

The EC - ASEAN Business Facilitator

National Energy Policy Review

Malaysia



December 2003

National Energy Policy Review

Malaysia

Prepared by EC-ASEAN COGEN Programme (COGEN 3)

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COGEN 3

Proven, Clean & Efficient Biomass, Coal, Gas Cogeneration

The objective of COGEN 3 is to promote the use of proven, clean and efficient cogeneration using biomass, coal or gas as fuel. This is achieved through partnership between ASEAN industries and European equipment suppliers.

The programme is co-ordinated in ASEAN by the Asian Institute of Technology (AIT), Bangkok, Thailand and in Europe by Carl Bro International, Sweden. COGEN 3 started its operation in January 2002 and will continue until December 2004.

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List of Abbreviations

8Malaysian Plan	The Malaysian plan for the period 2001 to 2005
AALCC	Arbitration Rules, and conducted at the Asian-African Legal Consultative Committee
AFTA	ASEAN Free Trade Area
CDM	Clean Development Mechanism
CHP	Combined Heat and Power
CPO	Crude Palm Oil
DES	Department of Electricity Supply
EE	Energy Efficient system
EFB	Empty Fruit Bunches
EPMI	Esso Production Malaysia Inc.
EPU	Economic Planning Unit
EU	European Union
FFB	Oil Palm Fresh Fruit Bunches
FRIM	Forest Research Institute Malaysia
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gas
GNP	Gross National Product
ICC	Industrial coordination Council
IMP2	The second Industrial Master Plan
IPIC	The industrial Policy and Incentive Committee
IPP	Independent Power Producers
JBEG	The Department of Electricity and Gas Supply (Jabatan Bekalan Elektrik dan Gas)
KLIA	Kuala Lumpur International Airport
KLCC	Kuala Lumpur City Centre
MDTCA	Malaysian Domestic Trade and Consumer Affairs
MEC	Malaysia Energy Centre
MECM	Ministry of Energy Communication and Multimedia
MIEEIP	Malaysia Industrial Energy Efficiency Improvement Project
MITI	Ministry of International Trade and Industry
MPOB	Malaysian Palm Oil Board.
MSTE	The Ministry of Science, Technology and Environment
MTJA	The Malaysia-Thailand Joint Authority
OPP3	Third Outline Perspective Plan

OPP3	Third Outline Perspective Plan
Petronas	Petroleum Nasional Berhad
POME	Palm oil mill effluents
PPA	Power Purchase agreement
PTM	The Energy Centre of Malaysia (Pusat Tenaga Malaysia)
RM	Malaysian Ringgit.
SCADA	Supervisory Control and Data Acquisition.
SESB	Sabah Electricity Sdn. Bhd.
SESCO	Sarawak Electricity Supply Corp.
SIRIM	Standards and Industrial Research Institute of Malaysia
SME	Small and Medium Enterprises.
SREP	Small Renewable Energy Programme
TNB	Tenaga Nasional Berhad
UNCITRAL	United Nations Commission on International Trade Law
WTO	World Trade Organisation

List of energy units

Bbl/d	barrels per day
Ktoe	Kilo Ton of Oil Equivalent
mmbtu	million British thermal units
MW	Mega Watt
MWh	Mega Watt hour
Mmscf	million standard cubic feet
tcf	Trillion Cubic Feet

Executive Summary

There have been no direct national policies in place in Malaysia to support cogeneration since the IPP development in the nineties. Cogeneration has only been indirectly supported in the energy efficiency and biomass power measures initiated in connection with the Eight Malaysian Plan (The Malaysian plan for the period 2001 to 2005).

The policy to reduce dependence on oil resulted in the rapid development and usage of natural gas. Furthermore, in the Eight Malaysian Plan, Renewable Energy was announced as the fifth fuel in the new Five Fuel Strategy (energy supply mix). It is targeted that RE will contribute 5% of the country's total electricity demand by the year 2005, that is by the end of the Eighth Malaysia Plan period. In line with this plan, Malaysia's abundant biomass waste resources coming mainly from its palm oil, wood and agro-industries stand a potential choice fuel for cogeneration. A total of about 665 MW capacities can be expected if the estimated overall potential of about 20.8 million tons of biomass residues from these main sources in addition to 31.5 million tons of palm oil mill effluents (POME) is used for power generation and cogeneration.

A total of 900 MW of small to medium sized cogeneration licensees has been issued in Malaysia. Most of the licensees were issued in the nineties, when Malaysia lacked power capacity and implemented a number of IPP's. The palm oil industry dominates the small scale cogeneration market with more than 350 captive cogeneration plants in the palm oil mills.

In conjunction with these policies, a number of Government supported projects to assist the National Energy Conservation plans, have been identified. Under the guidance and supervision of the Malaysia Energy Centre, some of the projects have been:

1. CDM - The National Steering Committee on Climate Change (NSCCC) has established a two-tiered organisation for CDM implementation in Malaysia towards reducing greenhouse gases.
2. IRP - undertaking Integrated Resource Planning (IRP) to assist in developing integrated energy policies.
3. MEDIS - Malaysia Energy Database and Information System to establish a comprehensive national database and information system to support Integrated National Energy Planning.
4. MIEEIP - The Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP) was developed to remove barriers to efficient industrial energy use.
5. BioGen - For development of the cogeneration technology and application related to renewable energy resources using POME and also to reduce the growth rate of GHG emissions from fossil fuel fired combustion processes.

The report also contains other National policies and legislations concerning the fuel mix, fuel resources and energy conservation and efficiency. The energy sector has been discussed along with a forecast for energy demand.

1. Introduction

Malaysia, a signatory to the United Nations Framework Convention on Climate Change since 1993, is committed to global efforts to reduce greenhouse gas emissions and mitigate climate change. Reflective of this, Malaysia is implementing several strategies and policies aimed at environmental protection. One such effort is the promotion of energy efficiency among industries in the country through the Malaysia Industrial Energy Efficiency Improvement Project (MIEEIP). The project is co-funded by the Malaysian Government, United Nations Development Programme and the Malaysian private sector, and is executed by the Malaysia Energy Centre (MEC) with the aim of bringing down energy consumption in eight manufacturing sectors by 10% by 2004 and this would translate into a 10% reduction in emissions into the environment as well as national savings.

Malaysia's electrical generating capacity was 14624 MW in 2002, of which 84% is thermal and 16% is hydroelectric. Three integrated utilities dominate the electricity sub sector: Tenaga Nasional Berhad (Tenaga) serving Peninsular Malaysia, Sabah Electricity Sdn. Bhd, (SESB) and Sarawak Electricity Supply Corp, (SESCO). Thirty medium sized cogeneration plants with a total capacity of 870 MW have been licensed by the Department of Electricity and Gas Supply or the Energy Commission (EC).

During the Seventh Plan period (1995-2000), the focus of the energy sector was on the sustainable development of depletable resources and the diversification of energy sources. The policy to reduce dependence on oil resulted in the rapid development and usage of natural gas. For the electricity subsector, the main thrust was ensuring adequacy of generating capacity as well as expanding and upgrading the transmission and distribution infrastructure. The use of new and alternative energy sources was encouraged and measures were also undertaken to utilise energy in an efficient manner.

For the Malaysian Eighth Plan period (2001-2005) (8MP), concerted efforts have been initiated to ensure the sustainable development of energy resources, both depletable and renewable energy as "the fifth fuel policy", in meeting the energy demand of the economy. Efforts will be intensified to ensure adequacy, quality and security of energy supply, encourage greater utilisation of gas and renewable energy as well as provide adequate electricity generating capacity. In addition, the development of industries that produce energy-related products and services will be supported for both the domestic and export markets.

Renewable energy (RE) and Energy Efficiency (EE) is now supported in the Eight Malaysian Plan period. The RE support is mainly focussed at biomass, where biomass is supported as the fifth fuel in the Malaysian fuel diversification program

2. General Overview of the Energy Sector

The Malaysian economy is expected to grow by 7.5% in the next decade (2001-2010), though the GDP actually grew at a steady rate of 4.2% in 2003. For the year 2001, the per capita primary energy supply was 2.196 toe and demand was 1.306 toe. The per capita electricity demand was 2622 kWh.

Malaysia owns 75 trillion cubic feet (Tcf) of proven natural gas reserves. Natural gas production has been rising steadily in recent years, reaching 1.50 Tcf in 2000, up from 1.42 Tcf in 1999. With the current rate at 2000 million standard cu ft per day, known natural gas reserves are expected to last for about 60 years.

Currently, almost 70% of the electricity requirements are supplied via gas-fired power plants. Most residential and commercial areas are now also supplied by natural gas.

Table 2.1: Economic Figures – compared to other ASEAN countries

Countries	Purchasing power parity (PPP) \$	Real GDP Growth %		Per Capita PPP \$	GDP per Sector		
		2003	2004		Agriculture %	Industry %	Services %
Cambodia	18 billion	5.0	5.5	1500	50	15	35
Indonesia	663 billion	3.5	4.0	3100	17	41	42
Malaysia	210 billion	4.2	5.1	9300	12	40	48
Philippines	356 billion	4.0	4.5	4200	15	31	54
Singapore	105 billion	2.2	4.2	24000	Negl	33	67
Thailand	429 billion	5.2	5.5	6900	11	40	49
Vietnam	168 billion	6.9	7.1	2100	25	35	40

Source: Asian Development Bank and World Bank Yearly Report for Year 2002

Malaysia currently has approximately 13 gigawatts (GW) of electric generation capacity, of which 84% is thermal and 16% is hydroelectric. In 2000, Malaysia generated around 63 billion kilowatthours of electricity. The Malaysian government expects that investment of \$9.7 billion will be required in the electric utility sector through 2010. Much of that amount will be for coal-fired plants, as the Malaysian government is promoting a shift away from the country's heavy reliance on natural gas for electric power generation.

It is estimated that the total final energy demand will grow in the range of 5% to 7.9% per year for the next 20 years and it was 3.6% to 10% in 1980 – 1998 periods. The total final energy demand is expected to reach 116 Mtoe by the year 2020 with the industrial sector maintaining a dominant share. Based on an annual growth rate of 8.1%, its share will reach 58.2 Mtoe by 2020. In other words, the industrial sector will consume about 50% of the total energy requirements of the country compared with the current share of 37.5%.

2.1. Energy Statistics and Data

Table 2.2: Final Commercial Energy Demand by Source

	1995		2000		2005		Growth rate	
	PJ	%	PJ	%	PJ	%	1995-2000	2000-2005
							(%)	(%)
Petroleum Products	676.0	72.8	804.3	68.9	1,139	67.0	3.5	7.2
Natural Gas	81.1	8.8	120	10.3	184.8	10.9	8.2	9.0
Electricity	141.3	15.2	205	17.6	320.0	18.8	7.7	9.3
Coal & Coke	29.8	3.2	37.8	3.2	55.9	3.3	4.9	8.1
Total	928.2	100.0	1,167	100.0	1,699	100.0	4.7	7.8

Source: National Energy Balance, 2001, Pusat Tenaga Malaysia (PTM)

Table 2.3: Energy Demand by Sector

	1995	2000		2005		Growth Rate (%)	
	%	PJ	%	PJ	%	1995-2000	2000-2005
Industrial	36.4	432.9	37.1	650	38.2	5.1	8.5
Transport	35.3	422.8	36.2	642.5	37.8	5.2	8.7
Residential&Commercial	12.8	147.8	12.7	213.2	12.5	4.5	7.6
Non-Energy	13.5	142.8	12.2	165.2	9.7	2.6	3
Agriculture&Forestry	2	20.8	1.8	28.9	1.8	2.2	6.8
Total	100	1,167.10	100	1,699.80	100	4.7	7.8

Source: National Energy balance, 2001- Pusat Tenaga Malaysia (PTM)

Malaysia has abundant biomass waste resources coming mainly from its palm oil, wood and agro-industries. A total of about 665 MW capacities can be expected if the estimated overall potential of about 20.8 million tons of biomass residues from these main sources in addition to 31.5 million tons of palm oil mill effluents (POME) is used for power generation and cogeneration. In addition, there is a substantial amount of unexploited biomass waste resources in the form of logging wood residues, rice straw, palm tree trunks and other residues.

2.2. Electricity Supply Industry

The electricity sub-sector is dominated by three integrated utilities, complimented by various independent power producers (IPPs), dedicated power producers and co-generators. They are:

- Tenaga Nasional Berhad (TNB) serving Peninsular Malaysia
- Sabah Electricity Sdn. Bhd. (SESB)
- Sarawak Electricity Supply Corp. (SESCo)
- various independent power producers (IPPs)

(a) Tenaga Nasional Berhad (TNB)

TNB is a public listed company and was established in 1990 through the corporatisation of the National Electricity Board. TNB is the largest electricity utility in Malaysia with more than RM 54.0¹ billion in assets. It also has the largest generation capacity of over 8,162 MW that accounts for over 61% of the total power generation in Peninsular Malaysia. 52,576 Gwh of electricity was sold to final consumers in the year 2000. The main subsidiaries of TNB are:

- TNB Generation Sdn. Bhd.

¹ Malaysian National Currency Ringgit (RM) is pegged against USD at USD 1 = RM 3.8.

2. TNB Transmission Sdn. Bhd.
3. TNB Distribution Sdn. Bhd.

Table 2.4: Installed Capacity of Power Plants in Malaysia (MW), 2001

	TNB	SESCO	SESB	IPPs			TOTAL MW
				PM ²	SWK ³	SAB ⁴	
STEAM							
Coal	1100	0.0	0.0	0.0	100	0.0	1200
Gas	1200	0.0	60.0	0.0	0.0	0.0	1260
Oil	360	0.0	103.0	0.0	0.0	0.0	463
Hydro	1898	90	66	0.0	0.0	0.0	2054
Mini Hydro	11.9	7.3	4.65	15	0.0	0.0	38.8
Diesel/LFO	0.0	93.9	79.75	0.0	0.0	170	343.7
Rural Diesel	0.0	0.0	4.3	0.0	0.0	0.0	4.3
Combined Cycle	1720	0.0	44.0	3850	0.0	0.0	5344
OPEN-CYCLE GT					0.0	0.0	
Diesel	68	64	0.0	0.0	0.0	0.0	132
Gas	1805	290	126	880	200	120	3421
TOTAL	8162.9	546.1	487.7	4475	300.0	290.0	14261.7

Source: Power Utilities and IPPs, Malaysia.

Table 2.5: Installed Capacity of Self-Generation of Electricity in Malaysia (MW)

No of Licenses of Power Generation	Total Capacity of Generators According to Type of Fuel in MW						Generation (GWh)
	Hydro	Gas	Diesel	Biomass	Oil	Total	
1907	2	163.05	508.13	183	5	861.18	985.3

Source: Department of Electricity & Gas Supply Malaysia and Ketua Merinyu Elektrik Sarawak.

(b) Sabah Electricity Sdn. Bhd. (SESB)

SESB was founded on 1 September 1998 to take over the business of electricity supply from Sabah Electricity Board, a statutory body of the Federal Government, which had been supplying electricity to consumers in Sabah and Labuan. TNB and the State Government of Sabah own SESB. SESB sold 1,912 Gwh of electricity in the year 2000. Its total installed capacity was 487.7 MW end of 2001.

(c) Sarawak Electricity Supply Corp. (SESCO)

SESCO is a statutory authority established by the State Government of Sarawak. The Sarawak Government has a 55% ownership and Sarawak Enterprise Corporation Bhd (SECB) holds the remaining 45% shares. SESCo is an integrated utility and sold 2,537Gwh of electricity in the year 2000. At the end of year 2001, the total installed capacity was 546 MW.

(d) Independent Power Generators (IPPs)

IPPs in Malaysia generate and sell electricity in bulk to the 3 dominant utilities. The combined installed capacity of IPPs in 2001 was 5065MW. In line with the privatisation plans of the electricity utility in Malaysia in 1990, there exist currently 13 IPPs. The IPPs in Malaysia can own their generation plants and also can sell power to the utilities through long-term power purchase agreements (PPAs).

² Peninsular Malaysia

³ Sarawak

⁴ Sabah

GRID SYSTEM IN PENINSULAR MALAYSIA



Figure 2.1: Map of Electricity Sector in Malaysia

Source: Energy Commission - http://www.st.gov.my/DL_Publications.htm

2.3. The Gas sector

The natural gas distribution is carried out by PETRONAS Gas Bhd and Gas Malaysia Sdn Bhd. PETRONAS Gas Bhd is supplying the natural gas to the IPP's in various part of peninsular Malaysia. Gas Malaysia Sdn Bhd is supplying the natural gas to the industrial and residential sectors from the natural gas main stream. The total gas pipeline availability for PETRONAS Bhd and Gas Malaysia Sdn Bhd are 1,700 km and 790 km respectively.

2.4. Electricity and Fuel Tariff / Prices

The tariff structures in Peninsular Malaysia, Sabah and Sarawak differ due to the differences in the cost of supply of electricity in those regions. The average tariff in Peninsula Malaysia, Sabah and Sarawak is 0.23 sen/kWh and 27.1 sen/Kwh respectively⁵. For detailed tabulation of the electricity tariff rates currently prevailing, **please refer the ANNEX 5 and ANNEX 6.**

2.5. Market Growth Forecast

According to the Third Outline Perspective Plan (OPP3), the Malaysian economy is expected to grow by 7.5% in the next decade (2001-2010). The actual GDP recorded for the year 2003 was 4.2%. It is estimated that the total final energy demand will grow by between 5% to 7.9% per annum for the next 20 years compared with a growth rate of 3.6% to 10% in 1980-98 period. It is expected that beyond 2005, the annual growth rate of final energy demand will be, to a certain extent, lower than the GDP growth. This indicates that the energy intensity is expected to decline slightly due to technological developments and the increasing use of more energy efficient equipment and processes.

In order to meet the electricity demand in the future, a total of 9,570 MW of new generation capacity will be planted between 2002 and 2007 in the Peninsula Malaysia. As a step to improve Malaysia's fuel diversity 5,600 MW will be coal fired power plant. By the year 2007, the fuel mix for electricity generation in Peninsular Malaysia will be 50-55% on natural gas, 30-35% on coal and the remaining on hydro, oil and renewable energy. In Sabah and Sarawak, the 2,400 MW capacity of hydro project is under construction now and is expected to be able to meet the future demand in Sabah and Sarawak.

2.6. Key Players in the Cogeneration Market

The government departments, Economic Planning Unit (EPU) of Prime Minister Department, Energy Commission, Ministry of Energy Communication and Multimedia (MECM) are the main drivers in developing the policy and providing incentives for cogeneration plant.

The utilities Tenaga Nasional Berhad, Sabah Electricity and Sarawak Electricity are buying the excess power from the IPP and cogeneration plant.

Approximately 900 MW of small to medium sized cogeneration licensees has been issued in Malaysia. Cogeneration is used in the selected IPP's, chemical plants and District Cooling systems like the one operating at the Kuala Lumpur International Airport (KLIA) in Sepang, Selangor. Most of the licensees were issued in the nineties, when Malaysia lacked power capacity and implemented a number of IPP's.

One of the newest and the biggest cogeneration plants is the 60 MW District Cooling project using natural gas as fuel in the new airport (KLIA) in Sepang, Selangor. The palm oil industry dominates

⁵ sen as in Ringgit (RM).

the small scale cogeneration market with more than 350 captive cogeneration plants in the palm oil mills.

Approximately 200 MW of small cogeneration systems have during a number of decades been implemented in the Malaysian palm oil mills and other isolated agro industries. In the small to medium sized cogeneration market the steam turbines is typically imported from EU, USA, China and Japan and the boiler is manufactured locally by Malaysian company.

Table 2.6: Cogeneration Facilities in Malaysia

Company	Location	Capacity (MW)	Type of Generation
SabahForest Industries Sdn. Bhd.	Sipitang, Sabah	57.7	Public
Perwaja Steel Sdn. Bhd.	Tanjung Berhala, Kemaman, Terengganu	9.5	Private
Titan Petrochemicals (M) Sdn. Bhd.	Pasir Gudang Industrial Estate, Johor	56	Private
Lembaga Padi dan Beras Negara	Sekinchan, Selangor	0.2	Private
Gas District Cooling (KLIA)	Sepang, Selangor	60	Public
Gas District Cooling (KLCC)	Kuala Lumpur City Centre	12	Private

Source: Compiled by the SIRIM Berhad.

3. Energy Sector Legislation Framework

Table 3.1: Policy Making Institutions Responsible For Energy Related Activities In Malaysia:

THE ENERGY SECTOR			
The Policy Maker		The economic and technical regulatory functions related activities.	
Institution	Area of Jurisdiction	Institution	Area of Jurisdiction
Economic Planning Unit	Responsible for formulating, regulating and implementing policies, regulations, legislations, programmes and projects to improve the economy and also co-ordinate functions of other energy related institutional bodies responsible for a specific sector.	The Energy Commission	Handles all Regulatory functions of the Ministry of Energy.
Ministry of Energy, Communications and Multimedia	<ul style="list-style-type: none"> - policy formulator and service regulator for the Energy, Communications and Multimedia sectors. - Facilitate and regulate the growth of industries in these sectors to ensure the availability of high quality, efficient and safe services at a reasonable price to consumers throughout the country. 	The Malaysia Energy Centre	To co-ordinate various activities, specifically energy planning and research, energy efficiency, and technological research, development and demonstration (R,D&D) undertaken in the energy sector due to the long lead time for energy projects to come on stream.
THE ENVIRONMENT SECTOR			
The Policy Maker		The economic and technical regulatory functions related activities.	
Institution	Area of Jurisdiction	Institution	Area of Jurisdiction
The Ministry of Science, Technology and Environment. (MSTE)	Policy formulation and regulatory functions related to environment.	Department of Environment under MSTE	- To administer and enforce the Environmental Quality Act, 1974 (Amendments 1985, 1996), and Section IV of the Economic Exclusive Zone Act, 1984.
THE INDUSTRY SECTOR			
The Policy Maker		The economic and technical regulatory functions related activities.	
Institution	Area of Jurisdiction	Institution	Area of Jurisdiction
The Ministry of International Trade and Industry	<ul style="list-style-type: none"> - Responsible for all policies, regulations and guidelines for facilitating International Trade. - Industry development responsibilities and related policy framework formulation and implementation. - Responsible for functioning of all administrative and technical bodies providing trade and the industries. - monitor and report domestic and global development trends affecting industry, investment, trade and productivity. 	The industrial Policy and Incentive Committee (IPIC)	<ul style="list-style-type: none"> - Steering and guiding the Industry task forces involved with the implementation of the second Industrial Master Plan (IMP2) 1996-2005 and responsible. - proposing policies from these task forces before final submission to the ICC.
Industrial Coordination Council(ICC)			
Chaired by the Minister of the International Trade and Industry, provides overall policy guidance and direction for the implementation of the second Industrial Master Plan(IMP2) 1996-2005			

3.1. Liberalisation of the Electricity and Gas Market

At the present there are new legislations concerning the Liberalisation of the Electricity and Gas Market in Malaysia. The Electricity Supply Act 1990 and The Gas Supply Act 1993, still regulate the gas and the electricity market. The shift to diversifying the fuel sources to generate electricity has led to few minor amendments in the Gas Policy to promote natural gas as a preferred fuel to generate electricity and for use in industries and households.

The Gas Supply Act 1993 was enacted to safeguard the interests of consumers supplied with gas through pipelines and from storage tanks or cylinders specifically used for reticulation of gas. Gas was reticulated to commercial and industrial outlets as well as residential consumers. It came into effect simultaneously with the gazetting of the Gas Supply Regulations 1997. The Regulations include procedures for the issuance of a license to supply installation of gas pipelines, inspection, tests and maintenance of gas installations as well as the certification and registration of competent persons to undertake the relevant work in such a manner as to ensure public safety. Both the Act and its Regulations are enforced by the Director General of the Electricity and Gas Supply Department.

With the introduction of the Electricity Supply Act 1990, the Electrical Inspectorate Department was abolished and the Department of Electricity Supply (DES) was formed. The new Department of Electricity Supply, besides taking over the responsibilities and duties of the former Electrical Inspectorate Department, is also vested with the roles of regulating the electricity supply industry in the peninsula and Sabah. In Sarawak, the Electricity Ordinance (Sarawak Chapter 137) is still in force enabling the Sarawak Electricity Supply Corporation to continue with the role of supplying of electricity and the state Chief Electrical Inspector with the responsibility of licensing and ensuring safety of the electrical installations and equipment in the state⁶.

3.2. Legislation and Programs Promoting Cogeneration

Since the IPP development in the nineties, no direct policy and legislation has been promulgated to promote cogeneration. Cogeneration has only been indirectly supported in the energy efficiency and biomass power measures initiated in connection with the Eight Malaysian Plan (The Malaysian plan for the period 2001 to 2005).

Malaysia started its restructuring of the electric power industry in 1990 when the Parliament passed into Law the Electricity Supply Act of 1990. The then National Electricity Board was corporatised into a wholly-owned Government company, Tenaga Nasional Berhad (TNB) with regulatory oversight by the Department of Electricity and Gas Supply or JBEG.

The Tenaga Nasional Berhad was privatised in 1992 allowing the private sector to own about 30 percent of TNB when the paid-up capital was enlarged. This was quickly followed by the entry of independent power producers or IPPs, majority owned by the private sector, from late 1994. Today, around 35 percent of total installed generation capacity are owned and operated by independent power producers.

3.3. Legislation and Programs Promoting Energy Efficiency

Energy Efficiency (EE) is now supported in the Eight Malaysian Plan period. EE programmes will focus on the industrial and commercial sectors being the major consumers of energy. Measures to promote the efficient utilisation of energy include the enforcement of the Energy Efficiency Regulation, extension of financial and fiscal incentives and demonstration projects. In this respect, the establishment of new integrated complexes and townships that are managed on an energy-efficient manner will be encouraged. The implementation of demand-side management will be

⁶ Source: Excerpt from the Department of Gas and Electricity, Malaysia.

intensified during the Plan period, which includes retrofitting and district cooling programmes, changing the energy usage pattern and appliance labelling.

3.4. Legislation and Programs Promoting Biomass

In the Eight Malaysian Plan, Renewable Energy was announced as the fifth fuel in the new Five Fuel Strategy in the energy supply mix. It is targeted that RE will contribute 5% of the country's total electricity demand by the year 2005, that is by the end of the Eighth Malaysia Plan period. With this objective in mind, greater effort is being undertaken to encourage the utilisation of renewable resources, such as biomass, biogas, solar and mini-hydro, for energy generation.

Utilisation of RE as the fifth fuel will be intensified to supplement the supply from conventional energy sources. RE resources that will be promoted in terms of priority are biomass, biogas, municipal waste, solar and mini-hydro projects. Of these, biomass resources, such as palm oil wastes and wood residues as well as rice husks, will be used on a wider basis for the purpose of heat and electricity generation.

Biomass-based cogeneration system for the production of electricity and usable energy will be encouraged. In this respect, the generation of energy mainly for in-house consumption will be promoted. The supply of excess energy generated by the biomass-based generating system to the local community and to the grid will be considered, depending on its technical and commercial viability.

In promoting greater utilisation of RE resources, initiatives that will be considered include demonstration projects and commercialisation of research findings as well as extension of financial and fiscal incentives for RE-related activities. Under the Budget 2001, biomass-based generating companies that applied for incentives by December 2002 were granted exemption of income tax on 70 per cent of the statutory income for five years or a tax allowance of 60 per cent of qualifying capital expenditure incurred within five years. In addition, import duty and sales tax exemption on machinery and equipment that were not produced locally was also granted. Co-operation between government agencies and private institutions in the development of RE resources will also be promoted.

The government extended in the year 2003 budget the fiscal incentive to encourage the private sector involvement in the SREP programme and energy efficiency. These benefits were extended until 31 December 2005.

No new regulation was introduced in 2003. The Government is considering modifying the price mechanism for renewable energy projects. Pusat Tenaga Malaysia has conducted a study to review the selling price of renewable energy to the utility. The objective of the study is to recommend to the government the renewable energy price and the mechanism to reduce the financial barriers. The maximum selling price to the utilities is RM 0.17 per unit for Peninsular Malaysia and RM 0.21 for Sabah. Currently, the government through the Energy Commission is reviewing the price to encourage developers to venture in the new business. This is to ensure that the SREP is an attractive and feasible programme for the small IPP developers. Clean Development Mechanism Policy is further being developed by the government to encourage the implementation of small renewable energy project.

(a) National Programme on Grid Connected Palm Oil Biomass Power Generation

The Ministry of Energy, Communications and Multimedia has received a grant facility from GEF to develop a detailed full project brief for a National Programme on Grid Connected Palm Oil Biomass Power Generation. The main aim of the project is to identify and remove barriers to commercial utilisation of biomass residue co-generation, including grid connected power generation in Malaysia.

(b) Small Renewable Energy Programme (SREP)

This Programme is one of the steps being undertaken by the Government to encourage and intensify the utilisation of Renewable Energy in power generation. It is in line with the Government's decision to intensify the development of RE as the fifth fuel resource.

SREP aims to:

- Promote the growth of small power generation plants that utilise Renewable Energy.
- Facilitate the expeditious implementation of grid-connected renewable energy resource-based small power plants to enable them to sell their electricity to the Utility through the Distribution Grid System.
- Promote and encourage the development of more efficient RE technologies

3.5. Legislation and Programs Promoting Natural Gas

Natural gas is part of the Malaysian Five Fuel Strategy with the aim to ensure energy security and reliability. The use of natural gas in electricity generation has the aim to ensure system security and reliability. The power sector continued to be the main consumer of gas accounting for 80.7 per cent of total gas utilisation in 2000.

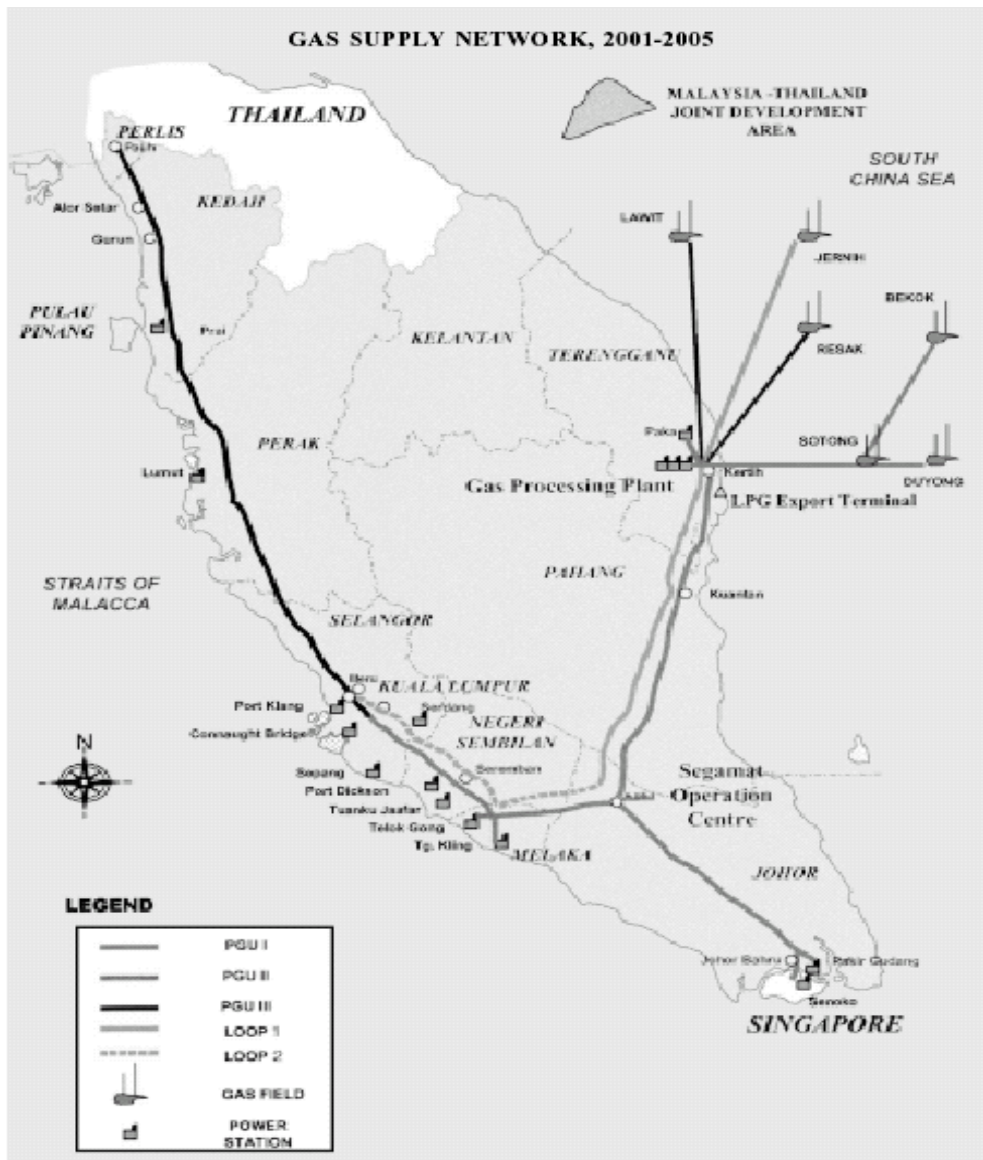


Figure 3.1: Gas Supply Network

3.6. Legislation and Programs Governing Petroleum

The Petroleum Development Act (1974) is enacted by PETRONAS and comes under the direct purview of the Prime Minister and is responsible for its planning, investment and regulation of all up-stream activities. The Ministry of International Trade and Industry (MITI) as well as the Domestic Trade and Consumer Affairs (MDTCA), through the Petroleum Regulations of 1974 (amended in 1975 and 1981), are vested with powers to regulate all downstream activities. MITI is responsible for the issuance of licences for the processing and refining of petroleum and the manufacture of petrochemical products, whilst MDTCA issue licences for the marketing and distribution of petroleum products.

3.7. Legislation and Programs Promoting Coal

The use of coal as an energy source in electricity generation has the aim to ensure system security and reliability. To meet the objective of the fuel diversification policy, three coal-fired power plants at Kapar, Manjung and Lukut will be commissioned during 2000-2005 period. These plants will utilise 11.2 million tonnes of coal per annum. Clean coal technology which will include among others, electrostatic precipitators and flue gas de-sulphurisation for emission control, will be utilised in these new plants to ensure environmental standards are met.

3.8. Clean Development Mechanism (CDM)

Malaysia ratified the Kyoto Protocol in September, 2002. With that, efforts have been carried out to look into opportunities to reduce the greenhouse gas (GHG) emission options in the country. A National Committee on CDM has been set up in The Ministry of Science, Technology and the Environment, which is the national focal point for climate change. Through the Ministry of Energy, Communications and Multimedia, The Malaysian Energy Centre (PTM) has been appointed as the CDM Secretariat for the energy sector.

In a parallel development, The Ministry of Primary Industries has been assigned to set up a CDM Secretariat for the forestry sector.

4. Conclusions

Small to medium sized cogeneration licensees have been issued in Malaysia which will produce approximately 900 MW of electricity. Cogeneration is used in selected IPPs, chemical plants and District Cooling systems (For example, the Kuala Lumpur International Airport (KLIA) in Sepang, Selangor). Most of the licensees were issued in the 90s, where Malaysia lacked power capacity and implemented a number of IPPs.

Small cogeneration systems usually in the Malaysian palm oil mills and other isolated agro industries have existed for few decades now, signifying the fact that cogeneration is not a new in the Malaysian Energy scene.

Since the IPP development in the 90s no direct policy and legislation has been in force to promote cogeneration. Cogeneration has only been indirectly supported in the energy efficiency and biomass power measures initiated in connection with the 8Malaysian Plan (The Malaysian plan for the period 2001 to 2005).

The SREP biomass power supporting program launched in May 2001 by the MECM minister, where biomass power electricity has been given access to export to the National grid to an “almost fixed⁷” tariff has initiated an option for grid connected biomass cogeneration in Malaysia. So far only limited number of cogeneration plants has been implemented due to the initiatives of the SREP program.

There are cost-effective opportunities for CHP capacity to grow several-fold in Malaysia.

- COGEN 3 estimates that a further 1000 MW of cogeneration capacity could be added

Some recommended next steps:

- The Energy Commission (EC) should promulgate a national interconnection standard. EC should also develop guidelines for the purchase of backup and supplemental power service for cogeneration facilities at fair and reasonable terms.
- Incentives should be adopted that enact tax credits to encourage efficient, low-emissions cogeneration systems.
- EC should implement rules favourable to cogeneration, facilitate siting and permitting, cost-share cogeneration feasibility studies, and review industrial and commercial as well as residential facilities for cogeneration opportunities.
- EC should support educational and technical assistance efforts by state and regional initiatives to identify and implement cogeneration at appropriate sites.

⁷ Please Refer Section 3.4 on Legislation and Programs Promoting Biomass for the fixed tariff rates

5. Links and Other Sources of Information

1. <http://www.st.gov.my/tariff.html#TNB> – The Energy Commission Website
2. <http://www.st.gov.my/cogeneration.html> - The Energy Commission website
3. http://www.gasmalaysia.com/AtYourService/index.jhtml?page_id=6350 -
4. <http://www.ktkm.gov.my/> - Website of The Ministry of Energy, Information and Multimedia of Malaysia
5. <http://www.tnb.com.my/> - The Malaysia's national electricity utility company.
6. <http://www.ptm.org.my/> - The Malaysian Centre for Energy.
7. National Energy Balance Malaysia – Quarterly report - The Ministry of Energy, Information and Multimedia of Malaysia.
8. <http://ns2.ptm.org.my/> - Malaysia Energy Database and Information System.
9. Asian Development Outlook 2003 Update – Asian Development Bank
10. The World Bank Outlook Reports, Country wise data and statistics.
11. www.jbeg.gov.my/english/akta_eng.htm - The Department of Malaysian gas and electricity sectors.

ANNEXES

ANNEX 1. Existing and future IPP's in Malaysia

Annex 1.1. Tenaga Nasional Berhad (TNB)

	Year	Capacity (MW)	Fuel
TNB Kapar (Phase III)	2001	1000	Coal
TNB Gelugor (conversion)	2002	110	Gas
IPP Sepang			
• open cycle	2002	460	Gas
• conversion	2003	250	Gas
IPP Lumut Block			
• open cycle	2002	430	Gas
• conversion	2003	210	Gas
IPP Telok Gong			
• open cycle	2002	430	Gas
• conversion	2003	290	Gas
TNB Pasir Gudang	2002	220	Gas
IPP Prai	2003	350	Gas
TNB Port Dickson	2003	1,500	Gas
TNB Manjung	2003	700	Coal
XXXXXXXXX ?	2004	1,400	Coal
IPP K. Sanglang	2004	650	Gas
IPP Sabah	2004	100	Gas
IPP Pulau Bunting	2005	700	Coal
Total		8,800	

Annex 1.2. Independent Power Generators (IPPs) - Peninsular Malaysia

IPP	Location	Capacity (MW)	Fuel	License Issued
YTL Power Generation	Paka, Terengganu Pasir Gudang, Johor	808 404		7 April 1993
Segari Energy Ventures Sdn. Bhd.	Lumut, Perak	1,303		15 July 1993
Powertek Sdn. Bhd.	Alor Gajah, Melaka	440		1 December 1993
Port Dickson Sdn. Bhd.	Tanjung Gemuk, Port Dickson	440		1 December 1993
Pahlawan Power Sdn. Bhd	Tanjung Keling, Melaka	334		26 May 1999
Genting Sanyen Power Sdn. Bhd.	Kuala Langat, Selangor	720		1 July 1993

Annex 1.3. Independent Power Generators (IPPs) - Sabah

IPP	Location	Capacity (MW)	Fuel	License Issued
ARL Tenaga Sdn. Bhd.	Melawa	50		14 June 1994
Serudong Power Sdn. Bhd.	Tawau	36		31 March 1995
Powertron Resources Sdn. Bhd.	Karambunai	120		6 February 1997
Stratavest Sdn. Bhd.	Sandakan	64.4		1 October 1996
Sandakan Power corporation Sdn. Bhd.	Sandakan	34		29 November 1997

Annex 2. Cogeneration Licensees in Malaysia

No.	Licensee	Capacity (MW)	Type of Generation	Fuels	Top Up (MW)
1.	Sabah Forest Industries Sdn.Bhd. W.D.T.31, Sipitang, Sabah.	57.7	Public	Wood /Diesel	-
2.	Perwaja Steel Sdn.Bhd. Tanjung Berhala, Kemaman, Terengganu.	9.5	Private	Waste Heat From Industrial Process	169
3.	Lembaga Padi dan Beras Negara, Sekinchan, Selangor.	(*) 0.2	Private	Agriculture Waste	0.5
4.	Lembaga Padi dan Beras Negara, Ulu Dedap, Kg. Gajah, Perak.	(*) 0.6	Private	Agriculture Waste	2.3
5.	Lembaga Padi dan Beras Negara, Changkat Lada, Kg. Gajah, Perak.	(*) 0.6	Private	Agriculture Waste	2.3
6.	Ban Heng Bee Rice Mill Sdn.Bhd. Lot 2171, Jalan Bukit Rajah Pendeng, Kedah.	(*) 0.5	Private	Agriculture Waste	-
7.	DMIB Berhad 4, Jalan Tandang, 46050 Petaling Jaya, Selangor	(**) 2.4	Private	Natural Gas	4.2
8.	Consolidated Plantations Bhd. Tennamaram, Batang Berjuntai, Selangor.	2.0	Private	Agriculture Waste	-
9.	Consolidated Plantations Bhd.-Nova Scotia Palm Oil Mil Bt. 5 Jalan Maharaja Lela, 36009 Teluk Intan, Perak	3.4	Private	Agriculture Waste	-
10.	Gas District Cooling (KLCC) Sdn.Bhd. Kuala Lumpur City Centre.	12	Private	Natural Gas	-
11.	Gas District Cooling (KLIA) Sdn. Bhd. Kuala Lumpur International Airport, Sepang, Selangor.	60	Public	Natural Gas	-
12.	See Sen Chemical Bhd. Kawasan Perindustrian Telok Kalong, Kemaman, Terengganu.	6	Public	Waste Heat From Industrial Process	-
13.	Public Holdings Sdn.Bhd. Jalan Ayer Hitam, Mukim Dengkil, Sepang, Selangor.	1.8	Private	Natural Gas	1.0
14.	Tractors Malaysia (1982) Sdn.Bhd. Kampung Puchong, Daerah Petaling, Selangor.	1.2	Private	Natural Gas	0.9
15.	Profound Heritage Sdn.Bhd. Sutera Harbour Resort, Kota Kinabalu, Sabah.	24 #(38)	Public	Diesel/Natural Gas	-
16.	TCL Industries (M) Sdn.Bhd. Telok Kalong Industrial Area Kemaman, Terengganu.	7	Private	Waste Gas From Industrial Process	-
17.	Malaysian Mosaics Bhd. Batu 3, Mukim Kluang, Jalan Batu Pahat, Kluang Johor	4.2	Private	Natural Gas	1.5
18.	Laras Perkasa Sdn.Bhd. Temerloh, Pahang.	79.2	Public	Oil	-
19.	Titan Petrochemicals (M) Sdn.Bhd. Plo 312, Jalan Tembaga 4, Pasir Gudang Industrial Estate, Pasir Gudang, Johor.	56	Private	Waste Gas From Industrial Process	6
20.	Titan Petrochemicals (M) Sdn.Bhd. PLO 8, Tanjung Langsat Industrial Park, Mukim Sg.Tiram, Johor Bharu, Johor.	42.6	Private	Natural Gas	6.0
21.	Shell Refining Company (FOM) Bhd., Batu 1, Jalan Pantai, Port Dickson, Negeri Sembilan	35	Public	Waste Gas From Industrial Process	-
22.	Bandar Utama City Corp. Sdn.Bhd. No.1, Persiaran Bandar Utama, Petaling Jaya.	(**) 50 # (100)	Public	Natural Gas	50
23.	Wirazone Sdn.Bhd.	(**) 12		Natural Gas	55

No.	Licensee	Capacity (MW)	Type of Generation	Fuels	Top Up (MW)
	Kuala Lumpur Sentral Development, Brickfields, Kuala Lumpur.	# (60)	Public		
24.	CCM Chemicals Sdn.Bhd. Pasir Gudang Works, Plot. 411, Kaw 4, Jalan Perak Satu, Pasir Gudang, Johor.	(**) 6.3	Private	Natural Gas	10.6
25.	Amoco Chemical (Malaysian) Sdn.Bhd. Lot 116, Gebeng Industrial Estate, P.O Box 11, Balok, 26080 Kuantan, Pahang.	(**) 21.6	Private	Natural Gas	2.4
26.	Seseni Energy Services Sdn. Bhd. Plaza Merdeka, Jalan Stadium, Kuala Lumpur	(**) 8.8 # 40	Public	Natural Gas	35
27.	Petronas Methanol (Labuan) Sdn.Bhd. Kompleks Petronas Methanol (Labuan), Kawasan Perindustrian Ranca-Ranca, Bersebelahan Stesen Janakuasa Sabah Electricity Sdn.Bhd. Patau-patau.	(**) 12.8	Public	Natural Gas	-
28.	Petronas Gas Bhd. Kertih, Terengganu	(**) 210	Public	Natural Gas	-
29.	Petronas Gas Bhd. Gebeng, Kuantan, Pahang.	(**) 105	Public	Natural Gas	-
30.	Tin Siang Oil Mill (Perak) Sdn.Bhd. , Lot 2161, Batu 21, Jalan Beruas, Padang Gajah, 32700 Beruas, Perak	1.8	Private	Agriculture Waste	-

Annex 3. General Data

Official Name	Federation of Malaysia
Population	23.8 million (mid-2001)
Territory	330.000 km ² , divided among Peninsular Malaysia and the East provinces of Sabah and Sarawak (in the island of Borneo)
GDP (USD billions)	89.7
GDP Growth	8.3 %
GDP per capita	\$US 3.780 **
Inflation	1.5 %
Unemployment	3.68 % (2001) *
Currency	Ringgit (pegged to \$US at RM 3.8:US \$1)
Official Reserves	\$US 30.4 billion (2001) *
Trade Balance	\$US 14.5 billion

Source: World Bank, except * Asia Development Bank (ARIC indicators), and ** The Economist Intelligence Unit. Figures of 2000 unless otherwise indicated.

Annex 4 Electricity Tariff Rates - TNB

Tariff Category	Unit(RM)	Rates
1. Tariff A - Domestic Tariff For the first 200 units per month For the next 800 units per month For each additional units per month The Minimum Monthly Charges is RM2.50	Sen/kWh Sen/kWh Sen/kWh	21.8 25.8 27.8
2. Tariff B - Low Voltage Commercial Tariff For all units The minimum Monthly Charges is RM 6.00	Sen/kWh	28.8
3. Tariff C1- Medium Voltage General Commercial Tariff For each kilowatt of maximum demand per month For all unit	RM/Kw Sen/kWh	17.30 20.8
4. Tariff C2 - Medium Voltage Peak/Off-Peak Commercial Tariff For each kilowatt of maximum demand per month during the Peak Period For all units during the Peak Period For all units during the Off-Peak Period	RM/kW Sen/kWh sen/kWh	25.70 20.8 12.8
5. Tariff D – Low Voltage Industrial Tariff For all units <i>Special for customer who qualify</i> For all units The minimum Monthly charges is RM 6.00	sen/kWh sen/kWh	25.8 23.8

Tariff Category	Unit (RM)	Rates
6. Tariff E1 – Medium Voltage General Industrial Tariff		
For each kilowatt of maximum demand per month For all units	RM/Kw Sen/kWh	17.30 19.8
<i>Special for customer who qualify</i> For each kilowatt of maximum demand per month	RM/Kw	13.20
For all units	Sen/kWh	18.8
The minimum Monthly Charges is RM 500.00		
7. Tariff E2 – Medium Voltage Peak/Off-Peak Industrial Tariff		
For each kilowatt of maximum demand per month during Peak Periods	sen/kWh	21.7
For all units during Peak Periods	sen/kWh	20.8
For all units during Off-Peak Periods	sen/kWh	12.8
<i>Special for Customers who qualify</i> For each kilowatt of maximum demand per month during Peak Periods	RM/kW	18.4
For all units during Peak Periods	sen/kWh	18.8
For all units during Off-Peak Periods	sen/kWh	10.8
The minimum Monthly Charges is RM 500.00		
8. Tariff E3 - High Voltage Peak/Off Peak Industrial Tariff		
For each kilowatt of maximum demand per month during Peak Periods	RM/Kw	20.80
For all units during Peak Periods	Sen/kWh	19.8
For all units during Off-Peak Periods	Sen/kWh	11.8
<i>Special for customers who qualify</i> For all kilowatt of maximum demand per month during Peak Periods	RM/Kw	16.20
For all units during Peak Periods	Sen/kWh	17.8
For all units during Off-Peak Periods	Sen/kWh	9.8
The minimum Monthly Charges is RM 500.00		

Tariff Category	Unit(RM)	Rates
<p>9. Tariff F – Low Voltage Mining Tariff</p> <p>For all units</p> <p>The Minimum Monthly Charges is RM 100.00</p>	Sen/kWh	21.8
<p>10. Tariff F1 - Medium Voltage General Mining Tariff</p> <p>For each kilowatt of maximum demand per month</p> <p>For all units</p> <p>The Minimum Monthly Charges is RM 100.00</p>	RM/Kw Sen/kWh	12.00 17.8
<p>11. Tariff F2 - Medium Voltage Peak/Off-Peak Mining Tariff</p> <p>For each kilowatt of maximum demand per month during Peak Periods</p> <p>For all units during Peak Period</p> <p>For all units during Off-Peak Period</p> <p>The Minimum Monthly Charges is RM 100.00</p>	RM/Kw Sen/kWh sen/kWh	17.00 17.8 9.8
<p>12. Tariff G –Street Lighting Tariff</p> <p>For all units (include maintenance – applicable for street lights mounted on Poles of TNB low voltage overhead mains)</p> <p>For all units (exclude maintenance)</p> <p>The minimum monthly charges is 15% of the calculated revenue in a month</p>	Sen/kWh sen/kWh	17.3 10.8
<p>13. Tariff G1 –Neon Light & Floodlight Tariff</p> <p>(Applicable for the purpose of lighting up roadside advertisement billboards or for decorating the façade of buildings)</p> <p>For all units</p> <p>The minimum monthly charges is 15% of the calculated revenue in a month</p>	sen/kWh	11.8

Tariff Category for Sabah Electricity Sdn Bhd (SESB)	Unit (RM)	Rates
1. Domestic 0-40 units permonth 41-200 units per month Above 200 units per month Minimum monthly charge	Sen/kWh Cent/kWh Cent/kWh RM	24 16 28 5.00
2. Commercial Class 1 0-1,000 units per month Above 1000 units per month Minimum monthly charge	Cent/kWh Cent/kWh RM	32 27 15.00
3. Commercial Class 2 For consumers with maximum demand above 500 kW Maximum demand charge per month All units per month Minimum monthly charge	RM/kW Cent/kWh RM	15.00 25 1000.00
4. Industrial Class 1 0-2,000 units per month Above 2000 units per month Minimum monthly charge	Cent/kWh Cent/kWh RM	32 26 15.00
5. Commercial Class 2 For consumers with maximum demand above 500 kW Maximum demand charge per month All units per month Minimum monthly charge	Cent/kWh Cent/kWh RM	15.00 20.00 1,000.00
6. Public Lighting All units per month	Cent/kWh	30

Tariff Category for Sarawak Electricity Supply Corporation (SESCO)	Unit (RM)	Rates
COMMERCIAL 1. Tariff C1 Applicable to consumer taking commercial supply whose estimated monthly consumption does not exceeds 100,000 kWh. 0-100 units per month 101-5000 units per month Above 5000 units per month Minimum monthly charge	Cent/kWh Cent/kWh Cent/kWh RM	40 34 30 10.00
2. Tariff C2 Generally available on application to consumer taking commercial supply whose estimated monthly consumption exceeds 100,000 kWh Maximum demand price Energy price Minimum monthly charge	RM/kW Cent/kWh RM/kW	12.00 25 12.00
3. Tariff C3 Generally available on application to consumer taking commercial supply whose estimated monthly consumption exceeds 100,000 kWh Peak Period (0700-2400 hrs) Maximum demand price Energy price Off Peak Period (0000-0700hrs) Energy price Minimum monthly charge	RM/kW Cent/kWh Cent/kWh RM/kW	20.00 25 10 20.00
INDUSTRIAL 4. Tariff I1 Applicable to consumer taking commercial supply whose estimated monthly consumption does not exceeds 100,000 kWh. 0-100 units per month 101-3000 units per month Above 3000 units per month Minimum monthly charge 5. Tariff I2 Generally available on application to consumer taking commercial supply whose estimated monthly consumption exceeds 100,000 kWh Maximum demand price Energy price Minimum monthly charge 6. Tariff I3 Generally available on application to consumer taking commercial supply whose estimated monthly consumption exceeds 100,000 kWh	Cent/kWh Cent/kWh Cent/kWh RM RM/kW Cent/kW RM/kW	40 30 21 10.00 12.00 17 12.00

Peak Period (0700-2400 hrs) Maximum demand price Energy price Off Peak Period (0000-0700hrs) Energy price Minimum monthly charge	RM/kW Cent/kWh Cent/kWh RM/kW	20.00 17
DOMESTIC 7.Tariff D Applicable to consumer taking domestic supply) 0-100 units per month 101-400 units per month Above 400 units per month Minimum monthly charge PUBLIC LIGHTING 8.Public Lighting Energy price Minimum monthly charge	Cent/kWh Cent/kWh Cent/kWh RM Cent/kWh RM	34 29 33 5.00 47 10.00

Annex 5: Gas Tariff

	Minimum Volume (Sm ³ /Month)	Unit Charge (RM/Sm ³)	Applicable Range (Sm ³ /year and mmBtu/year)
Domestic Tariff (A)	-	RM 0.75/m ³	N/A
Monthly Fixed Charge	-	RM 5.00	
Small Business Tariff (B)	210	RM 0.58/Sm ³	0- 15,793 (0- 600 mmBtu)
Small Commercial & Industrial Tariff (C)	980		
Small Commercial & Industrial Tariff (D)	1,600	RM 0.50/Sm ³	131,514 – 1,315,013 (5,001 – 50,000 mmBtu)
Large Commercial & Industrial Tariff (E)	25,000	RM 0.49/Sm ³	131,514- 5,260,013 (50,00 – 200,000 mmBtu)
Large Commercial & Industrial Tariff (F)	25,000	RM 0.49/Sm ³	5'260,014 – 19,725,000 (200,001 – 750,000 mmBtu)
			Rates
Residential			
Usage above 3m ³		RM 2.89/m ³	
Usage below 3m ³		RM 10.00	
<i>(minimum Charge for two months)</i>			
Retail Commercial			
Minimum monthly charge for the first 10 units		RM 80.00	