

# ENERGY STATISTICS - 1999

## Introduction

The Energy Statistics presented in this issue of the Economic and Social Indicators pertain to the years 1998 and 1999, and have been compiled with the collaboration of the Ministry of Public Utilities and the Central Electricity Board.

All data refer to the Republic of Mauritius unless stated otherwise. Final energy consumption data by sector has been compiled according to the classification used by the suppliers of data. Consumption of energy in the transport sector refers to the amount of fuel used by industries as well as private households for transportation. For meaningful comparison and analysis, the quantities of each type of fuel have been expressed in a common accounting unit, namely, tonnes of oil equivalent (**toe**).

### *2.1 Total primary energy requirement*

The total primary energy requirement of the country is met from imported fuels as well as indigenous sources. The year 1999 has been an odd year due to the prevailing drought. Hydro generation decreased from 22.9 ktoe in 1998 to 6.5 ktoe in 1999 and bagasse, from 282.7 ktoe to 210.3 ktoe. Consequently, the total primary energy requirement dropped to 1,000 ktoe from 1,017 ktoe in 1998. Of the 1,000 ktoe, 779 ktoe were met from imported petroleum products and coal and the remaining 221 ktoe, from indigenous production, mainly bagasse.

Compared to 1998, the share of the petroleum products and coal has increased from 69.5 % to 77.9 % in 1999, whilst indigenous production decreased from 30.5 % to 22.1 %.

#### *2.1.1 Local production*

Local energy sources consist mainly of bagasse, the residue left over after extraction of sugar from sugarcane, hydro-electricity and to a small extent, fuel wood. In 1999, indigenous production of energy dropped by 28.7 % to 221.3 ktoe from 310.2 ktoe in 1998. This reduction in production, from both bagasse and hydro, was due to the prevailing drought.

#### *2.1.2 Imports of energy sources*

Table 4 shows data on imports of energy sources. Some 1,003 ktoe of petroleum products and coal were imported in 1999 compared to 959 ktoe in 1998, representing an increase of 4.6 %. Petroleum products increased from 905.5 ktoe to 923.3 ktoe and coal from 53.5 ktoe to 79.9 ktoe. The import bill for petroleum products and coal was valued at Rs 3,795.7 million against Rs 2,873.2 million in 1998.

### **2.1.3 Re-exports and bunkering**

Of the 1,003.2 ktoe of imported energy sources, 249.8 ktoe were re-exported to bunkers and foreign aircraft, 23.3 ktoe of diesel oil, 45.1 ktoe of fuel oil and 81.4 ktoe of aviation fuel. (Table 5)

## **2.2 Electricity generation**

In 1999, 1,440.7 GWh (316.9 ktoe) of electricity were generated, compared to 1,380.2 GWh (303.6 ktoe) in 1998, representing an increase of 4.4 %. The Central Electricity Board (CEB) generated 76.1 % and private power producers, 23.9 %. Thermal energy represented 97.9 % and hydro, the remaining 2.1 %. The installed capacity of the power plants in the Island of Mauritius increased from 480.4 MW in 1998 to 509.4 MW in 1999 and the effective capacity from 396.7 MW to 425.7 MW. The peak demand in 1999 was 265.8 MW (Tables 6 and 7).

### **2.2.1 Fuel input for electricity generation**

Table 8 shows the different types of fuel used for electricity generation. Fuel input increased from 329.3 ktoe in 1998 to 375.5 ktoe in 1999, representing an increase of 14 %. The amount of coal used in 1999 (69.5 ktoe) for electricity generation more than doubled compared to 27.9 ktoe in 1998. This was mainly due to the decrease in bagasse produced and the unavailability of water for hydro generation.

### **2.2.2 Number of electricity consumers and average unit price by category**

The total number of electricity consumers in the Island of Mauritius increased from 293,887 in 1998 to 304,029 in 1999 (Table 9). The domestic category had the highest number of consumers (271,061) followed by commercial (25,730) and industrial (6,981). The average sales price of electricity increased from Rs.2.14 per KWh in 1998 to Rs.2.19 per KWh in 1999.

## **2.3 Final energy consumption**

Some 925.9 ktoe of energy was consumed as final energy in 1999 compared to 960.1 ktoe in 1998. The Manufacturing sector and the Transport sector accounted, each for around 35 %, followed by Residential (15.9 %), Commercial and Distributive Trade (8.5 %) and Agriculture (0.8%). The different types and amount of fuel consumed by each sector is given in Table 10.

### **2.3.1 Manufacturing**

Energy used for manufacturing process in 1999 amounted to 325.3 ktoe, bagasse contributing 138.1 ktoe, electricity, 91.1 ktoe, fuel oil and diesel oil, 76.3 ktoe. Compared to 1998 (386.7 ktoe), a decrease of 15.9 % has been registered mainly resulting from the lower bagasse consumption.

### **2.3.2 Transport**

As shown in Table 10, in 1999, 325.4 ktoe of energy were used for transportation. Gasolene consumption has remained almost constant at 96.7 ktoe, whilst that of diesel oil rose from 120.1 ktoe to 127.8 ktoe and aviation fuel used by our national airline from 93.1 ktoe to 101.0 ktoe.

### **2.3.3 Commercial and Distributive Trade**

Total energy consumption stood at 78.6 ktoe in 1999 compared to 74.8 ktoe in 1998. Electricity is the main source of energy and its consumption by enterprises engaged in the Distributive Trade increased from 70.2 ktoe in 1998 to 73.6 ktoe in 1999.

### **2.3.4 Residential**

Energy consumed by households increased by 3.9 % in 1999 and amounted to 147.6 ktoe. The two main sources of energy for households were electricity and LPG. Electricity consumption increased by 4.2 % from 93.1 ktoe to 97.1 ktoe and that of LPG, by 5.7 % from 35.7 ktoe to 37.8 ktoe.

### **2.3.5 Agriculture**

Electricity and diesel oil are the only sources of energy in Agriculture. In 1999, 5.0 ktoe of electricity were used for irrigation whilst 2.3 ktoe of diesel oil were used for derocking of land and preparation of soil prior to plantation.

## **3. Energy Ratios**

As shown in table 11, the total primary energy requirement index (1990 = 100) decreased from 138.5 in 1998 to 136.2 in 1999. Per capita primary energy requirement dropped by 3.4 % to 0.85 toe. Energy intensity, defined as total primary energy requirement (toe) per 100,000 rupees of GDP (at constant 1990 rupees), also went down from 2.00 to 1.92.

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## Concepts and Terminology

The energy data have been compiled according to the recommendations of the United Nations Manual, Series F No. 29 on Energy Statistics.

- **Energy**  
Energy means the capacity for doing work or for producing heat. Producing heat is a common manifestation of "doing work" as are producing light and motive force.
- **Primary energy**  
Primary energy designates energy from sources that involve only extraction or capture, with or without separation from contiguous material, cleaning or grading, before the energy embodied in that source can be converted into heat or mechanical work. Primary energy is not derived from any other form of energy. By convention, sources of energy that occur naturally such as coal, natural gas, fuel wood are termed primary energy.
- **Secondary energy**  
Secondary energy designates energy from all sources of energy that results from transformation of primary sources.
- **Fuels**  
The term fuel is used to describe those energy sources, whether primary or secondary, that must be subjected to combustion or fission in order to release for use the energy stored up inside them.
- **Re-export of bunkers and aviation fuel**  
Bunkers relate to fuels sold to ships irrespective of their flags of ownership or registration. Re-exports include aviation fuel delivered to foreign aircraft. Aviation fuel delivered to aircraft owned by the national airline is included as final consumption in the transport sector.
- **Primary energy requirement**  
It is the sum of imported fuels and locally available fuels less re-exports of bunkers and aviation fuel to foreign aircraft after adjusting for stock changes.
- **Primary energy input to hydro electricity.**  
The primary energy input to hydro electricity is defined as the energy value of the electricity generated from hydro.

## Energy conversion factors

The following energy conversion factors have been used to express the energy content for the different fuels in terms of a common accounting unit, tonnes of oil equivalent (toe)

	<u>Tonne</u>	<u>toe</u>
Gasolene	1	1.08
Diesel Oil	1	1.01
Dual Purpose Kerosene (DPK)	1	1.04
Fuel oil	1	0.96
Liquefied Petroleum Gas (LPG)	1	1.08
Coal	1	0.62
Bagasse	1	0.16
Fuel Wood	1	0.38
Charcoal	1	0.74
	<u>GWh</u>	<u>toe</u>
Electricity	1	220

1 toe = 41.84 gigajoule (net calorific value)

### SYMBOLS

The following technical abbreviations have been used throughout the report.

toe	Tonne of oil equivalent
ktoe	Thousand tonnes of oil equivalent
LPG	Liquefied Petroleum Gas
MW	Megawatt (1,000 kW)
kWh	Kilowatt hour
GWh	Gigawatt hour

### ACRONYMS

CEB	Central Electricity Board
GDP	Gross Domestic Product

Table 1 - Energy commodity balance, 1998

Flow	Source	Tonnes of oil equivalent (toe)											Total		
		Coal	Gasoline	Diesel	Aviation Fuel	Kerosene	Fuel Oil	LPG	Fuel Wood	Charcoal	Hydro	Bagasse		Electricity	
Indigenous Production		-	-	-	-	-	-	4,560	-	22,916	282,719	-	-	-	310,195
Imports		53,533	93,847	285,564	158,400	56,293	263,160	48,250	-	-	-	-	-	-	959,048
Re-Exports and Bunkering		-	-	(128,589)	(55,273)	-	(33,909)	(734)	-	-	-	-	-	-	(218,505)
Stock change / Statistical error		(9,670)	1,833	(305)	(10,009)	5,221	(16,599)	(3,836)	-	-	-	-	-	-	(33,365)
<b>Total Primary Energy Requirement</b>		<b>43,864</b>	<b>95,679</b>	<b>156,670</b>	<b>93,118</b>	<b>61,514</b>	<b>212,652</b>	<b>43,681</b>	<b>4,560</b>	<b>22,916</b>	<b>282,719</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,017,373</b>
Electricity Generation		(27,922)	-	(3,789)	-	(51,663)	(171,582)	-	-	(22,916)	(74,364)	303,654	-	-	(48,582)
Other transformation		-	-	-	-	-	-	(760)	370	-	-	-	-	-	(390)
Own use		-	-	-	-	-	-	-	-	-	-	-	(8,286)	-	(8,286)
<b>Total Final Consumption</b>		<b>15,942</b>	<b>95,679</b>	<b>152,881</b>	<b>93,118</b>	<b>9,851</b>	<b>41,070</b>	<b>43,681</b>	<b>3,800</b>	<b>370</b>	<b>208,355</b>	<b>295,368</b>	<b>-</b>	<b>-</b>	<b>960,115</b>
Manufacturing Sector		15,942	-	30,535	-	-	41,063	3,538	760	-	208,355	86,530	-	-	386,724
Transport Sector		-	95,679	120,123	93,118	-	-	-	-	-	-	-	-	-	308,921
Commercial and Distributive Trade Sector		-	-	-	-	-	-	4,320	-	222	-	70,233	-	-	74,775
Residential Sector		-	-	-	-	9,851	-	35,748	3,040	148	-	93,181	-	-	141,968
Agriculture		-	-	2,222	-	-	-	-	-	-	-	5,586	-	-	7,808
Other(n.e.s) and losses		-	-	-	-	-	7	75	-	-	-	39,838	-	-	39,920

Note: figures in brackets represent negative quantities

Table 2 - Energy commodity balance, 1999

Flow	Source	Tonne of oil equivalent (toe)											Total	
		Coal	Gasolene	Diesel	Aviation Fuel	Kerosene	Fuel Oil	LPG	Fuel Wood	Charcoal	Hydro	Bagasse		Electricity
Indigenous Production		-	-	-	-	-	-	-	4,484	-	6,505	210,299	-	221,288
Imports		79,900	100,156	298,507	195,205	45,947	236,428	47,055	-	-	-	-	-	1,003,198
Re-Exports and Bunkering		-	-	(123,344)	(81,394)	-	(45,061)	-	-	-	-	-	-	(249,799)
Stock change / Statistical error		4,800	(3,491)	(8,558)	(12,800)	7,143	38,624	(399)	-	-	-	-	-	25,319
<b>Total Primary Energy Requirement</b>		<b>84,700</b>	<b>96,665</b>	<b>166,605</b>	<b>101,011</b>	<b>53,090</b>	<b>229,990</b>	<b>46,656</b>	<b>4,484</b>	<b>-</b>	<b>6,505</b>	<b>210,299</b>	<b>-</b>	<b>1,000,006</b>
Electricity Generation		(69,516)	-	(3,539)	-	(43,626)	(186,646)	-	-	-	(6,505)	(72,163)	316,955	(65,041)
Other transformation		-	-	-	-	-	-	-	(760)	370	-	-	-	(390)
Own use		-	-	-	-	-	-	-	-	-	-	-	(8,729)	(8,729)
<b>Total Final Consumption</b>		<b>15,184</b>	<b>96,665</b>	<b>163,066</b>	<b>101,011</b>	<b>9,464</b>	<b>43,344</b>	<b>46,656</b>	<b>3,724</b>	<b>370</b>	<b>-</b>	<b>138,136</b>	<b>308,227</b>	<b>925,846</b>
Manufacturing Sector		15,184	-	32,977	-	-	43,344	3,888	684	-	-	138,136	91,115	325,327
Transport Sector		-	96,660	127,765	101,011	-	-	-	-	-	-	-	-	325,436
Commercial and Distributive Trade Sector		-	-	-	-	-	-	4,860	-	222	-	-	73,561	78,643
Residential Sector		-	-	-	-	9,464	-	37,800	3,040	148	-	-	97,125	147,577
Agriculture		-	-	2,323	-	-	-	-	-	-	-	-	4,957	7,280
Other(n.e.s) and losses		-	5	1	-	-	-	108	-	-	-	-	41,469	41,583

Note: figures in brackets represent negative quantities

Table 3 - Primary energy requirement , 1998 - 1999

Energy source	Physical unit (Tonne\GWh)		Energy unit (ktoe)	
	1998	1999	1998	1999
<b>Imported</b>				
Gasolene	88,592	89,505	95.68	96.67
Diesel Oil	155,119	164,955	156.67	166.60
Dual Purpose Kerosene	148,685	148,174	154.63	154.10
<i>Kerosene</i>	59,148	51,048	61.51	53.09
<i>Aviation Fuel</i>	89,537	97,126	93.12	101.01
Fuel Oil	221,512	239,573	212.65	229.99
LPG	40,445	43,200	43.68	46.66
<b><i>Sub total (petroleum products)</i></b>			<b>663.31</b>	<b>694.02</b>
Coal	70,748	136,613	43.86	84.70
<b>Sub total (Imported)</b>			<b>707.18</b>	<b>778.72</b>
<b>Local</b>				
Electricity (hydro + wind) <i>GWh</i>	104	30	22.92	6.51
Bagasse	1,766,992	1,314,370	282.72	210.30
Fuel Wood *	12,000	11,800	4.56	4.48
<b>Sub total (Local)</b>			<b>310.20</b>	<b>221.29</b>
<b>Total</b>			<b>1,017.37</b>	<b>1,000.01</b>

\* estimates



Table 4 - Imports of energy sources , 1998 - 1999

Energy source	Physical unit (Thousand tonne)		Energy unit (ktoe)		C.I.F value (Rs million)	
	1998	1999	1998	1999	1998	1999
Gasolene	86.90	92.74	93.85	100.16	356.3	475.2
Diesel Oil	282.74	295.55	285.56	298.51	808.3	1,114.0
Dual Purpose Kerosene	206.44	231.88	214.69	241.15	700.5	998.5
<i>Kerosene</i>	54.13	44.18	56.29	45.95	186.9	178.5
<i>Aviation Fuel</i>	152.31	187.70	158.40	195.20	513.6	820.0
Fuel Oil	274.12	246.28	263.16	236.43	568.4	717.7
LPG	44.68	43.57	48.25	47.06	323.4	378.2
<b>Sub total (petroleum products)</b>			<b>905.51</b>	<b>923.30</b>	<b>2,756.9</b>	<b>3,683.6</b>
Coal	86.34	128.87	53.53	79.90	116.2	112.1
<b>Total imports</b>			<b>959.05</b>	<b>1,003.20</b>	<b>2,873.2</b>	<b>3,795.7</b>

Table 5 - Re-exports of energy sources to foreign aircraft and bunkers, 1998- 1999

Energy Re-exported	Physical unit (tonne)		Energy unit (ktoe)	
	1998	1999	1998	1999
Aviation fuel to foreign aircraft	53,147	78,263	55.27	81.39
Diesel oil	127,316	122,123	128.58	123.34
Fuel oil	35,322	46,939	33.90	45.06
<b>Total</b>			<b>217.77</b>	<b>249.79</b>

Table 6 - Evolution of plant capacities, peak demand and electricity generation, 1998 - 1999

Year	Installed capacity <sup>1</sup> (MW)	Effective capacity <sup>1</sup> (MW)	Peak demand <sup>1</sup> (MW)	Electricity generated (GWh)		
				Hydro	Thermal	Total
1998	480.4	396.7	248.9	104.17	1,276.08	1,380.24
1999	509.4	425.7	265.8	29.57	1,411.14	1,440.71

Table 7 - Electricity production by source of energy, 1998 - 1999

Source of energy	1998		1999	
	GWh	%	GWh	%
Primary energy	104.17	7.5	29.57	2.1
Hydro	104.17	7.5	29.57	2.1
Secondary energy	1,276.07	92.5	1,411.14	97.9
Gas turbine (kerosene)	161.93	11.7	136.64	9.5
Diesel & Fuel oil	857.41	62.1	930.77	64.6
Coal*	62.39	4.5	155.20	10.8
Bagasse*	194.34	14.1	188.53	13.1
<b>Total</b>	<b>1,380.24</b>	<b>100.0</b>	<b>1,440.71</b>	<b>100.0</b>

\* Electricity purchased by C.E.B.

Table 8 - Fuel input for electricity production, 1998 - 1999

Fuel	1998			1999		
	Tonne	Ktoe	%	Tonne	Ktoe	%
Fuel oil	178,732	171.58	52.1	194,423	186.65	49.7
Diesel oil	3,752	3.79	1.2	3,504	3.54	0.9
Kerosene	49,676	51.66	15.7	41,948	43.63	11.6
Coal*	45,035	27.92	8.5	112,123	69.52	18.5
Bagasse *	464,773	74.36	22.6	451,020	72.16	19.2
<b>Total</b>		<b>329.32</b>	<b>100.0</b>		<b>375.49</b>	<b>100.0</b>

\* Electricity purchased by C.E.B.

Table 9 - Electricity consumption by class of consumer, 1998 - 1999 (Island of Mauritius)

Class of consumer	No. of consumers		Consumption (MWh)		Average sales price <sup>1</sup> per KWh (Rupees)	
	1998	1999 <sup>2</sup>	1998 <sup>3</sup>	1999 <sup>2</sup>	1998 <sup>3</sup>	1999 <sup>2</sup>
Domestic	261,971	271,061	421,836	441,477	2.21	2.28
Commercial	24,914	25,730	318,575	334,368	2.51	2.51
Industrial	6,751	6,981	417,845	436,690	1.75	1.82
of which: irrigation	(409)	(562)	(25,336)	(22,531)	(1.69)	(2.71)
Other	251	257	17,313	19,965	3.02	2.86
<b>All consumers</b>	<b>293,887</b>	<b>304,029</b>	<b>1,176,404</b>	<b>1,232,500</b>	<b>2.14</b>	<b>2.19</b>

<sup>1</sup> Excluding VAT & meter rent<sup>2</sup> Provisional<sup>3</sup> Revised

Source: Central Electricity Board (CEB)

Table 10 - Final energy consumption by sector and type of fuel, 1998- 1999

Sector	1998	1999	1998	1999
	(tonne)		(ktoe)	
<b>1. Manufacturing</b>			<b>386.72</b>	<b>325.33</b>
<b>1.1 Excluding bagasse</b>			<b>178.37</b>	<b>187.19</b>
Fuel oil	42,774	45,150	41.06	43.34
Diesel oil	30,233	32,650	30.54	32.98
LPG	3,276	3,600	3.54	3.89
Coal	25,713	24,490	15.94	15.18
Fuel wood <sup>1</sup>	2,000	1,800	0.76	0.68
Electricity <sup>2</sup> (GWh)	393.32	414.16	86.53	91.11
<b>1.2 Bagasse</b>	1,302,219	863,350	<b>208.36</b>	<b>138.14</b>
<b>2. Transport</b>			<b>308.92</b>	<b>325.44</b>
Gasolene	88,592	89,500	95.68	96.66
Diesel oil	118,934	126,500	120.12	127.77
Aviation Fuel	89,537	97,126	93.12	101.01
<b>3. Residential</b>			<b>141.97</b>	<b>147.58</b>
Kerosene	9,472	9,100	9.85	9.46
LPG	33,100	35,000	35.75	37.80
Fuel wood <sup>1</sup>	8,000	8,000	3.04	3.04
Charcoal <sup>1</sup>	200	200	0.15	0.15
Electricity <sup>2</sup> (GWh)	423.55	441.48	93.18	97.12
<b>4. Commercial and Distributive Trade</b>			<b>74.77</b>	<b>78.64</b>
LPG	4,000	4,500	4.32	4.86
Charcoal <sup>1</sup>	300	300	0.22	0.22
Electricity <sup>2</sup> (GWh)	319.24	334.37	70.23	73.56
<b>5. Agriculture</b>			<b>7.81</b>	<b>7.28</b>
Diesel oil <sup>1</sup>	2,200	2,300	2.22	2.32
Electricity <sup>2</sup> (GWh)	25.39	22.53	5.59	4.96
<b>6. Other (n.e.s) and losses</b>			<b>39.92</b>	<b>41.58</b>
<b>TOTAL</b>			<b>960.11</b>	<b>925.85</b>

<sup>1</sup> Estimates<sup>2</sup> Island of Mauritius only

Table 11 - Energy Ratios, 1995 - 1999

Energy Ratio	unit	1990	1995	1996	1997	1998	1999
1. Total primary energy requirement	ktoe	734.33	882.97	918.56	950.96	1,017.37	1,000.01
<i>Imported</i>	ktoe	433.85	584.26	634.70	647.31	707.18	778.72
<i>Local</i>	ktoe	300.48	298.71	283.86	303.65	310.20	221.29
2. Total primary energy requirement index (1990 = 100)		100.00	120.24	125.09	129.50	138.54	136.18
3. Import dependency	%	59.08	66.17	69.10	68.07	69.51	77.87
4. GDP (at 1990 factor cost)	Rs. Mn	33,030	42,878	45,537	48,087	50,827	52,200
5. GDP Index (1990 = 100)		100.00	129.82	137.87	145.59	153.88	158.04
6. Energy Intensity	toe per Rs.100,000 GDP	2.22	2.06	2.02	1.98	2.00	1.92
7. Mid-year population	thousand	1,059	1,122	1,134	1,148	1,160	1,174
8. Per capita primary energy requirement	toe	0.69	0.79	0.81	0.83	0.88	0.85