

ENERGY AND MINERALS

ENERGY

Department of Minerals and Energy

The Department of Minerals and Energy is responsible for the administration and regulation of legislation relating to mining and energy. This includes the following Acts: *Coal Mines Act 1958*; *Corio to Newport Pipeline Act 1953*; *Explosives Act 1960*; *Extractive Industries Act 1966*; *Gas Act 1969*; *Groundwater Act 1969*; *Inflammable Liquids Act 1966*; *Liquefied Petroleum Gas Act 1958*; *Liquefied Gases Act 1968* (partially proclaimed); *Mines Act 1958*; *Mining Development Act 1958*; *Petroleum Act 1958*; the *Commonwealth Petroleum (Submerged Lands) Act 1967*; the *State Petroleum (Submerged Lands) Act 1982*; *Pipelines Act 1967*; *Shell (Corio to Williamstown) Pipelines Act 1964*; *Underseas Mineral Resources Act 1963*; *Coal Mine Workers' Pensions (Early Retirement) Act 1958*; *Minerals and Energy Act 1976*; *Mines (Aluminium Agreement) Act 1961*; and the *Liquefied Petroleum Gas Subsidy Act 1980*.

The Minister for Minerals and Energy is responsible for the administration of the Department of Minerals and Energy, as well as for the State Electricity Commission of Victoria, the Gas and Fuel Corporation of Victoria, the Victorian Brown Coal Council, and the Victorian Solar Energy Council.

The Geological Survey Division of the Department carries out field geological surveys and regional exploration and the Draughting Branch prepares the resulting geological maps and technical reports which increase understanding of the geology, petroleum, mineral, stone, and groundwater potential of Victoria. Deep drilling to establish groundwater resources for town water supply purposes, together with various shallow drilling programmes, is undertaken by the Drilling Branch of the Oil and Gas Division at sites selected by the Geological Survey Division. The Oil and Gas Division administers, on behalf of the Commonwealth Government, the *Offshore Petroleum (Submerged Lands) Act 1976* and, for the State, the *Petroleum Submerged Lands Act 1982*. Under these two Acts crude oil amounting to about 70 per cent of Australia's requirements is produced. These products and other gaseous liquid substances are transmitted by pipelines constructed under the supervision of the Department. Core and cuttings from drilling operations are retained in a core library, and a geological museum and comprehensive library are maintained. Technical and drilling assistance and loans or grants are considered for mineral exploration, prospecting, and approved development projects. Stamp batteries are maintained at five country locations to enable trial crushings to be made for the benefit of prospectors. The Department also undertakes the capping or filling of disused shafts on Crown land. Through its Energy Division, the Department co-ordinates advice to the Victorian Government on energy policy and monitors the implementation of that policy. The Department plays a leading role in promoting energy conservation in Victoria. The Divisions of Administration and Hazardous Materials make up the full complement of the Department.

Further reference: *Victorian Year Book 1978*, pp. 295-7

General

Management of energy

Each year Victorians spend billions of dollars on oil, petrol, electricity, and gas. Considerable advertising and public relations budgets have in the past been allocated to

promote the sale of energy in its various forms. However, as the price of energy and questions about its continued ready availability have assumed more importance, the Victorian Government has sought means by which supply may be balanced with demand, and the most appropriate use made of the various forms of energy at the State's disposal.

Energy conservation is one of the few Victorian Government energy policy options capable of influencing the local short-term supply/demand balance. Consequently, the Victorian Government's energy policies place emphasis on the responsible management of energy resources. At the end of 1982, these policies included price disincentives to energy waste through the introduction of new tariff structures to promote conservation of electricity and gas; a Home Energy Savings Campaign; a Save Petrol Campaign; an Energy Audit for schools; and an industry energy conservation programme.

The Victorian Government also announced its intention to provide new energy management services to the community. These included:

- (1) The Victorian Energy Plan—a project to study energy pricing and future energy use;
- (2) the Home Energy Inspection Service—a service designed to provide free inspections and advice on ways energy may be saved in individual homes;
- (3) the Government Energy Management Programme—a plan to reduce energy use in Government buildings; and
- (4) Energy Sales Centres—centres to combine the marketing of electricity and gas appliances and provide advice on energy and its use. The introduction of the Energy Sales Centre provides for the gradual phasing out of the present separate State Electricity Commission and Gas and Fuel Corporation showrooms.

Sources of energy

During recent years, natural gas has assumed an increasingly important role in the supply of energy in Victoria. Over 99 per cent of all gas used in Victoria for domestic and industrial purposes is produced from the offshore gas and oilfields in Bass Strait. It is estimated that this resource is adequate to provide Victoria's needs for the next 30 years. There is a small but steadily increasing use of liquefied petroleum gas (propane, butane) derived from refineries and the Bass Strait gas and oilfields.

In 1980–81, about 74 per cent of Victoria's electricity needs were produced by the brown coal fired generating stations situated in the coalfields in the La Trobe Valley and 14 per cent by peak-load thermal stations. A further 3 per cent of Victoria's electricity requirements is currently generated in hydro power stations located in the north-eastern ranges of the State and 9 per cent is obtained from the Snowy Mountains Hydro-Electric Scheme in New South Wales.

About 96 per cent of Victoria's petroleum refinery crude oil input in 1978–79 came from the State's offshore oilfields and the balance was derived from crude oil imported from the Middle East.

VICTORIA—PRIMARY ENERGY RESERVES (PROVEN ECONOMICALLY RECOVERABLE), 1980–81

Source	Million terajoules	Per cent
Crude oil	17.3	3.7
Brown coal	442.8	93.8
Natural gas	8.5	1.8
Gas liquids	3.3	0.7
Total	471.9	100.0

Source: Department of Minerals and Energy.

Brown coal

Location

Victoria's largest resources of fossil fuels are the huge deposits of brown coal in the central Gippsland region. These extend over an area of about 500 square kilometres

commencing about 140 kilometres east-south-east from Melbourne, with by far the most valuable and best quality coal being located in the La Trobe Valley. These deposits, which form the bulk of primary energy available to Victoria, compare in extent with other major deposits of brown coal in the world. Smaller deposits exist in other areas in south-eastern Victoria at Gelliondale, and in the south-central region at Anglesea, Bacchus Marsh, and Altona. These deposits, although extensive, do not compare in magnitude and importance with those in the La Trobe Valley and comprise only about 5 per cent of the total resource in Victoria. A map of brown coal areas of Victoria can be found on page 298 of the *Victorian Year Book 1978*.

Resources

The total geological resources of brown coal in Victoria are about 124,307 megatonnes. Knowledge of these resources is gradually being increased by drilling, particularly in the eastern part of the coal bearing areas of the La Trobe Valley and east and south-east of the South Gippsland Highlands.

The resources which have been proved as potentially economically recoverable are classified as reserves. The balance is marginal or sub-marginal according to present criteria but is classified as part of the total resource. This is illustrated in the following table:

VICTORIA—RESOURCES AND RESERVES OF BROWN COAL: ORIGINAL QUANTITIES IN PLACE, 1 JULY 1980
(megatonnes)

Coalfield	Total demonstrated resources	Economically winnable
Yallourn-Morwell	(a)23,331	(a)13,757
Loy Yang	30,248	11,506
Gormandale	4,250	2,117
Holey Plains-Coolungoolun	2,439	1,297
Rosedale	1,381	1,173
Traralgon Syncline	29,935	4,965
Other La Trobe Valley	16,263	939
Stradbroke	2,800	2,800
Gelliondale	(b)5,600	(b)5,600
Anglesea	(c)450	(c)100
Bacchus Marsh	(d)110	(d)30
Bacchus Marsh-Altona	7,500	..
Total	124,307	44,284

(a) Includes 657 megatonnes excavated in the La Trobe Valley to 30 June 1980, and 6,000 tonnes beneath La Trobe Valley townships, storage dams, and the A.P.M. mill area.

(b) Includes 450 megatonnes under Alberton township and offshore from Gelliondale.

(c) Includes 11 megatonnes excavated from Anglesea open cut to 30 June 1980.

(d) Includes approximately 10 megatonnes excavated from Maddingley open cut to 30 June 1980.

La Trobe Valley coalfields

Thick coal seams occur close to the surface in two large areas known as Yallourn-Morwell and the Loy Yang coalfields and in several smaller areas. The Yallourn-Morwell coalfield is split into the Yallourn-Maryvale and the Morwell-Narracan fields by the town of Morwell and the services corridor containing the Princes Highway and the East Gippsland rail line. The brown coal in these seams ranges in geological age from Eocene to early Miocene and are therefore between 50 and 20 million years old.

The La Trobe Valley brown coal resources have been determined as 108,000 megatonnes at 1 July 1980. An amount of 36,000 megatonnes has been classified as economic reserves of which 12,000 megatonnes are considered readily recoverable using present mining techniques.

Other coalfields

Stradbroke

This is a newly discovered field at the eastern end of the South Gippsland Highlands, adjacent to the southern flank of the La Trobe Valley, with estimated reserves of 2,800 megatonnes in the economically winnable category.

Gelliondale

The Gelliondale coalfield is located beneath the flat coastal plain south of the South Gippsland Highlands. The boundaries of the field have not been clearly defined, but an

area approximately 10 kilometres long and 2.5 to 4 kilometres wide has been closely drilled and shown to contain an important economic coalfield. The deposit is second in size to the La Trobe Valley. Measured and indicated reserves total about 5,600 megatonnes.

Production, 1981-82

During the period 1 July 1981 to 30 June 1982, 37.6 megatonnes of brown coal was mined in Victoria. Of this quantity, 36.3 megatonnes was won by the State Electricity Commission of Victoria from three open cuts it operates in the La Trobe Valley and an assumed 1.3 megatonnes by two privately owned companies in the south-central region (Anglesea and Bacchus Marsh).

The principal use for brown coal mined in Victoria is for the generation of electricity, 33.4 megatonnes being used in 1981-82 for this purpose. Only about 4.3 megatonnes was used during the same period for other purposes such as briquette manufacture and steam raising.

Other uses for brown coal

Briquettes

Raw brown coal is treated and compressed into regular shaped pellets of a convenient size called briquettes to produce a high grade solid fuel having a moisture content of about 15 per cent. Briquettes are transported more economically than raw coal for industrial and domestic use. They are also used in power stations as a fuel stock for the production of char and can be used to produce liquid hydrocarbons.

Only coal from the Yallourn open cut is used for making briquettes as it is the highest quality coal available in the La Trobe Valley. Approximately 3 tonnes of raw coal are used to produce a tonne of briquettes and about 1 tonne of brown coal is used for raising steam used in the process of manufacturing 1 tonne of briquettes. The annual production of briquettes reached a peak of 1.9 megatonnes during 1965 but with the advent of natural gas declined to less than 1 megatonne in 1976. Production in 1981-82 was again just short of 1 megatonne.

Char

Char is a form of high-grade carbon made by the carbonisation of brown coal. It can be used as a source of carbon or as a reducing agent in chemical and metallurgical industries. There are two privately owned plants operating in Victoria at present for the production of char. Both are in the La Trobe Valley and both purchase briquettes and small amounts of brown coal from the State Electricity Commission. The larger plant, at Morwell, has an output capacity of 60,000 tonnes a year.

Victorian Brown Coal Council

The Victorian Brown Coal Council manages Victoria's research and development programme into potential uses of brown coal (excluding electricity and natural gas production). The Council was established by an Act of the Victorian Parliament which became operative on 1 January 1979, and succeeded an advisory committee (the Victorian Brown Coal Research and Development Committee) established in 1975.

The endowment of Victoria with brown coal in very large quantities—reserves that are economically winnable using existing technology amount to more than 44,000 million tonnes—makes it possible to consider using some of this coal for the production of synthetic fuels, special carbons, chemical feedstock, and its increasing use as a direct fuel.

The Victorian Brown Coal Council is undertaking through its consultants a comprehensive study to recommend a strategy which will achieve the best use of the Victorian brown coal resource taking into account all aspects including labour, infrastructure, and social and community needs.

The brown coal deposits are large and easily accessible, and the coal has been shown to be amenable to the processes of gasification, pyrolysis, solvent refining, and hydrogenation. The potential for its conversion has been widely recognised and a number of proposals are under consideration. The most significant of these has advanced beyond the proposal stage. Erection and operation of a \$200m pilot plant at Morwell in Victoria for the testing of technology for the production of liquid hydrocarbons has begun. The plant is being constructed by Brown Coal Liquefaction (Victoria) Pty Ltd which is a wholly owned subsidiary of Nippon Brown Coal Liquefaction Limited which comprises a

consortium of five Japanese companies (Kobe Steel Ltd, Mitsubishi Chemical Industries Ltd, Nissho Iwai Co. Ltd, Idemitsu Kosan Ltd, and Asia Oil Co. Ltd). This has been taken up as a national project by the Japanese Government under the sponsorship of the Ministry of International Trade and Industry through its National Energy Development Organisation. Construction of this plant is scheduled for completion by mid-1984 and will be capable of processing 50 tonnes of dried coal per day.

However, other possibilities for the development of brown coal exist. Brown coal may be used as a direct fuel. For example, processes to produce dry pulverised brown coal have been announced, and if the problems associated with high moisture content and combustibility can be overcome, its use as a direct fuel could increase.

Further, it is possible to produce a wide variety of chemicals from coal tar or coal itself through gasification and synthesis. These include the primary intermediates for the production of a variety of polymers, and the Victorian Brown Coal Council, through its function of encouraging development of the resource, is interested in promoting these potential new uses for Victoria.

Another new area of possible application for Victorian brown coal is the production of special carbons. These include activated carbons for liquid and vapour phase absorption applications, carbon fibres as possible replacement for asbestos and fibreglass, and carbon electrodes for the aluminium smelting industry.

Further reference: *Victorian Year Book* 1980, pp. 288-9; Coal to oil conversion, 1982, p. 268

Electricity

State Electricity Commission of Victoria

The State Electricity Commission of Victoria (SEC) is the largest electricity supply authority in Australia and Australia's largest individual coal producer. In 1981-82, its revenue was \$1,088m. At 30 June 1982, it had capital assets of \$4,763m and a staff of 21,891. In the same year, it distributed electricity directly to 1,342,700 customers and indirectly to a further 280,000 through eleven metropolitan councils which buy power in bulk for retail distribution under franchises granted by the Victorian Government before the SEC's establishment.

The SEC is a semi-government authority with the principal responsibility of generating or purchasing electricity for supply throughout Victoria. It may own, develop, and operate brown coal open cuts and briquetting plant, and develop Victoria's hydro-electric resources. It is required to meet, from its own revenue, all expenditure involved with operating its power and fuel undertakings, and provide for statutory transfers to the Consolidated Revenue of the State.

It was established by an Act of the Victorian Parliament in 1921 and now operates under the *State Electricity Commission Act* 1958. The Act charges the SEC with responsibility for ensuring that the State has a safe, effective, and economical supply of electricity through the establishment and improvement of works for the generation, distribution, supply, and use of electricity throughout Victoria. The SEC has now expanded and co-ordinated the generation, transmission, and supply of electricity on a State-wide basis and it now produces all electricity generated in Victoria for public supply.

Existing electricity system

The State Electricity Commission Act requires the SEC to apply the natural resources of Victoria. Of the State's recoverable fossil fuel reserves, brown coal represents 94.6 per cent, natural gas 2.6 and oil 2.8. The SEC has committed itself to increasing the proportion of total Victorian requirements met with coal based energy.

Victoria's electricity system is based upon the State's extensive brown coal resource in the La Trobe Valley; 140 to 180 kilometres east of Melbourne in central Gippsland. It is one of the largest single brown coal deposits in the world, amounting to 108,000 megatonnes of which 35,000 are economically winnable.

The coal is young and soft with a moisture content of 60 to 70 per cent and occurs in thick seams from relatively close to the surface to a depth of several hundred metres. The coal can be won continuously in large quantities and at low cost by specialised mechanical plant. The SEC's coal fired powered stations have been established near the coal deposits

because the coal's moisture content would make the coal expensive to transport, every three tonnes of material including two tonnes of water.

The major brown coal fired generating plants in the system are the 1,600 MW Hazelwood and 1,450 MW Yallourn "W" power stations. Other brown coal fired plants are Morwell (170 MW) and Yallourn "C", "D", and "E" (521 MW). These stations are all located in the La Trobe Valley and generate three-quarters of the State's electricity requirement.

Other thermal stations are the Jeeralang (465 MW) gas turbine station in the La Trobe Valley, Newport "D" (500 MW) gas fired, and Spencer Street (60 MW) oil fired stations in Melbourne. Spencer Street power station ceased operation in 1981 but recommenced in February 1982 to supply New South Wales. There are hydro-electric power stations in north-eastern Victoria: Kiewa (184 MW), Dartmouth (150 MW), and Eildon/Rubicon/-Cairn Curran (137 MW). Victoria is also entitled to about 30 per cent of the output of the Snowy Mountains hydro-electric scheme and half of the output of the Hume hydro-electric station near Albury.

The SEC's total installed generating plant capacity at 30 June 1982 was 6,344 MW, including both capacity within the State and that available to it from New South Wales. In 1981-82, electricity generated by the SEC in its thermal and hydro-electric power stations and purchased totalled 26,331 GWh.

Power station construction

In 1981-82, the SEC was involved in a major capital works programme. The crucial period began in 1971 with the SEC's proposal of a 1,000 MW power station at Newport for initial service in 1976. In a staged development programme, a third 375 MW unit for Yallourn "W" was proposed for service in 1979, and a fourth unit of the same capacity for service in 1980. In the event, a 500 MW Newport power station and Yallourn "W3" were brought into service in 1981 and Yallourn "W4" in 1982 while the SEC was constructing the 2,000 MW Loy Yang "A" power station.

VICTORIA—POWER STATIONS: LOCATION, RATING, AND PRODUCTION

Station	Maximum continuous rating (a)	Electricity production							
		1978-79		1979-80		1980-81		1981-82	
		Quantity	Percentage of production	Quantity	Percentage of production	Quantity	Percentage of production	Quantity	Percentage of production
	MW	Mill kWh		Mill kWh		Mill kWh		Mill kWh	
Thermal stations—									
Hazelwood	1,600	9,405.8	45.2	9,758.6	45.7	8,838.2	38.0	8,173.5	33.4
Yallourn	521	2,939.0	14.1	2,608.6	12.2	2,605.7	11.2	2,310.2	9.5
Yallourn "W"	1,450	3,525.8	16.9	3,657.2	17.1	4,446.2	19.1	7,608.4	31.1
Morwell	170	1,178.5	5.7	1,140.1	5.3	1,188.1	5.1	1,009.9	4.1
Newport "C" (b)	..	373.7	1.8	439.2	2.1	252.3	1.1	59.6	0.2
Newport "D"	500	..	..	..	..	1,130.6	4.9	2,751.8	11.2
Spencer Street (c)	60	184.1	0.9	212.7	1.0	116.2	0.5	81.6	0.3
Richmond (d)	..	58.7	0.3	42.0	0.2	14.2	0.1	..	..
Jeeralang	465	478.7	2.3	1,046.6	4.9	2,195.3	9.4	2,276.9	9.3
Total SEC thermal	4,766	18,144.3	87.2	18,905.0	88.5	20,786.8	89.4	24,271.9	99.1
Hydro stations—									
Kiewa (e)	184	327.7	1.6	304.8	1.4	300.6	1.3	414.5	1.7
Eildon (f)	135	228.9	1.1	279.2	1.3	263.9	1.1	312.3	1.3
Dartmouth	150	..	..	..	..	105.6	0.5	9.7	..
Total SEC hydro	469	556.6	2.7	584.0	2.7	670.1	2.9	736.5	3.0
Total SEC	5,235	18,700.9	89.9	19,489.0	91.2	21,456.9	92.3	25,008.4	102.2
Net purchases	..	2,105.9	10.1	1,884.2	8.8	1,797.6	7.7	Cr. 527.0	Cr. 2.2
Total	5,235	20,806.8	100.0	21,373.2	100.0	23,254.5	100.0	24,481.4	100.0

(a) At 30 June 1982.

(b) Newport "C" power station retired from service in December 1981.

(c) Melbourne City Council station.

(d) Richmond "B" power station retired from service in December 1980.

(e) McKay Creek, West Kiewa, and Clover.

(f) Eildon, Rubicon, Lower Rubicon, Royston, Rubicon Falls, and Cairn Curran.

Source: State Electricity Commission of Victoria.

Transmission and distribution

Except for some isolated and remote areas of the State, the distribution of electricity throughout Victoria has been completed. Main transmission is by 500, 330, 220, and 66 kV transmission lines which supply the principal distribution centres and interconnection between generating sources.

Major development of Victoria's transmission system in 1981-82 included the construction of a 500 kV line from Hazelwood to Cranbourne to increase capacity for power generated in the La Trobe Valley. Another major project was the erection of two 500 kV lines from Sydenham to Geelong to meet Geelong's projected demand and a line from Geelong to Portland to supply an aluminium smelter proposed for development at Portland.

Loy Yang power station and open cut project

Construction of the Loy Yang "A" power station complex south-east of Traralgon in the La Trobe Valley was authorised by the Victorian Government in 1976. It is the largest single engineering project undertaken in Australia, its direct capital cost estimated to be nearly \$4,000m in 1982 dollars. Coal fired, Loy Yang will provide base load electricity for the Victorian grid and almost double the State's generating capacity. The project nominally comprises two 2,000 MW power stations, Loy Yang "A" and Loy Yang "B", in eight 500 MW units, an open cut and engineering services. The first unit is to come into service in 1984.

At 30 June 1982, approximately 3000 persons were employed on construction of the power stations. Operation of the first power station and open cut will require approximately 2,000 persons and some 3,000 for the full two station development.

By 30 June 1982 certain major targets had been reached. The first unit was on schedule for first steam to turbine in October 1983; all civil work on the 100,000 tonne raw coal bunker had been completed; the first of four dredgers, each to be capable of digging 60,000 tonnes of coal a day, had moved into the open cut area; and the first of the coal and overburden conveyors, eventually to take coal from the open cut to the coal bunker and into the power stations, had been commissioned.

The SEC has proposed to the Victorian Government that Loy Yang be followed by a similar power station and open cut project.

Further references: *Victorian Year Book* 1982, p. 271; *Jerralang*, 1981, p. 290; *Portland transmission line*, 1982, pp. 271-2

Petroleum

Petroleum products were first imported into Victoria from the United States of America, in drums, during the last few years of the nineteenth century. Victoria's first refinery, a small one erected at Laverton, was closed in 1955. In order to cope with a rapidly increasing demand for petroleum products after the Second World War, two major refineries were erected. The first of these was Shell Australia's refinery at Corio, near Geelong, which was commissioned in 1954, and the second was the Standard Vacuum refinery—now Petroleum Refineries (Australia) Pty Ltd, which commenced full scale operations at Altona in 1955. This latter event led to the closure of the small Laverton refinery. A third major refinery was built by BP Refinery (Westernport) Pty Ltd, at Crib Point in 1965. These three refineries, all of which are within a radius of 75 kilometres from the centre of Melbourne, currently satisfy almost the whole of Victoria's market for refined products.

*Discovery and development of indigenous gas and oilfields**Exploration offshore in the Gippsland Basin, 1960 to 1981*

Exploration for petroleum has been carried out almost continuously in the offshore waters of the Gippsland Basin in eastern Bass Strait since 1960, principally by the partnership of Hematite Petroleum Pty Ltd (a wholly owned subsidiary of The Broken Hill Proprietary Co. Ltd) and Esso Exploration and Production Australia Inc., with Esso Australia Ltd as the operator. During this period, 79 exploration wells have been drilled of which 40 have proved to be of commercial significance.

Four other companies (B.O.C. of Australia Ltd, Endeavour Oil NL, NSW Oil and Gas Co. NL, and Shell Development (Aust.) Pty Ltd) drilled seven wells during the 1970s but without success.

Following the surrender by Esso-BHP of exploration rights over certain blocks in the waters of the Gippsland Basin, the Minister for Minerals and Energy during 1979 granted to the Gas and Fuel Corporation of Victoria and Beach Petroleum NL, working as a joint venture, an exploration permit over waters adjacent to the Lakes Entrance area of Bass Strait, with Beach Petroleum NL as the operator. Geophysical exploration work has been carried out and the results are still being evaluated.

Tenement holders, 1981

At the end of 1981, tenement holders for exploration in the Gippsland, Murray, and Otway Basins were:

VICTORIA—TENEMENT HOLDERS, 1981

Name of company	Onshore exploration			Offshore exploration	
	Murray Basin	Otway Basin	Gippsland Basin	Otway Basin	Gippsland Basin
Hematite Petroleum Pty Ltd and Esso Exploration and Production Aust. Pty Ltd					Vic./L1 to L11 Vic./P1
Hematite Petroleum Pty Ltd					Vic./P11
Gas and Fuel Exploration N.L. and Beach Petroleum N.L.					Vic./P12
Cultus Pacific N.L., York Resources N.L., Metramar Minerals Ltd, and Archean Investments Ltd					Vic./P13
Bass Strait Oil and Gas N.L., Bass Oil and Gas Participants Pty Ltd, Youngblood Holdings Pty Ltd, Hampton Oil and Gas Group Pty Ltd, and Idlewild Securities Pty Ltd					Vic./P14
Phillips Australian Oil Co., Gas and Fuel Exploration N.L., MIM Investments Pty Ltd					Vic./P15
Esso Exploration and Production Aust. Inc.					Vic./P16
Oil and Minerals Quest N.L., Mincorp Ltd, Central Energy Pty Ltd, Zanex Ltd, and Otway Oil and Gas N.L.					P.E.P. 93 P.E.P. 94 P.E.P. 95
Beach Petroleum N.L.					P.E.P. 96 and 97
Western Mining Corporation Ltd Conserv (No. 779) Pty Ltd					P.E.P. 98 P.E.P. 99
Mincorp Ltd, Southern Oil Pty Ltd, and Alan Robert Burns and Derek Rose Gascoine					P.E.P. 100
Victor Petroleum and Resources Ltd					P.E.P. 101 P.E.P. 101
Gas and Fuel Exploration N.L.					P.E.P. 102
Siberia Oil and Gas N.L., Scmeld Pty Ltd, and Girvan Oil and Gas Pty Ltd					
Sion Resources (Australia) Ltd					
Australian Aquitane Petroleum Pty Ltd, Australian Occidental Pty Ltd, Alliance Resources Pty Ltd, Agex Pty Ltd, and Cluff Oil Pty Ltd					Vic./P17
Phillips Australian Oil Company, Lend Lease Investments Pty Ltd, and Mount Isa Mines Ltd					Vic./P18
Shell Development (Australia) Pty Ltd, The News Corporation Ltd, TNT Management Pty Ltd, Crusader (Victoria) Pty Ltd, and Mincorp Offshore Pty Ltd					Vic./P19

P.E.P. = Petroleum Exploration Permit; Vic./L = Victorian Licence; Vic./P = Victorian Permit.

Source: Department of Minerals and Energy.

Development of the Gippsland fields

The initial stage of development took place between 1967 and 1971, when the four commercial fields discovered to that time were developed as an integrated system. These were the Barracouta and Marlin gasfields and the Halibut and Kingfish oilfields, together with a small oil reservoir in the Barracouta field. This resulted in the construction of the five first-generation platforms listed below:

(1) Barracouta platform, over the Barracouta gas and oilfield, with eight gas wells and two oil wells. Production started in March 1969.

(2) Marlin platform, over the Marlin gasfield, with seventeen gas wells and four oil wells. Gas production started in January 1970. The four oil wells allocated for this platform were brought into production during 1982 after the installation of production facilities to produce oil from a small accumulation beneath the main gas reservoir.

(3) Halibut platform, over the Halibut oilfield, with twenty oil wells. Oil production started in March 1970.

(4) Kingfish "A" platform, over the Kingfish oilfield, with twenty-one oil wells. Oil production started in April 1971.

(5) Kingfish "B" platform, over the Kingfish oilfield, with twenty-one oil wells. Oil production started in November 1971.

The second stage of development took place from 1973 onwards with construction of the following second-generation platforms and one sub-sea completion:

(1) Mackerel platform, over the Mackerel oilfield, with eighteen oil wells. Two of the eighteen wells are high-angle wells drilled directionally to drain the south end of the Mackerel field about 4 kilometres from the platform. Oil production started in December 1977. Drilling was completed in November 1980.

(2) Sub-sea Cobia 2 oil well, over the Cobia oilfield, came on stream in June 1979. This was the first sub-sea well completed in the Gippsland Basin fields and the crude oil from this well is conveyed by two 100 mm submarine pipelines to the Mackerel platform. This was also the first project where the pre-welded pipeline was laid by the spooling method from a specially adapted ship.

(3) Tuna platform, over the Tuna gas and oilfield, with eighteen wells. Oil production started in June 1979; gas production commenced in September 1979. Drilling of all wells on this platform was completed during 1981.

(4) Snapper platform, over the Snapper gas and oilfield. The platform was erected in May 1979 and development drilling of the planned twenty-seven wells commenced in March 1981. Production started in July 1981.

Four more second-generation platforms have been planned and are in various stages of development. These are:

(1) West Kingfish platform, over the western end of the Kingfish oilfield, with twenty-seven wells planned. The platform was launched and set in position in August 1981. Development drilling was continuing.

(2) Cobia platform, over the Cobia oilfield, with twenty-one wells planned. The onshore construction phase was almost complete at the end of 1982.

(3) Fortescue platform, over the Fortescue oilfield, with twenty-one wells planned. The onshore platform jacket was set towards the end of 1982.

(4) Flounder platform, over the Flounder gas and oilfield, with twenty-four wells planned. The onshore construction was nearing completion. The jacket was to be set in 1983.

The completion of these four new platforms during 1983 will bring the total number of platforms in Bass Strait to twelve.

The laying of a gas pipeline from the Marlin platform to the Mackerel platform via the Halibut platform, using the spooling method as used for the Cobia 2 submarine pipeline, was completed during 1980. The pipeline came into operation in August 1981.

The design of Gas Plant 3 at Longford was completed by the end of 1980 and on-site construction had started. Gas Plant 3 came on stream during 1982 to supplement supply to the expanding Victorian gas market.

VICTORIA—CRUDE OIL PRODUCTION (a), 1977 TO 1981

Year	Barrels		Kilolitres	
	During year	Average barrels/day for year	During year	Average kilolitres/day for year
1977	145,187,523	397,774	23,074,930	63,219
1978	146,826,012	402,263	23,343,427	63,955
1979	149,790,661	410,385	23,790,661	65,180
1980	128,993,885	352,442	20,508,424	56,034
1981	134,281,582	366,890	21,349,102	58,331

(a) After processing.

Source: Esso Australia Ltd.

**VICTORIA—GIPPSLAND BASIN COMMERCIAL HYDROCARBON
RESERVES AND PRODUCTION, 30 SEPTEMBER 1982**

Item	Initial	Produced	Remaining
		billions (10 ⁹) cubic metres	
Natural gas	220.4	40.7	179.7
		standard gigalitres	
Crude oil	466.2	243.9	222.3
Condensate	34.4	6.3	28.1
Liquefied petroleum gas	88.7	28.9	59.8

NOTE. All figures are for products after processing.

1 gigalitre = 10⁹ litres.

Figures given are based on direct conversion of cubic metres or gigalitres and may be + or - actual production.

Further reference: *Victorian Year Book 1982*, pp. 273-4

Refining

There are three refineries in Victoria: the Shell Refining (Australia) Pty Ltd at Corio near Geelong, the Petroleum Refineries (Australia) Pty Ltd at Altona, and the BP Refinery (Western Port) Pty Ltd at Crib Point, Western Port. Shell Refining (Australia) Pty Ltd also operates a plant at its Corio refinery for the production of lubricating oil. Refining capacity at 1 December 1981 is set out in the following table:

VICTORIA—REFINING CAPACITY AT 1 DECEMBER 1981

Refinery	Location in Victoria and year refinery came on stream	Primary processing capacity (a)
Shell Refining (Australia) Pty Ltd	Corio near Geelong 1954	110,000 to 132,000 BSD 5,000,000 tonnes/year
(Lubricating oil plant)	Corio near Geelong 1954	3,000 BSD 145,000 tonnes/year
Petroleum Refineries (Australia) Pty Ltd	Altona near Melbourne 1954	100,000 BSD 4,670,000 tonnes/year
BP Refinery (Western Port) Pty Ltd	Crib Point on Western Port Bay 1966	60,000 BSD 2,540,000 tonnes/year

(a) BSD: barrels per stream day.

Source: *Oil and Australia*, Australian Institute of Petroleum Ltd, 1981.

Each refinery also imports crude oil from the Middle East for the production of special products including bitumen, asphalt, and certain other heavy products. A certain amount of light ends such as motor spirit and aviation jet fuel are also produced in the process of treating these imported crude oils.

Transportation

Indigenous processed crude oil is shipped by tanker from the Long Island Point and Crib Point jetties at Western Port to refineries in Sydney and Brisbane and by pipeline to Victoria's three local refineries.

The total volume shipped by tanker during the 1980 calendar year was 59,089,003 barrels (9,394,417 kilolitres). The volumes of crude oil conveyed through the pipelines to local refineries during 1980 was 89,623,209 barrels (14,248,976 kilolitres).

The three refineries in Victoria also import between 4.5 and 5 million barrels (0.7-0.8 million kilolitres) of crude oil each year from the Persian Gulf and also import approximately 1.3 million barrels (0.2 million kilolitres) of wholly or partially refined products from overseas or from other States in Australia. Approximately 35 million barrels (5.6 million kilolitres) of wholly or partially refined products are exported to overseas destinations such as New Zealand or the Pacific Islands or transported to other States within Australia.

Marketing

Motor spirit in two grades—97 octane (super grade) and 89 octane (standard grade)—and a wide range of other petroleum products are marketed in Victoria through a

number of industry terminals and depots and 3,541 retail outlets (30 June 1979), the majority of which are operated by the nine major oil companies. At 30 June 1979, Victoria had the capacity to store 3,246,200 kilolitres of crude oil and petroleum products in bulk at 21 installations; in Melbourne (14), Geelong (1), Crib Point (1), Long Island Point (1), and Portland (4), including refineries.

VICTORIA—PRINCIPAL PETROLEUM PRODUCTS MARKETING, 1981

Item	Megalitres	Item	Megalitres
Aviation gasoline	18.52	Industrial diesel fuel—	
Motor spirit—		Inland	63.78
Super	3,903.15	Bunkers	77.45
Standard	302.59		
		Total	141.23
Total	4,205.74	Fuel oil—	
		Inland (a)	187.79
Power kerosene	5.44	Bunkers	396.72
Aviation turbine fuel	469.32		
Lighting kerosene	33.65	Total	584.51
Heating oil	119.87		
Automotive distillate—		Grand total (b)	6,771.95
Inland	1,147.81		
Bunkers	45.86		
Total	1,193.67		

(a) Excluding refinery fuel.

(b) Other petroleum fuels, including refinery oil, are no longer included as principal petroleum products marketed.

Source: Oil and Gas Division, Department of National Development and Energy, Canberra.

Liquefied petroleum gas (propane and butane)

Liquefied petroleum gas (LPG) is produced at the Esso-BHP fractionation plant at Long Island Point and by Victoria's three refineries. The principal distributor in Victoria is the Gas and Fuel Corporation of Victoria. A number of oil companies and other marketing companies also distribute LPG throughout the State in accordance with the provisions of the *Gas Franchises Act 1970*.

The Long Island facilities produce over 75 per cent of the total production of LPG in Victoria. The establishment of the Long Island facilities is described in the 1977 and earlier editions of the *Victorian Year Book*.

Annual production of propane and butane at the Long Island Point plant is now approximately 1.8 million tonnes. The total storage capacity at the plant comprises six tanks, each of 10,000 tonnes capacity of either butane or propane and a 20,000 tonne capacity tank to store butane. Nearly all the production at Long Island Point is shipped to Japan.

Ethane gas

Ethane gas is produced at the Long Island Point Fractionation Plant and has since 1972 been conveyed through a pipeline to the Altona Petrochemical Company Limited at Altona. A new plant using ethane gas as a feedstock and conveyed by pipeline from Altona has been built for Hydrocarbon Products Proprietary Limited at West Footscray at a cost of \$60m and is now in production.

Further reference: *Discovery and development of crude oil in Victoria, Victorian Year Book 1974, pp. 382-5*

Gas industry

Introduction

The gas industry in Victoria dates from the formation of the City of Melbourne Gas and Coke Company in 1850 with the objective of lighting the City of Melbourne by gas. Many other gas companies were formed in the more heavily populated suburbs of Melbourne and country towns of the State during the second half of the nineteenth century, many by municipal authorities.

Gas and Fuel Corporation of Victoria

In 1877, the Metropolitan Gas Company was formed by the amalgamation of three companies, one of which was the City of Melbourne Gas and Coke Company. The former company subsequently joined with the Brighton Gas Company and the State to form the Gas and Fuel Corporation of Victoria. Since then, the structure of the industry changed from multiple privately owned utilities to gradual unification under the Gas and Fuel Corporation of Victoria—a public authority of the State owned jointly by the Victorian Government and private shareholders.

With the purchase of the Gas Supply Company's Victorian undertakings in 1970, The Geelong Gas Company in 1971, and Colonial Gas Holdings Limited in 1973, complete unification of the gas industry was achieved. The acquisition of The Albury Gas Company Ltd in 1974 made it possible for the Corporation to extend natural gas supply to the Albury/Wodonga Development Project. The Gas and Fuel Corporation of Victoria is now the sole distributor of gas in Victoria.

During the 1970s, the Corporation progressively extended its natural gas supply system to the point where 99 per cent of the reticulated gas supplied in Victoria is natural gas, and this fuel is currently accessible to more than 80 per cent of the State's population. In 1981-82, natural gas provided 57 per cent of Victoria's total secondary energy requirements, excluding transport.

In areas where it is not economic to supply natural gas, the Corporation meets the community demand for gaseous fuel either by providing a reticulated gas supply based on liquefied petroleum gas (LPG) or by supplying LPG in cylinders or bulk.

Future sources

Approximately 5.3 billion gigajoules (50 billion therms) of the gas reserves in Esso-BHP's Bass Strait fields were contractually dedicated to the Corporation from 1 January 1975, with an option on a similar quantity from any further reserves established in Victoria by the partners.

In keeping with its responsibility to meet the needs of its consumers and ensure continuing security of gas supply, the Corporation, through a fully owned subsidiary company, Gas and Fuel Exploration N.L., is engaged in exploring for oil and gas in the Bass Strait area in joint ventures with Beach Petroleum N.L. and Hudebay Oil (Australia) Ltd in the offshore Gippsland Basin, with Phillips Australian Oil Company and Mount Isa Mines Ltd in offshore Otway Basin, and in its own right in the onshore Otway Basin.

Supplies of natural gas contractually dedicated to the Corporation are adequate to meet the estimated overall requirements of the Victorian market until 2000/2005 and it is anticipated that current and future exploration programmes in the Gippsland and Otway Basins will result in the definition of further resources.

However, if major additional reserves are not developed in these areas and supplies of natural gas are not available from other sources, the Corporation plans to establish large scale substitute natural gas (SNG) production facilities to meet the community's demand for gaseous fuel. This long-term requirement of coal for SNG production is being taken into account in planning the development of the State's brown coal resources.

Conservation of energy

In 1977, the Corporation established Australia's first Energy Management Centre to advise industry and commerce on the efficient use of energy. This Centre provides educational, consulting, and development services to companies and government and international agencies, in a number of spheres including energy auditing and equipment evaluation and demonstration.

In 1978, the Corporation established an Energy Information Centre at 139 Flinders Street, Melbourne, to provide information to the general public on all aspects of the use of energy. It is also actively involved in research directed towards the development of efficient gas appliances, and in promoting low energy housing, the use of insulation in domestic dwellings, and the conversion of motor vehicles to LP Gas operation. These activities have played a significant part in increasing public awareness of the need to conserve energy and in improving the efficiency of energy utilisation in industry, commerce, and homes throughout Victoria.

Gas supply areas

At 30 June 1982, the Corporation was supplying 909,571 consumers with gas through a network of approximately 19,100 kilometres of mains. Of these consumers, 896,325 were receiving natural gas and 13,246 were provided with a reticulated supply based on liquefied petroleum gas.

The areas provided with a reticulated gas supply at 30 June 1982 are shown in the following table:

VICTORIA—AREAS SUPPLIED WITH GAS AT 30 JUNE 1982 (a)

Supplier	Area supplied with			
	Natural gas			Tempered LPG
Gas and Fuel Corporation of Victoria	Bacchus Marsh	Kyneton	Queenscliff	Ararat
	Ballan	Lara	Rosedale	Colac
	Ballarat	Longwarry	Sale	Hamilton
	Benalla	Maffra	Seymour	Horsham
	Bendigo	Maryborough	Shepparton	Portland
	Broadford	Moe	Tatura	Stawell
	Castlemaine	Mooroopna	Trafalgar	Warrnambool
	Churchill	Mornington	Traragon	
	Drouin	Peninsula	Wangaratta	
	Euroa	Morwell	Warragul	
	Geelong	Ocean Grove	Wodonga	
	Greater Melbourne	Pakenham		
		Point Lonsdale		

(a) In addition, the Gas and Fuel Corporation provides a reticulated gas supply in Albury, New South Wales, through its wholly owned subsidiary, the Albury Gas Company Limited.

Source: Gas and Fuel Corporation of Victoria.

Sales

The degree to which natural gas has penetrated the competitive energy market in Victoria is reflected by the fact that total sales by gas utilities have risen from 12.8 million gigajoules in 1967-68—the last full year of manufactured gas supply—to a total of 135.2 million gigajoules in 1981-82. While the introduction of natural gas has resulted in a five-fold increase in the domestic market, from 8.8 million gigajoules in 1967-68 to 45.8 million gigajoules in 1981-82, its greatest impact has been in the industrial market where sales have risen from 2.5 million gigajoules in 1967-68 to 77.9 million gigajoules in 1981-82.

VICTORIA—COMMERCIAL SALES OF NATURAL GAS (a)

Year	Quantity	Quantity
	million m ³	million ft ³
1977	3,256.752	114,963.346
1978	3,461.135	122,178.065
1979	4,020.826	141,993.360
1980	4,547.774	160,603.270
1981	5,313.180	183,192.840

(a) Includes sales, field, and plant usage.

Source: Department of National Development and Energy, Canberra.

VICTORIA—SALES OF GAS (a)
(⁰⁰⁰ gigajoules)

Year	Domestic	Commercial	Industrial	Total
1977-78	31,850	7,327	62,886	102,063
1978-79	35,056	8,675	65,407	109,138
1979-80	36,979	9,425	70,286	116,690
1980-81	40,495	10,276	75,627	126,398
1981-82	46,037	11,603	78,986	136,626

(a) Includes sales to Albury/Wodonga.

Source: Gas and Fuel Corporation of Victoria.

MINERALS

Economic natural resources

Introduction

Mineral discoveries in Victoria in the past have had an important effect both on the State and Australia as a whole. The first major mineral development occurred in the 1850s with the gold discoveries and the subsequent gold rushes in various parts of the State. A less spectacular development, but one equally important for Victoria's economy, was the commencement of the utilisation of the La Trobe Valley brown coal deposits for power generation in the 1920s. Of equal significance were the oil and gas discoveries in eastern Bass Strait during the 1960s from which Victoria now supplies about 68 per cent of Australia's crude oil requirements and the whole of the State's gas needs.

The recent world energy crisis has emphasised that liquid fuel deposits are not infinite and that in the future, liquid hydrocarbons may have to be manufactured from coal. Victoria, with its vast reserves of brown coal, may be in an excellent position to continue to supply a substantial part of Australia's liquid fuel requirements in the future.

Following the discovery of a copper-zinc deposit by Western Mining Corporation in an area west of Benambra during the middle of 1978, further drilling in the area has established the existence of two separate bodies containing copper and zinc, in the Wilga and Currawong prospects. Silver is an important constituent of these ore bodies. Drilling to evaluate these deposits is continuing. The two bodies constitute the most important finds of base metals in Victoria and have stimulated exploration in the State.

Construction materials

Quarry products used for construction (including clay), and limestone for the manufacture of lime and cement, dropped from 36,500,000 tonnes produced in 1980-81 to 28,500,000 in 1981-82. This represents a downturn of 22 per cent but because of increased commodity prices the overall value (ignoring the effect of inflation) increased from \$122.4m to \$129.5m—a rise of 5.5 per cent.

Fossil fuel reserves

At July 1980, Victoria's measured geological resources of brown coal (lignite) amounted to 65,933 megatonnes, of which 64,923 megatonnes occurred in the extensive coalfields of the La Trobe Valley. The total geological resources down to depths at present uneconomic to mine, amount to 124,307 megatonnes. State Electricity Commission estimates have classified 44,284 megatonnes as *economic reserves* and of these, 12,890 megatonnes could be mined from large-scale open cut operations at about present day costs. The energy contents of economic and readily recoverable brown coal reserves are 442,840,000 and 128,900,000 terajoules, respectively.

The Bass Strait oil and natural gasfields will supply Victoria and other markets with natural gas until well into the twenty-first century at the anticipated rate of consumption. It is estimated that an energy equivalent of 8,500,000 terajoules will be available if new gasfields are not discovered. The crude oil reserves, equivalent to 17,300,000 terajoules, will be seriously depleted by the late 1980s unless new discoveries are made in Victoria and Australia during the next few years.

**VICTORIA—ENERGY EQUIVALENT OF ECONOMICALLY
RECOVERABLE FOSSIL FUEL RESERVES (a)**
(million terajoules)

Crude oil	Natural gas	Gas liquids	Brown coal	Total
17.3	8.5	3.3	442.8	471.9

(a) Proven economically recoverable reserves at 30 June 1981.

The crude oil from the Bass Strait oilfields is deficient in the heavier lubricating fractions and the main commercial derivatives are light petroleum liquids ranging from heating oil to motor spirit. Victoria and Australia still depend on overseas crude oil for production of medium to heavy lubricating oils.

Metallic minerals

Only minor amounts of metallic minerals are produced in Victoria. The most valuable of these is gold. These minerals contribute only about 0.5 per cent of the value of all mineral and quarry products.

Geological Survey of Victoria

The Geological Survey of Victoria, formally established in 1856 was in 1867 brought under the control of the Minister of Mines and since 1 September 1977 has functioned as a division in the Department of Minerals and Energy.

The early work of the Survey included detailed surface and sub-surface mapping of the important goldfield areas. In the 1890s, studies were extended to the black coal deposits in south Gippsland, culminating in the discovery of the Wonthaggi coalfield in the early 1900s.

In the period from 1910 to 1920, the Survey intensified the mapping programmes and undertook surveys of the brown coal deposits of the La Trobe Valley. The Department initiated the re-opening of the Morwell open cut at Yallourn North and developed the brown coalfields as a source of fuel before this responsibility was transferred to the State Electricity Commission of Victoria in 1920.

After the Second World War, the activities of the Survey were diversified with the growing interest in petroleum exploration, groundwater investigation, engineering geology, and the extractive industries. The studies carried out on the Tertiary stratigraphy and micropalaeontology of the onshore Gippsland Basin set a basis for the discovery of the oil and gasfields of Bass Strait during the middle 1960s.

In summary, the main activities of the Survey are the investigation of Victoria's geological structure, and mineral, petroleum, and groundwater resources; engineering geology; and the provision of basic information on these matters in the form of geological maps, reports, and advice to industry, the public, and Commonwealth and Victorian Government departments. The Survey also serves as geological consultant to government agencies when required, and provides scientific information for the appraisal, development, and conservation of Victoria's sub-surface resources.

Mining and quarry production

The mining and quarrying production of Victoria from lands occupied under the Mines Act and the Extractive Industries Act is recorded by the Victorian Department of Minerals and Energy, and from other lands by the Australian Bureau of Statistics. The production from both sources for the years 1978-79 to 1980-81 is shown in the following table:

VICTORIA—MINING AND QUARRYING PRODUCTION

Mineral	Unit	1978-79		1979-80		1980-81	
		Quantity	Value	Quantity	Value	Quantity	Value
			\$'000		\$'000		\$'000
Metallic minerals—							
Antimony ore	tonne	—	—	—	—	—	—
Bauxite	"	1,965	n.p.	1,143	n.p.	3,123	28
Gold bullion	'000 gm	26	129	41	456	65	863
Iron ore	tonne	8,409	n.p.	1,791	n.p.	170	2
Tin concentrate	"	1	n.p.	—	—	—	—
Total value of metallic minerals		..	239	..	492	..	893
Coal							
Brown coal (a)	'000 tonne	29,095	79,630	29,544	91,821	29,212	107,052
Briquettes	"	1,131	25,063	1,253	24,938	1,081	22,230
Total value of coal (a)		..	104,693	..	116,759	..	129,282
Petroleum products (b)							
Crude oil	'000 kilolitre	23,074	} (d) 771,385	22,080	} (d) 980,800	20,508	} (d) 1,338,820
Ethane (c)	"	144,025		147,908		125,894	
Liquefied petroleum gas—							
Propane (c)	"	1,542		1,553		1,456	
Butane (c)	"	1,681		1,561		1,434	
Natural gas	million kilolitre	3,715		4,262		4,077	
Construction materials							
Crushed and broken stone—							
Basalt	'000 tonne	12,241	47,950	11,388	56,306	9,659	54,348
Dacite, Rhyodacite, and	"	1,497	7,248	1,601	9,412	471	2,961
Toscanite	"	781	2,981	1,004	4,854	766	5,098
Granite	"						

VICTORIA—MINING AND QUARRYING PRODUCTION—*continued*

Mineral	Unit	1978-79		1979-80		1980-81	
		Quantity	Value	Quantity	Value	Quantity	Value
			\$'000		\$'000		\$'000
Hornfels	..	1,478	5,211	1,311	5,850	543	2,249
Limestone	..	680	1,108	845	1,349	1,138	1,830
Quartz and quartzite	..	81	346	34	165	63	134
Sandstone	..	1,710	2,314	1,735	2,442	1,315	2,229
Shale and schist	..	377	1,458	82	160	118	309
Slate	..	—	—	—	1	—	—
Other crushed and broken stone	..	—	—	—	—	198	294
Total crushed and broken stone	..	18,845	68,616	18,000	80,539	14,271	69,452
Sand—For concrete	..	4,248	12,085	3,652	12,594	3,736	14,548
For other purposes	..	4,003	7,061	4,748	8,314	4,194	9,524
Gravel	..	4,759	5,387	5,131	6,272	4,751	6,863
Dimension stone—Granite	tonne	13,094	363	24,772	509	26,556	688
Slate	..	1,312	47	866	18	2,445	91
Other	..	1	—	2	—	3	—
Total dimension stone	..	14,407	410	25,640	527	29,004	779
Other construction materials—							
Earth, soil, and filling	'000 tonne	1,034	1,211	1,299	2,637	1,295	2,215
Salamander	..	155	370	278	578	438	1,095
Scoria	..	1,183	2,057	1,363	2,911	1,143	3,015
Other (e)	..	281	349	415	935	2,518	15,394
Total other construction materials	..	2,653	3,987	3,355	7,061	5,394	21,719
Total value of all types of construction materials	97,545	..	115,307	..	122,886
Other non-metallic minerals							
Clay—brick and cement	'000 tonne	1,324	1,807	1,338	2,354	1,210	1,720
fire	..	39	95	33	80	8	54
kaolin—refined	..	31	2,728	43	4,248	33	3,827
unrefined	..	6	25	4	27	3	22
stoneware	..	139	157	73	132	76	150
pipe and tile	..	35	95	63	120	21	44
bentonitic	..	—	—	2	n.p.	3	64
other clays (f)	..	59	n.p.	31	n.p.	42	1,783
Diatomite	tonne	378	35	634	125	634	137
Dolomite	'000 tonne	—	—	2	n.p.	—	—
Gypsum	..	201	601	277	882	370	1,325
Limestone	..	2,141	7,810	2,213	8,761	2,351	9,837
Salt	..	n.p.	n.p.	73	1,544	74	1,786
Silica	..	196	1,542	255	2,101	288	3,069
Total value of non-metallic minerals	16,018	..	20,501	..	23,818
Grand total (value of all minerals)	989,880	..	1,233,859	..	1,615,699

(a) Excludes the quantity and value of brown coal used for briquette manufacture: 1978-79 = 3,006,000 tonnes, 1979-80 = 3,350,000 tonnes, 1980-81 = 2,891,000 tonnes.

(b) Previously reported in cubic metres, now reported in kilolitres; 1 cubic metre = 1 kilolitre.

(c) Excludes refinery production.

(d) Value shown is an estimate based on prices prescribed in legislation, quoted market prices, and information from the Victorian Department of Minerals and Energy. Values of individual petroleum products are not available for publication.

(e) Includes aggregate previously included under crushed and broken stone.

(f) Includes white clay.

VICTORIA—ASSAYED CONTENT OF METALLIC MINERALS

Metal or element and mineral in which contained	Unit	1976-77	1977-78	1978-79	1979-80	1980-81
Alumina contained in bauxite	tonne	2,829	1,100	963	520	1,677
Gold contained in gold bullion	gm	40,175	9,238	21,752	33,709	54,190
Iron contained in—bauxite	tonne	324	145	138	80	89
iron ore	..	1071	284	5,045	1,075	102
Total iron	..	1,395	429	5,183	1,155	191
Tin contained in tin concentrate	..	1	2	1	—	—

Sources: Department of Minerals and Energy, Victoria, and Australian Bureau of Statistics.

VICTORIA—COAL PRODUCTION AND VALUE (a)

Period (b)	Black coal		Brown coal	
	Production	Value	Production	Value
	tonnes	\$'000	tonnes	\$'000
1926-1930	678,901	1,786	1,539,917	386
1931-1935	479,606	888	2,484,461	512
1936-1940	330,118	568	3,666,671	712
1941-1945	290,872	818	5,090,974	1,052

VICTORIA— COAL PRODUCTION AND VALUE (a)—continued

Period (b)	Black coal		Brown coal	
	Production	Value	Production	Value
	tonnes	\$'000	tonnes	\$'000
1946-1950	158,798	722	6,755,137	2,404
1951-1955	145,838	1,590	8,868,202	7,186
1956-1960	102,512	1,050	12,389,332	11,302
1961-1965	53,418	599	18,607,269	16,605
1966	36,089	497	22,132,593	20,064
1967	32,581	251	23,758,913	20,686
1968	26,736	209	23,339,331	21,555
1968-69	13,312	105	23,499,703	20,879
1969-70	407	6	24,310,900	22,131
1970-71	20	—	23,180,539	22,975
1971-72	—	—	23,630,467	25,706
1972-73	—	—	24,121,155	28,555
1973-74	—	—	26,354,577	31,532
1974-75	—	—	27,541,462	45,341
1975-76	—	—	29,211,090	52,871
1976-77	—	—	30,994,476	61,598
1977-78	—	—	30,492,186	73,183
1978-79	—	—	32,896,279	r87,641
1979-80	—	—	32,894,505	r101,480
1980-81	—	—	32,102,983	116,728

(a) Value of output at the mine. This is essentially the unit selling price of the commodity, less any unit transport costs from the mine or associated treatment works, multiplied by the production. Where a commodity is transferred to another location for further processing without being sold, the unit value is based on production costs plus an allowance for overhead and profit.

(b) Figures for five-yearly periods are annual averages.

Further references: Groundwater in Victoria, *Victorian Year Book* 1969, pp. 384-6; Victorian clays 1970, pp. 376-8; History of the Mines Department, 1970, pp. 105-8; Minerals in Victoria, 1970, pp. 1-29; Mineral exploration, 1972, pp. 363-7; Geological Survey of Victoria, 1975, pp. 362-3; Extractive industries, 1975, pp. 364-5; Mineral deposits in Victoria, 1976, pp. 362-3; Mines Department, 1977, pp. 367-9; History of mining, 1979, p. 287

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