in 2025, less than that of the base case, perhaps because the manufacturing sector requires more non-electricity energy as economy marks higher growth. The low case makes the inputs for electricity relatively higher since the economy, that is, the manufacturing sector, is not growing as anticipated.

After the year 2010 to the year 2025, a number of the coal fired electricity generations will be introduced on the plan(please refer to the related chapter), the coal demand during the corresponding period will increase significantly, simultaneously reduce the fuel oil and kerosene demand for electricity generation.

Table 7.2 describes the energy demand forecast by sector. The present demand for the base case is 0.4 million TOE, will change to 0.5 million TOE in 2000, 0.9 million TOE in 2010, and 2 million TOE in the year 2025 eventually. On the other hand, the high case records 2.8 million TOE and the low case 1.7 million TOE in 2025. The per capita energy consumption is 0.4 TOE in 1995, will rise to 0.5 TOE in 2000, 0.9 TOE in 2010

and 2.1 TOE in 2025 for the base case. The energy consumption will increase as income rises, no doubt. The high case marks 2.8 TOE and the low case 1.7 TOE in 2025.

Table 7.3 indicates so called the income elasticity of energy by sector, manufacturing, commercial, transport and household. At the base case, that of manufacturing sector changes from 1.5 to 1.2, that of the commercial sector unchanged at the level of 1.5, that of the transport changes from 1.2 to 0.6, and that of the household from 0.7 to 0.8. As a whole, that of the electricity in total shifts from 1.8 to 1.2, that of the energy from 1.3 to 1.1. The similar trend can be observed for the high and low cases as well.

Table 7.1 GDP GROWTH RATE BY SECTOR (Base Case)

(%)

GDP at Constant Price (1990)	1995/1985	2000/1995	2010/2000	2025/2010	2025/1995
Agriculture, Hunting, Forestry, Mining, and Quarrying	-0.1	4.0	4.0	4.0	4.0
Manufacturing	8.1	5.2	5.5	7.8	6.6
Sugar	-1.7	4.0	0.0	0.0	0.7
EPZ	10.4	5.0	5.5	8.0	6.7
Domestic Manufacturing	8.1	5.5	6.0	8.0	6.9
Electricity, Gas, and Water	6.7	8.0	8.0	8.0	8.0
Construction	9.0	5.0	5.0	5.0	5.0
Wholesale, Retail, Restaurants, and Hotels	8.5	6.5	6.0	5.0	5.6
Transportation, Storage, and Communication	7.6	6.5	6.5	6.0	6.2
Banking, Insurance, Real Estate, Business service	7.0	6.5	6.5	6.0	6.2
Other service	7.7	5.0	5.0	5.0	5.0
Imputed Bank Service Charge	0.0	11.0	12.0	12.0	11.8
GDP at Factor cost	6.5	5.4	5.3	5.2	5.3
Net Indirect Taxes	3.7	5.0	5.0	5.0	5.0
GDP at constant (1990)	6.1	5.4	5.3	5.1	5.2

GDP GROWTH RATE BY SECTOR (High Case)

(%)

GDP at Constant Price (1990)	1995/1985	2000/1995	2010/2000	2025/2010	2025/1995
Agriculture, Hunting, Forestry, Mining, and Quarrying	-0.1	4.0	4.0	4.0	4.0
Manufacturing	8.1	5.2	8.9	8.1	7.9
Sugar	-1.7	4.0	0.0	0.0	0.7
EPZ	10.4	5.0	9.4	8.3	8.1
Domestic Manufacturing	8.1	5.5	9.1	8.2	8.0
Electricity, Gas, and Water	6.7	8.0	8.5	8.5	8.4
Construction	9.0	5.0	6.3	6.3	6.1
Wholesale, Retail, Restaurants, and Hotels	8.5	6.5	6.0	5.0	5.6
Transportation, Storage, and Communication	7.6	6.5	6.5	6.0	6.2
Banking, Insurance, Real Estate, Business service	7.0	6.5	6.5	6.0	6.2
Other service	7.7	5.4	5.0	5.0	5.1
Imputed Bank Service Charge	0.0	11.	12.0	12	11.8
GDP at Factor cost	6.5	5.5	6.3	5.7	5.8
Net Indirect Taxes	3.7	5.0	5.0	5.0	5.0
GDP at constant (1990)	6.1	5.4	6.1	5.6	5.7

GDP GROWTH RATE BY SECTOR (Low Case)

GDP at Constant Price (1990)	1995/1985	2000/1995	2010/2000	2025/2010	2025/1995
Agriculture, Hunting, Forestry, Mining, and Quarrying	-0.1	4.0	4.0	4.0	4.0
Manufacturing	8.1	5.2	4.2	6.5	5.5
Sugar	-1.7	4.0	0.0	0.0	0.7
EPZ	10.4	5.0	4.2	6.7	5.6
Domestic Manufacturing	8.1	5.5	4.6	6.6	5.7
Electricity, Gas, and Water	6.7	8.0	7.5	7.5	7.6
Construction	9.0	5.0	3.6	3.6	3.8
Wholesale, Retail, Restaurants, and Hotels	8.5	6.5	6.0	5.0	5.6
Transportation, Storage, and Communication	7.6	6.5	6.5	6.0	6.2
Banking, Insurance, Real Estate, Business service	7.0	6.5	6.5	6.0	6.2
Other service	7.7	5.4	5.0	5.0	5.1
Imputed Bank Service Charge	0.0	11.0	12.0	12.0	11.8
GDP at Factor cost	6.5	5.5	4.9	4.6	4.8
Net Indirect Taxes	3.7	5.0	5.0	5.0	5.0
GDP at constant (1990)	6.1	5.4	4.9	4.6	4.9

(Source: CSO and JICA Study Team)

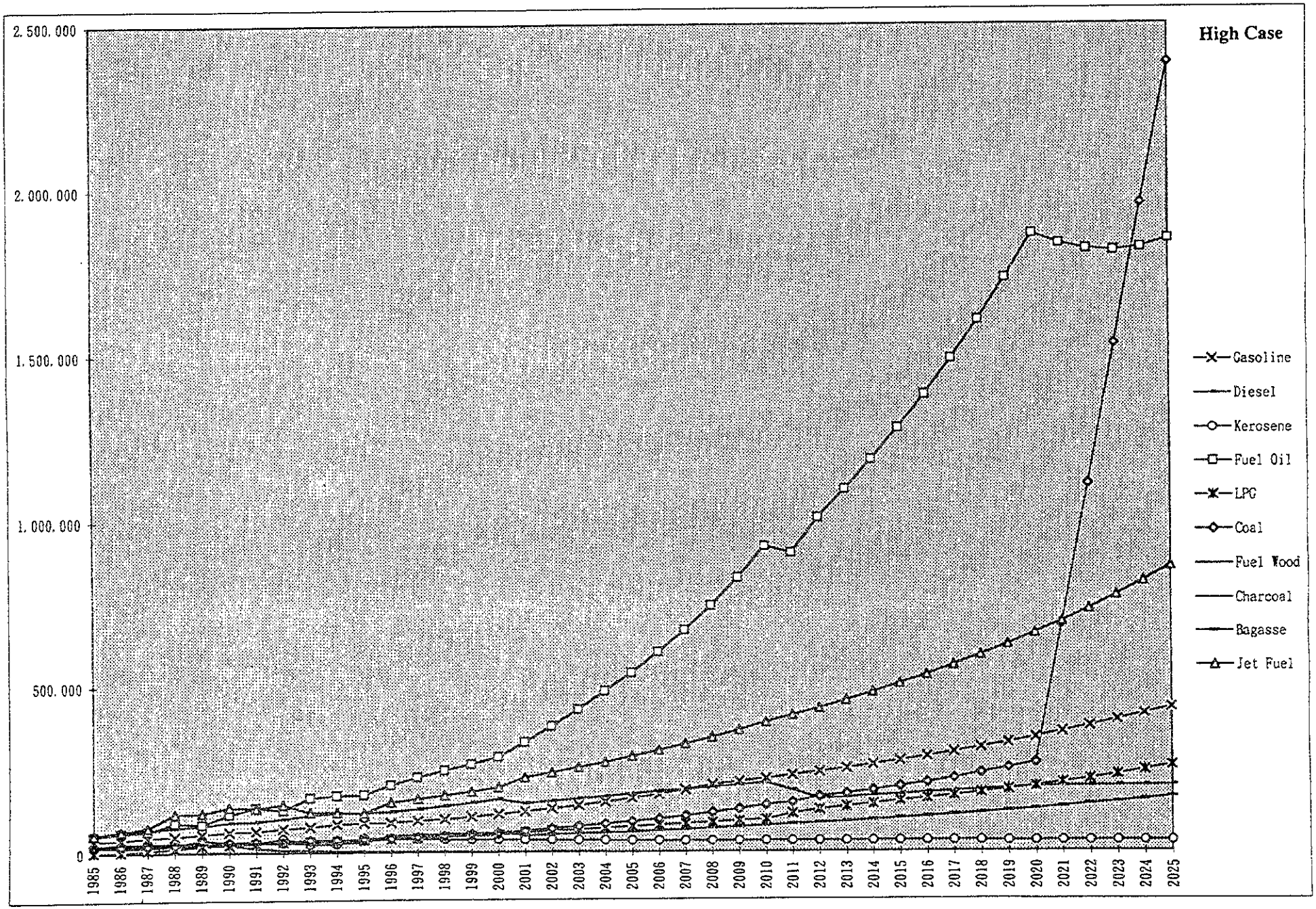
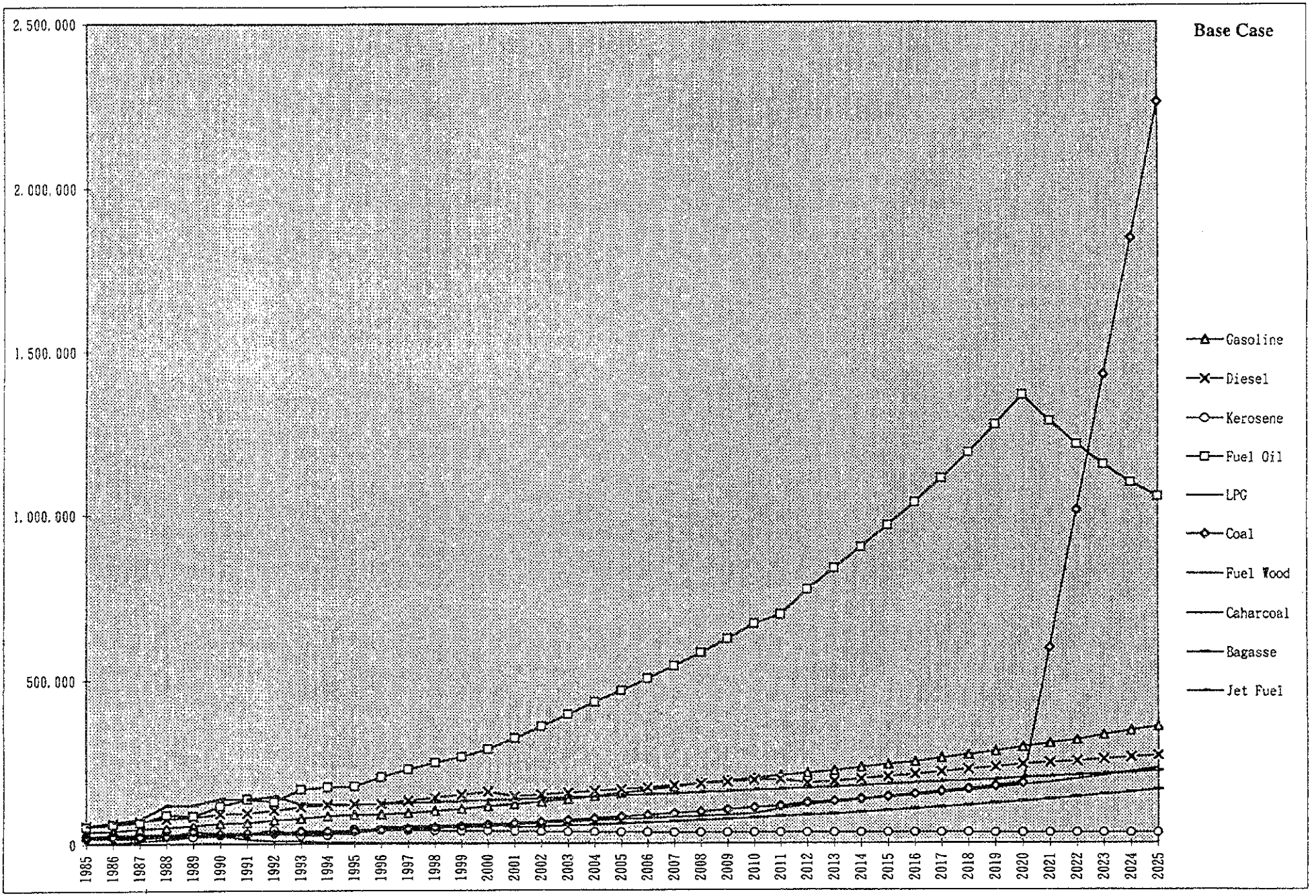


Figure 7.1 ENERGY DEMAND BY TYPE OF ENERGY


Base Case
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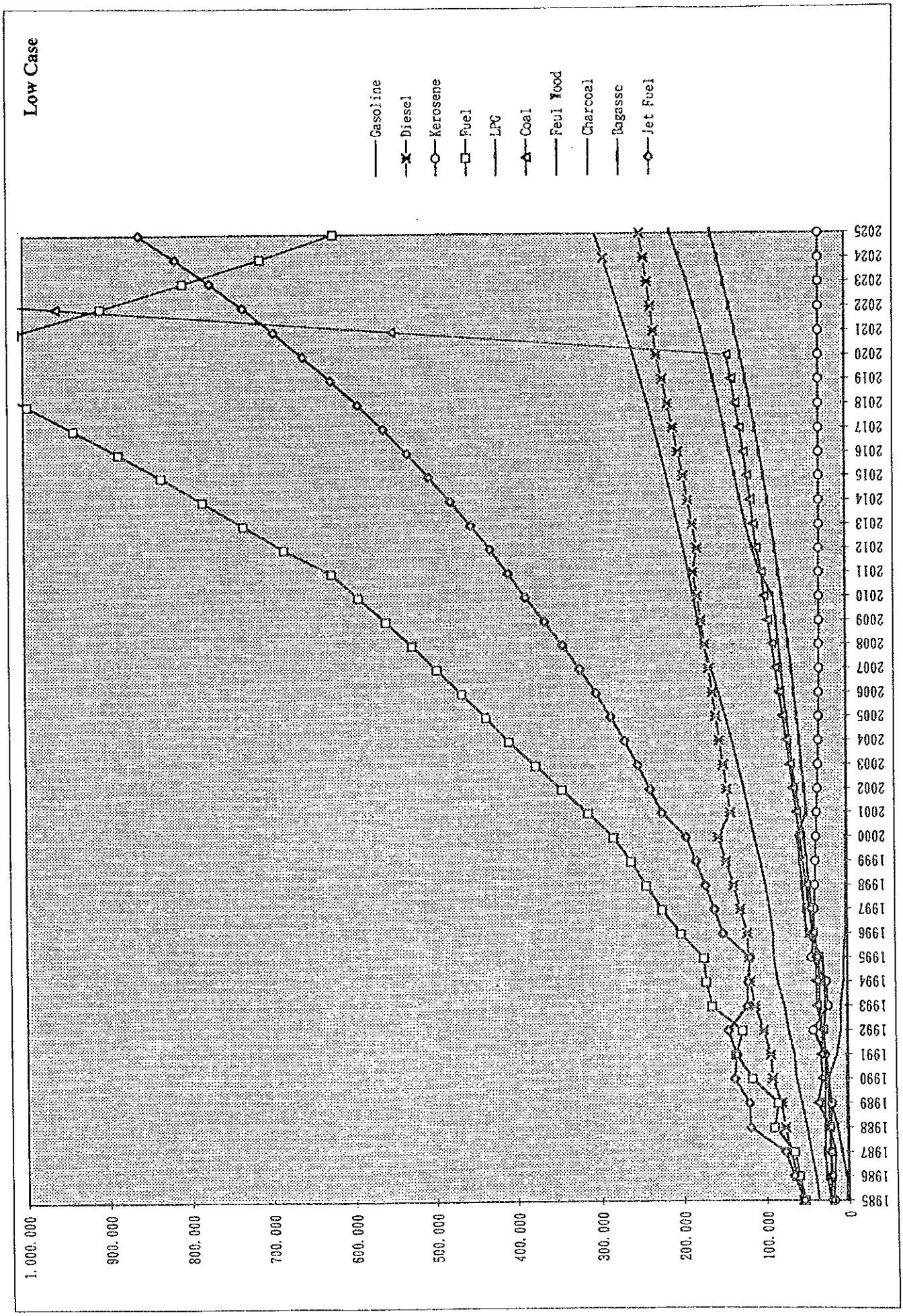
Fuel Oil
LPG
Coal
Fuel Wood
Caharcoal
Bagasse
Jet Fuel


Low Case
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Kerosene
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Charcoal
Bagasse
Jet Fuel
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600,000
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Table 7.2 TOTAL ENERGY DEMAND BY SECTOR (Base Case)

	Unit	1985	1995	2000	2010	2025
Non-electricity Consumption by Industry	TOE	38,127	80,263	114,034	222,652	694,029
Electricity Consumption by Industry	MWh	103,900	322,476	502,898	1,177,432	3,672,913
Conversion to TOE	TOE	8935.4	27,733	43,249	101,259	315,871
Total Consumption by Industry	TOE	47,062	107,996	157,283	323,911	1,009,899
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	6,921	20,303	89,239
Electricity Consumption by Commercial	MWh	73,000	227,327	325,408	659,303	1,741,575
Conversion to TOE	TOE	6,278	19,550	27,985	56,700	149,775
Total Consumption by Commercial	TOE	7,821	23,544	34,906	77,003	239,014
Total Consumption by Transport	TOE	79,202	192,132	248,376	352,958	588,753
Non-Electricity Consumption by Residential	TOE	35,561	45,082	51,004	62,488	88,553
Electricity Consumption by Residential	MWh	138,200	330,792	478,302	943,667	1,664,980
Conversion to TOE	TOE	11,885	28,448	41,134	81,155	143,188
Total Consumption by Residential	TOE	47,447	73,530	92,138	143,644	231,742
Electricity Consumption by Others	MWh	5,800	14,490	20,906	44,486	113,271
Total Electricity Consumption by all Sectors	MWh	320,900	895,085	1,327,514	2,824,889	7,192,740
Total Energy Consumption by all Sectors	TOE	181,531	397,202	532,703	897,516	2,069,409
Final Energy Consumption per Capita	TOE	0.2	0.4	0.5	0.9	2.1

TOTAL ENERGY DEMAND BY SECTOR (High Case)

	Unit	1985	1995	2000	2010	2025
Non-electricity Consumption by Industry	TOE	38,127	80,263	115,451	344,887	1,082,331
Electricity Consumption by Industry	MWh	103,900	322,476	506,285	1,861,206	5,448,416
Conversion to TOE	TOE	8,935	27,733	43,541	160,064	468,564
Total Consumption by Industry	TOE	47,062	107,996	158,992	504,951	1,550,894
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	7,001	20,520	90,145
Electricity Consumption by Commercial	MWh	73,000	227,327	327,881	663,921	1,753,160
Conversion to TOE	TOE	6,278	19,550	28,198	57,097	150,772
Total Consumption by Commercial	TOE	7,821	23,544	35,199	77,617	240,917
Total Consumption by Transport	TOE	79,202	192,132	252,011	389,675	710,111
Non-Electricity Consumption by Residential	TOE	35,561	45,082	51,056	63,092	88,769
Electricity Consumption by Residential	MWh	138,200	330,792	478,752	976,446	1,779,699
Conversion to TOE	TOE	11,885	28,448	41,173	83,974	153,054
Total Consumption by Residential	TOE	47,447	73,530	92,229	147,066	241,823
Electricity Consumption by Others	MWh	5,800	14,490	21,007	56,025	143,700
Total Electricity Consumption by all Sectors	MWh	320,900	895,085	1,333,925	3,557,598	9,124,976
Total Energy Consumption by all Sectors	TOE	181,531	397,202	538,430	1,119,310	2,743,746
Final Energy Consumption per Capita	TOE	0.2	0.4	0.5	1.1	2.8

TOTAL ENERGY DEMAND BY SECTOR (Low Case)

	Unit	1985	1995	2000	2010	2025
Non-electricity Consumption by Industry	TOE	38,127	80,263	112,604	183,533	466,945
Electricity Consumption by Industry	MWh	103,900	322,476	499,278	973,954	2,593,714
Conversion to TOE	TOE	8,935	27,733	42,938	83,760	223,059
Total Consumption by Industry	TOE	47,062	107,996	155,542	267,293	690,004
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	7,001	20,520	90,145
Electricity Consumption by Commercial	MWh	73,000	227,327	327,881	663,921	1,753,160
Conversion to TOE	TOE	6,278	19,550	28,198	57,097	150,772
Total Consumption by Commercial	TOE	7,821	23,544	35,199	77,617	240,917
Total Consumption by Transport	TOE	79,202	192,132	246,189	332,372	506,994
Non-Electricity Consumption by Residential	TOE	35,561	45,082	50,990	62,228	88,403
Electricity Consumption by Residential	MWh	138,200	330,792	478,089	929,751	1,588,415
Conversion to TOE	TOE	11,885	28,448	41,116	79,959	136,604
Total Consumption by Residential	TOE	47,447	73,530	92,105	142,187	225,006
Electricity Consumption by Others	MWh	5,800	14,490	20,884	41,082	94,965
Total Electricity Consumption by all Sectors	MWh	320,900	895,085	1,326,131	2,608,708	6,030,253
Total Energy Consumption by all Sectors	TOE	181,531	397,202	529,035	819,470	1,662,922
Final Energy Consumption per Capita	TOE	0.2	0.4	0.5	0.8	1.7

(Source: CSO and JICA Study Team)

Table 7.3 INCOME ELASTICITY BY SECTOR (Base Case)

	Unit	1985	1995	2000	2010	2025
Non-Electricity consumption by industry	TOE	38,127	80,263	114,034	222,652	694,029
Electricity including irrigation	MWh	103,900	322,476	502,898	1,177,432	3,672,913
Conversion to TOE	TOE	8,935	27,733	43,249	101,259	315,871
Total Consumption by Industry	TOE	47,062	107,996	157,283	323,911	1,009,899
Average Annual Growth Rate	(%)	-	8.7	7.8	7.5	7.9
Real GDP by Industry	Rs. million	10,244	17756.1	22660.4	37702.	101244.3
Average Annual Growth Rate by industry	(%)	-	5.7	5.0	5.2	6.8
Income Elasticity		-	1.5	1.6	1.4	1.2
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	6,921	20,303	89,239
Electricity Consumption by Commercial	MWh	73,000	227,327	325,408	659,303	1,741,575
Conversion to TOE	TOE	6,278	19,550	27,985	56,700	149,775
Total Consumption by Commercial	TOE	7820.76	23,544	34,906	77,003	239,014
Average Annual Growth Rate	(%)	-	11.7	8.2	8.2	7.8
Real GDP by Commercial	Rs. million	10,201	21511.2	28796.9	50892.	111392.7
Average Annual Growth Rate by Commercial	(%)	-	7.7	6.0	5.9	5.4
Income Elasticity		-	1.5	1.4	1.4	1.5
Total Consumption by Transport	TOE	79,202	192,132	248,376	352,958	588,753
Average Annual Growth Rate	(%)	-	9.3	5.3	3.6	3.5
Real GDP by Transport, etc.	Rs. million	2,406	5016.3	6872.7	12901.	30918.
Average Annual Growth Rate by Transport	(%)	-	7.6	6.5	6.5	6.0
Income Elasticity		-	1.2	0.8	0.6	0.6
Non-Electricity Consumption by Residential	TOE	35,561	45,082	51,004	62,488	88,553
Electricity Consumption by Residential	MWh	138,200	330,792	478,302	943,667	1,664,980
Conversion to TOE	TOE	11885.2	28,448	41,134	81,155	143,188
Total Consumption by Residential	TOE	47,447	73,530	92,138	143,644	231,742
Average Annual Growth Rate	(%)	-	4.5	4.6	4.5	3.2
Real Private Consumption Expenditure	Rs. million	17591.77	31745.92	40795.85	65809.50	122565.58
Average Annual Growth Rate by RPCON	(%)	-	6.1	5.1	4.9	4.2
Income Elasticity		-	0.7	0.9	0.9	0.8
Total Electricity Consumption by all sectors	TOE	27,099	75,731	112,368	239,115	608,834
Average Annual Growth Rate	(%)	-	10.8	8.2	7.8	6.4
Income Elasticity		-	1.8	1.5	1.5	1.2
Total Energy Consumption by all sectors	TOE	181,531	397,202	532,703	897,516	2,069,409
Average Annual Growth Rate	(%)	-	8.1	6.0	5.4	5.7
Income Elasticity		-	1.3	1.1	1.0	1.1
GDP at constant (1990)	Rs million	27,183	48,932	63,622	106,211	225,494
Average Annual Growth Rate	(%)	-	6.1	5.4	5.3	5.1

INCOME ELASTICITY BY SECTOR (High Case)

	Unit	1985	1995	2000	2010	2025
Non-Electricity consumption by industry	TOE	38,127	80,263	115,451	344,887	1,082,331
Electricity including irrigation	MWh	103,900	322,476	506,285	1,861,206	5,448,416
Conversion to TOE	TOE	8,935	27,733	43,541	160,064	468,564
Total Consumption by Industry	TOE	47,062	107,996	158,992	504,951	1,550,894
Average Annual Growth Rate	(%)	-	8.7	8.	12.3	7.8
Real GDP by Industry	Rs. million	10,244	17756.1	22660.4	46890.8	136436.8
Average Annual Growth Rate by industry	(%)	-	5.7	5.0	7.5	7.4
Income Elasticity		-	1.5	1.6	1.6	1.1
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	7,001	20,520	90,145
Electricity Consumption by Commercial	MWh	73,000	227,327	327,881	663,921	1,753,160
Conversion to TOE	TOE	6,278	19,550	28,198	57,097	150,772
Total Consumption by Commercial	TOE	7820.76	23,544	35,199	77,617	240,917
Average Annual Growth Rate	(%)	-	11.7	8.4	8.2	7.8
Real GDP by Commercial	Rs. million	10,201	21511.2	28973.2	51179.3	111989.9
Average Annual Growth Rate by Commercial	(%)	-	7.7	6.1	5.9	5.4
Income Elasticity		-	1.5	1.4	1.4	1.5
Total Consumption by Transport	TOE	79,202	192,132	252,011	389,675	710,111
Average Annual Growth Rate	(%)	-	9.3	5.6	4.5	4.1
Real GDP by Transport, etc.	Rs. million	2,406	5016.3	6872.7	12901.	30918.
Average Annual Growth Rate by Transport	(%)	-	7.6	6.5	6.5	6.0
Income Elasticity		-	1.2	0.9	0.7	0.7

Non-Electricity Consumption by Residential	TOE	35,561	45,082	51,056	63,092	88,769
Electricity Consumption by Residential	MWh	138,200	330,792	478,752	976,446	1,779,699
Conversion to TOE	TOE	11885.2	28,448	41,173	83,974	153,054
Total Consumption by Residential	TOE	47,447	73,530	92,229	147,066	241,823
Average Annual Growth Rate	(%)	-	4.5	4.6	4.8	3.4
Real Private Consumption Expenditure	Rs. million	17591.77	31745.92	40849.87	68177.65	133150.13
Average Annual Growth Rate by RPCON	(%)	-	6.1	5.2	5.3	4.6
Income Elasticity		-	0.7	0.9	0.9	0.7
Total Electricity Consumption by all sectors	TOE	27,099	75,731	112,911	301,135	772,390
Average Annual Growth Rate	(%)	-	10.8	8.3	10.3	6.5
Income Elasticity		-	1.8	1.5	1.7	1.2
Total Energy Consumption by all sectors	TOE	181,531	397,202	538,430	1,119,310	2,743,746
Average Annual Growth Rate	(%)	-	8.1	6.3	7.6	6.2
Income Elasticity		-	1.3	1.2	1.2	1.1
GDP at constant (1990)	Rs. million	27,183	48,932	63,798	115,687	261,284
Average Annual Growth Rate	(%)	-	6.1	5.4	6.1	5.6

INCOME ELASTICITY BY SECTORr (Low Case)

	Unit	1985	1995	2000	2010	2025
Non-Electricity consumption by industry	TOE	38,127	80,263	112,604	183,533	466,945
Electricity including irrigation	MWh	103,900	322,476	499,278	973,954	2,593,714
Conversion to TOE	TOE	8,935	27,733	42,938	83,760	223,059
Total Consumption by Industry	TOE	47,062	107,996	155,542	267,293	690,004
Average Annual Growth Rate	(%)	-	8.7	7.6	5.6	6.5
Real GDP by Industry	Rs. million	10,244	17756.1	22660.4	34239.6	78399.1
Average Annual Growth Rate by industry	(%)	-	5.7	5.0	4.2	5.7
Income Elasticity		-	1.0	1.0	1.0	1.0
Non-Electricity Consumption by Commercial	TOE	1,543	3,994	7,001	20,520	90,145
Electricity Consumption by Commercial	MWh	73,000	227,327	327,881	663,921	1,753,160
Conversion to TOE	TOE	6,278	19,550	28,198	57,097	150,772
Total Consumption by Commercial	TOE	7820.76	23,544	35,199	77,617	240,917
Average Annual Growth Rate	(%)	-	11.7	8.4	8.2	7.8
Real GDP by Commercial	Rs. million	10,201	21511.2	28973.2	51179.3	111989.9
Average Annual Growth Rate by Commercial	(%)	-	7.7	6.1	5.9	5.4
Income Elasticity		-	1.5	1.4	1.4	1.5
Total Consumption by Transport	TOE	79,202	192,132	246,189	332,372	506,994
Average Annual Growth Rate	(%)	-	9.3	5.1	3.0	2.9
Real GDP by Transport, etc.	Rs. million	2,406	5016.3	6872.7	12901.	30918.
Average Annual Growth Rate by Transport	(%)	-	7.6	6.5	6.5	6.0
Income Elasticity		-	1.2	0.8	0.5	0.5
Non-Electricity Consumption by Residential	TOE	35,561	45,082	50,990	62,228	88,403
Electricity Consumption by Residential	MWh	138,200	330,792	478,089	929,751	1,588,415
Conversion to TOE	TOE	11885.2	28,448	41,116	79,959	136,604
Total Consumption by Residential	TOE	47,447	73,530	92,105	142,187	225,006
Average Annual Growth Rate	(%)	-	4.5	4.6	4.4	3.1
Real Private Consumption Expenditure	Rs. million	17591.77	31745.92	40778.97	64811.45	115308.66
Average Annual Growth Rate by RPCON	(%)	-	6.1	5.1	4.7	3.9
Income Elasticity		-	0.7	0.9	0.9	0.8
Total Electricity Consumption by all sectors	TOE	27,099	75,731	112,251	220,816	510,435
Average Annual Growth Rate	(%)	-	10.8	8.2	7.0	5.7
Income Elasticity		-	1.8	1.5	1.4	1.2
Total Energy Consumption by all sectors	TOE	181,531	397,202	529,035	819,470	1,662,922
Average Annual Growth Rate	(%)	-	8.1	5.9	4.5	4.8
Income Elasticity		-	1.3	1.1	0.9	1.0
GDP at constant (1990)	Rs. million	27,183	48,932	63,798	103,036	203,246
Average Annual Growth Rate	(%)	-	6.1	5.4	4.9	4.6