

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*; *Petroleum (Submerged Lands) Act 1967*; *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 is undertaken, together with various shallow drilling programmes, by the Drilling Branch of the Oil and Gas Division. The Oil and Gas Division administers, on behalf of the Commonwealth Government, the Offshore Petroleum (Submerged Lands) Act, under which crude oil amounting to almost 70 per cent of Australia's requirements is produced. 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. Assays and analyses of minerals and groundwater are undertaken in the laboratory of the Chemical Branch, Geological Survey Division, which also offers advice on mineral problems of a chemical nature. Stamp batteries are maintained at five country locations to enable trial crushings to be made for the benefit of prospectors. The Department also undertakes certain reclamation projects on mined areas and the capping or filling of disused shafts on Crown land.

General

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 73 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 16 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 10 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.

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

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 to 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 AT 1 JULY 1980:
ORIGINAL QUANTITIES IN PLACE (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	339
Stradbroke	2,800	2,800

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

Coalfield	Total demonstrated resources	Economically winnable
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 Madingley open cut to 30 June 1980.

La Trobe Valley coalfields

Thick coal seams occur close to the surface in two large areas known as the 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, 1980-81

During the period 1 July 1980 to 30 June 1981, 32.1 megatonnes of brown coal was mined in Victoria. Of this quantity, 30.8 megatonnes was won by the State Electricity Commission of Victoria from 3 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, 27.7 megatonnes being used in 1980-81 for this purpose. Only about 4.4 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 1980-81 was 1.1 megatonnes.

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.

Coal to oil conversion

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 recoverable using existing technology amount to more than 35 billion tonnes — makes it possible to consider using some of this coal for the production of synthetic oil. Other products such as solvent refined coal, used in the steel industry, can also be readily manufactured from Victorian brown coal.

The research programme of the Council covers both the description of coal quality in the various fields potentially available for conversion and the behaviour of brown coal when subjected to solvent refining and hydrogenation. Simple tests have indicated that the liquid yields from the various fields differ only slightly, despite considerable variation in some coal properties from field to field. While brown coal suffers some disadvantages for conversion in its high oxygen and moisture content, it offers the advantages of low ash and sulphur contents and high reactivity.

Expert advice on the formulation of the brown coal research programme is obtained from individuals with specialist knowledge, and from member companies of an industry group contributing to the funding of research.

The development of feasibility studies and experimental programmes is undertaken in collaboration with overseas groups and Australian consultants. In respect of processing studies, steps have been taken towards establishing a major pilot plant in Victoria based on the SRC (solvent refined coal) approach to brown coal liquefaction adopted by the Nippon Brown Coal Liquefaction Co. Ltd (successor to KOMINIC). Consultative arrangements have been set up with the Government of Japan, and an agreement has been made between the Victorian Government in relation to the pilot plant and feasibility study proposals. There is also close co-operation between the Council and the partners Mitsui SRC Development Company and CSR Ltd to assist their feasibility studies into the production of solvent refined coal for use in the steel industry and in the manufacture of other carbon-based products.

The Council is the Victorian agency concerned in the management and conduct of the Joint Australian/Federal Republic of Germany Coal-to-Oil Feasibility Study, in which four Australian State Governments are involved with the West German Government and seven large German companies. Council personnel have worked on the Study programme in Germany. One of the German companies (Rheinische Braunkohlenwerke AG, Cologne) has proposed applying the Study results to a more specific study of a coal production and liquefaction operation in Victoria. The Victorian Government has made an agreement with the company to facilitate carrying out the proposal.

A "Coalfields Development Strategy Study" has been conducted by an Australian consultant under contract to the Council, to indicate possible ways of winning large annual tonnages of brown coal from the more extensive coal-bearing areas.

Further reference: Victorian Brown Coal Council, *Victorian Year Book* 1980, pp. 288-9

Electricity

State Electricity Commission of Victoria

The most widely used and extensively distributed form of energy in Victoria is electricity. This is generated and distributed by the State Electricity Commission of Victoria, a public utility formed by an Act of the Victorian Parliament in 1920. Since it was formed the Commission has expanded and co-ordinated the generation, transmission, and supply of electricity on a State-wide basis to the point where it now produces all of the electricity generated in Victoria available for public supply.

At 30 June 1981, the Commission with 21,226 personnel and capital assets of \$3,826m distributed electricity to 1,321,200 consumers throughout Victoria. In addition, eleven metropolitan municipal councils purchased electricity in bulk from the Commission for retail distribution to a further 275,500 customers. Nearly 117,000 kilometres of power lines are used by the State Electricity Commission of Victoria and the municipal networks.

Other electricity producers

A 150 MW power station owned and operated by Alcoa of Australia Ltd produces electricity using brown coal found as a fossil fuel at Anglesea in south central Victoria to supply the company's alumina smelter at Point Henry on Port Phillip Bay. A number of other industrial enterprises such as the Shell Refinery at Corio generate electricity within their own plant.

Existing electricity system

The development of Victoria's electricity system is based on the utilisation of Victoria's extensive brown coal resources in the La Trobe Valley in central Gippsland with supplementary development of hydro sources in north-eastern Victoria. Victoria is entitled to receive one-third (New South Wales receives two-thirds) of the electricity generated in the Snowy Mountains Hydro-Electric Scheme after the Commonwealth Government's requirements for the Australian Capital Territory have been met. Victoria also shares with New South Wales the electricity generated at the Hume hydro station near Albury on the Murray River.

In 1980-81, 73 per cent of Victoria's electricity needs were generated from brown coal. Brown coal is also manufactured into a high quality fuel in the form of briquettes. About 44 per cent of these are consumed in power stations, the balance being sold to industry and for domestic purposes.

The major station in the Commission's interconnected system is the 1,600 MW brown coal fired power station at Hazelwood which alone generates 38 per cent of Victoria's electricity. The other brown coal fired, base load, power stations in the interconnected system are Yallourn, Morwell, and Yallourn "W".

There are also steam stations in Melbourne (Newport and Spencer Street), a gas turbine station at Jeeralang, and hydro-electric stations at Kiewa, Eildon and Dartmouth, on the Rubicon and Royston Rivers near Eildon, and at Cairn Curran on the Loddon River near Bendigo.

VICTORIA—POWER STATIONS: LOCATION, RATING, AND PRODUCTION

Station	Maximum continuous rating (a)	Electricity production							
		1977-78		1978-79		1979-80		1980-81	
		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	9,228.3	47.3	9,405.8	45.2	9,758.6	45.7	8,838.2	38.0
Yallourn	521	2,183.9	11.2	2,939.0	14.1	2,608.6	12.2	2,605.7	11.2
Yallourn "W"	700	4,204.0	21.5	3,525.8	16.9	3,657.9	17.1	4,446.2	19.1
Morwell	170	830.1	4.2	1,178.5	5.7	1,140.1	5.3	1,188.1	5.1
Newport	198	306.4	1.6	373.7	1.8	439.2	2.1	252.3	1.1
Newport "D"	500	—	—	—	—	—	—	1,130.6	4.9
Spencer Street (b)	90	109.9	0.6	184.1	0.9	212.7	1.0	116.2	0.5
Richmond	38	54.7	0.3	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
Total SEC thermal	4,282	16,917.3	86.7	18,144.3	87.2	18,905.7	88.5	20,786.8	89.4

VICTORIA—POWER STATIONS: LOCATION, RATING,
AND PRODUCTION—*continued*

Station	Maximum continuous rating (a)	Electricity production							
		1977-78		1978-79		1979-80		1980-81	
		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	
Hydro stations—									
Kiewa (c)	184	251.5	1.3	327.7	1.6	304.8	1.4	300.6	1.3
Eildon (d)	135	263.0	1.3	228.9	1.1	279.2	1.3	263.9	1.1
Dartmouth (d)	150	105.6	0.5
Total SEC hydro	469	514.5	2.6	556.6	2.7	584.0	2.7	670.1	2.9
Total SEC	4,751	17,431.8	89.3	18,700.9	89.9	19,489.7	91.2	21,456.9	92.3
Net purchases	..	2,077.0	10.7	2,105.9	10.1	1,884.2	8.8	1,797.6	7.7
Total	4,751	19,508.8	100.0	20,806.8	100.0	21,373.9	100.0	23,254.5	100.0

(a) At 30 June 1981.

(b) Melbourne City Council station.

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

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

Source: State Electricity Commission of Victoria.

Transmission and distribution

The distribution of electricity throughout Victoria has been virtually completed except for some isolated properties in remote parts of Victoria. The Commission supplies electricity in bulk to eleven municipal undertakings which operate as separate supply authorities under franchises granted before the Commission was established.

The electrical transmission and distribution system in the State supply network at 30 June 1981 comprised nearly 117,000 kilometres of power lines, 4 auto-transformation stations, 26 terminal receiving stations, 184 zone sub-stations, and nearly 87,000 distribution sub-stations. Main transmission is by 9,000 route kilometres of 500 kV, 330 kV, 220 kV, and 66 kV power lines which supply the principal distribution centres and also provide interconnection between generating sources. Electricity from Hazelwood is transmitted to the Melbourne area at 500 kV. A map of Victoria's main power transmission system can be found on page 301 of the *Victorian Year Book 1978*.

*New generating projects**Yallourn "W"*

Designed as a base load power station of 1,450 MW capacity, this station is being built in two stages at Yallourn West in the La Trobe Valley. It was originally planned to comprise only 2 x 350 MW units when approved by the Victorian Government in 1965. The first was commissioned during the winter of 1973 and the second during the winter of 1975. These units are now in operation.

In 1972, the Victorian Parliament approved a proposal to extend the Yallourn "W" power station by the addition of two generating units. Each will have a capacity of 375 MW. Site works commenced in 1975, and one of the generators is now in operation while the other is expected to be fully operational by June 1982.

Newport

The Victorian Government authorised the State Electricity Commission to build a 500 MW regulating power station at the mouth of the Yarra River. This station commenced generating electricity during 1980 while the final stages of construction were being completed. Further information on the Newport power station can be found on pages 799-800 of the *Victorian Year Book 1978*.

Dartmouth

The Commission constructed a new hydro-electric power station comprising a single 150 MW generator at Dartmouth on the Mitta Mitta River in north-eastern Victoria. The station commenced operating in January 1981.

Further reference: Jeeralang, *Victorian Year Book 1981*, p. 290

Loy Yang power station and open cut project

In 1976, the Victorian Government gave the State Electricity Commission authority to go ahead with the development of Loy Yang. Construction work started on access roads and associated earthworks in February 1977. The Loy Yang project is the largest single engineering project undertaken in Australia and will require a gradual build up in the workforce to 2,500 persons.

The first stage of the project, comprising the Loy Yang A 2,000 MW power station, the open cut, and engineering services, is expected to come into service progressively between 1984 and 1987, and the second stage, comprising a further 2,000 MW station Loy Yang B, between 1989 and the early 1990s. The direct capital cost of the project, at 1981 price levels, is estimated at more than \$3,500m.

Operation of the power station and open cut will require approximately 1,300 employees for the initial 2,000 MW Loy Yang A and some 2,000 employees for the full 4,000 MW development.

The two Loy Yang power stations will be built about five kilometres south-east of Traralgon, on the southern side of the open cut. The first 2,000 MW station, Loy Yang A, will comprise four 500 MW generating units. The turbine house will be about 400 metres long and 36 metres wide and nearly 35 metres high. Boiler house buildings will be about 115 metres high and each pair of boilers will be served by a single chimney 260 metres high.

Natural draught cooling towers, similar to those in service at the nearby Yallourn "W" power station, will be 113 metres high and 92 metres wide at the base. Cooling water circulating through the towers will be used over and over again.

The second 2,000 MW station, Loy Yang B, which is also planned to have 500 MW units, will be located east of the Loy Yang A station.

The Loy Yang open cut will be established between the valleys of the Traralgon and Sheepwash Creeks and extend from the southern boundary of the coalfield towards Traralgon. Overburden removal by the first large bucket wheel excavator (Dredger No. 14) will begin late in 1981.

Coal for the first 2,000 MW stage will be won by three dredgers each with a capacity of about 60,000 tonnes a day — about twice that of the largest dredgers now used by the SEC at Yallourn and Morwell. A fourth dredger of similar capacity will be brought into service for the second 2,000 MW stage. Coal will be transported from the dredgers by large conveyors to a coal storage bunker between the two Loy Yang power stations.

Initially, overburden will be placed in an area south of the coalfield. Later, as coal winning progresses, the overburden removed will be put in the worked-out area of the open cut. The external overburden dump will be landscaped to blend into the surrounding countryside and progressively covered with trees, shrubs, and grasses. By careful design, construction, and operational procedures, the SEC will ensure that any injurious effect of Loy Yang on the environment is kept to a minimum.

In evidence to the public inquiry into the project, the Environment Protection Authority said that there was no reason that waste discharge licences, with appropriate conditions, should not be issued and, in its report, the Parliamentary Public Works Committee concluded that the SEC had the ways and means to comply with these licences and conditions and to minimise adverse environmental effects.

The main works area will be surrounded by a buffer zone varying from 300 metres to 1,000 metres in width. This will screen operations, provide the site with a fire protection break, and give added protection to Traralgon residents from noise, dust, and earth movement.

Portland transmission line

A transmission line from Geelong to Portland became necessary with the approval by the Victorian Government of a proposal by Alcoa Australia Ltd for development of an aluminium smelter at Portland. Studies showed that the most economical way of supplying the load and providing adequate reliability was to build a double circuit 500 kV transmission line. The construction of two 500 kV transmission lines from Melbourne to Geelong, which are ancillary to the project, were planned before the Alcoa proposal but

their service dates were brought forward so that power could be transmitted from Melbourne to Portland by April 1983, the date planned for the smelter's commencement of operation.

The SEC made public in October 1979 details of three alternative routes between Geelong and Portland as well as proposed routes for the transmission lines from Melbourne to Geelong, together with related environmental effects statements. Before the Parliamentary Public Works Committee (PPWC) began its inquiry in February 1980, SEC officers met with parties concerned, including government departments and instrumentalities, councils, and landowners, and used the media to inform the community. When the PPWC began its inquiry, the community responded to the opportunity of being involved, and the PPWC took 1,053 pages of evidence over 11 days of hearing in Melbourne, Geelong, Camperdown, and Portland.

The routes of the transmission lines from Melbourne to Geelong and from Geelong to Portland, as recommended by the PPWC, were approved by the Governor in Council on 6 May 1980 and 10 June 1980, respectively. The route from Geelong to Portland recommended by the PPWC was a combination of the two more northern alternatives proposed by the SEC with modifications suggested by the evidence heard by the PPWC. The two projects require the SEC to establish 500 kV terminal stations at Sydenham, on the south-western outskirts of Melbourne, and at Moorabool, north-west of Geelong. Alcoa is to develop a sub-station in its works at Portland.

Construction on the two projects is being carried out in three sections. In December 1981, the following progress was reported:

- (1) Sydenham-Moorabool: Surveying had been completed and tower site foundations were being constructed. Tower assembly and erection had begun at the Sydenham end.
- (2) Moorabool-Mortlake: Design survey work had been completed and tower foundations had been completed as far as Shelford. Tower assembly and erection had begun between Moorabool and Bannockburn.
- (3) Mortlake-Portland: All main surveys had been completed and tower foundations had been completed between Mortlake and Orford. Steel was being delivered to tower sites in the Woolsthorpe region and tower assembly was about to begin.

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 1980

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. The latter are set out in the following table:

VICTORIA—COMMERCIAL EXPLORATION WELLS DRILLED BY ESSO AND BHP OFFSHORE IN THE GIPPSLAND BASIN, 1964 TO 1980

Well	Date well spudded-in	Type of well (a)	Result
Barracouta 1	27.12.64	W	Gas discovery
Barracouta 2	8. 6.65	A	Gas discovery confirmation
Barracouta 3	3. 8.69	A	Gas discovery confirmation
Barracouta A-3 (b)	20. 4.68	D	Oil discovery
Barracouta 4	30. 3.77	A	Oil and gas confirmation
Marlin 1	5.12.65	W	Gas discovery and oil show
Marlin 2	31. 5.66	A	Gas discovery confirmation
Marlin 3	16.12.66	A	Gas discovery and oil show confirmation
Marlin A-6 (c)	11. 8.68	D	Gas discovery confirmation
Marlin A-24 (d)	16. 5.73	D	Gas discovery confirmation
Halibut 1	20. 6.67	W	Oil discovery
Kingfish 1	6. 4.67	W	Oil discovery
Kingfish 2	28.11.67	A	Oil discovery confirmation
Kingfish 3	2. 2.68	A	Oil discovery confirmation
Kingfish 4	15.11.73	A	Oil discovery confirmation
Kingfish 7	26. 5.77	A	Oil discovery confirmation
Tuna 1	7. 5.68	W	Gas and oil discovery
Tuna 2	30.10.68	A	Gas and oil discovery confirmation
Tuna 3	18. 2.70	A	Gas and oil discovery confirmation
Snapper 1	8. 5.68	W	Gas discovery and oil show
Snapper 2	16. 6.69	A	Gas discovery confirmation
Snapper 3	24.11.69	A	Gas discovery confirmation
Mackerel 1	27. 3.69	W	Oil discovery
Mackerel 2	14. 2.72	A	Oil discovery confirmation
Mackerel 3	1. 4.72	A	Oil discovery confirmation
Mackerel 4	11. 2.73	A	Oil discovery confirmation
Cobia 1	4. 8.72	W	Oil discovery
Cobia 2	2. 5.77	D	Oil discovery: subsequent production
West Halibut 1 (e)	3. 9.78	A,W	Oil discovery
Fortescue 2	30.10.78	A	Oil discovery confirmation
Fortescue 3	26.11.78	A	Oil discovery confirmation
Fortescue 4	18. 3.79	A	Oil discovery confirmation
Flounder 1	10. 7.68	W	Oil discovery
Flounder 2	19. 2.69	A	Oil discovery confirmation
Flounder 3	24. 4.69	A	Oil discovery confirmation
Flounder 4	28.12.72	A	Oil discovery confirmation and gas discovery
Flounder 6	12. 7.77	A	Oil and gas discovery confirmation
Bream 2	23. 2.69	W	Gas and oil discovery
Bream 3	16.11.69	A	Gas and oil confirmation
Seahorse 1	30. 7.78	W	Oil discovery

(a) W = wildcat, A = appraisal well, D = development well.

(b) Drilled during development drilling on Barracouta platform in 1968 — deep well probe.

(c) Drilled during development drilling (first stage) on Marlin platform 1968 — deep well probe.

(d) Drilled during development drilling (second stage) on Marlin platform in 1973 — deep well probe.

(e) West Halibut 1 commenced as a step out for the Halibut field but ended as the exploration well for a new field called Fortescue.

Source: The Broken Hill Proprietary Co. Ltd, 1980.

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.

Drilling programmes, 1979 to 1981

During 1979 to 1981, the following wells were drilled in the Gippsland and Otway Basins:

VICTORIA—EXPLORATION WELLS DRILLED, 1979 TO 1981

Well	Date well spudded-in	Basin	Type of well (a)	Result
Threadfin 1	22. 2.79	Offshore Gippsland	W	Dry hole
Fortescue 4	18. 3.79	Offshore Gippsland	A	Oil discovery confirmation
North Paaratte 1	31.10.79	Onshore Otway	W	Gas discovery
North Paaratte 3	29. 5.80	Onshore Otway	W	Dry hole
East Seacombe 1	29. 6.80	Onshore Gippsland	W	Dry hole
North Paaratte 2	21. 1.81	Onshore Otway	W	Shut in gas well
Grumby 1	19. 2.81	Onshore Otway	W	Shut in gas well
Wallaby Creek 1	16. 3.81	Onshore Otway	W	Shut in gas well
Seaview 1	5. 4.81	Onshore Otway	W	Dry hole
Palmer 1	12. 8.81	Offshore Gippsland	W	Plugged and abandoned Dry hole
Bream 4A	18. 8.81	Offshore Gippsland	A	Oil and gas appraisal
West Seahorse 1	16. 9.81	Offshore Gippsland	W	Oil discovery
Yellowtail 1	17.10.81	Offshore Gippsland	W	Oil discovery
Baleen 1	4.11.81	Offshore Gippsland	W	Currently drilling (11.11.81)

(a) A = appraisal well, W = wildcat well.

Source: Department of Minerals and Energy.

Tenement holders, 1981

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

VICTORIA—TENEMENT HOLDERS, 1980

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
Hematite Petroleum Pty Ltd Gas and Fuel Exploration N.L. and Beach Petroleum N.L.					Vic./P1
Cultus Pacific N.L., York Resources N.L., Metramer Minerals Ltd, and Archean Investments Ltd					Vic./P11
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./P12
Phillips Australian Oil Co., Gas and Fuel Exploration N.L., MIM Investments Pty Ltd					Vic./P13
Esso Exploration and Production Aust. Inc.					Vic./P14
Oil and Minerals Quest N.L., Mincorp Ltd, Central Energy Pty Ltd, Zanex Ltd, and Otway Oil and Gas N.L.					Vic./P15
Beach Petroleum N.L.			P.E.P. 93	P.E.P. 94	
Western Mining Corporation Ltd Conserv (No. 779) Pty Ltd			P.E.P. 95		
Mincorp Ltd, Southern Oil Pty Ltd, and Alan Robert Burns and Derek Rose Gascoine	P.E.P. 96 and 97				
Victor Petroleum and Resources Ltd				P.E.P. 98	
Gas and Fuel Exploration N.L.				P.E.P. 99	
Siberia Oil and Gas N.L., Scomeid Pty Ltd, and Girvan Oil and Gas Pty Ltd				P.E.P. 100	
Sion Resources (Australia) Ltd				P.E.P. 101	
Australian Aquitane Petroleum Pty Ltd, Australian Occidental Pty Ltd, Alliance Resources Pty Ltd, Agex Pty Ltd, and Cluff Oil Pty Ltd				P.E.P. 101	
				P.E.P. 102	
					Vic./P17

VICTORIA—TENEMENT HOLDERS, 1980—*continued*

Name of company	Onshore exploration			Offshore exploration	
	Murray Basin	Otway Basin	Gippsland Basin	Otway Basin	Gippsland Basin
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 were expected to be brought into production in 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 is expected to be completed by the end of 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. Offshore construction is in progress.
- (2) Cobia platform, over the Cobia oilfield, with twenty-one wells planned. The onshore construction was approximately 96 per cent complete at the end of September 1981.
- (3) Fortescue platform, over the Fortescue oilfield, with twenty-one wells planned. The onshore construction was approximately 60 per cent complete at the end of September 1981.

(4) Flounder platform, over the Flounder gas and oilfield, with twenty-four wells planned. The onshore construction was approximately 10 per cent complete at the end of September 1981.

The completion of these four new platforms 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, was expected to come on stream in 1982 to supplement supply to the expanding Victorian gas market.

VICTORIA—CRUDE OIL PRODUCTION, 1976 TO 1980
(After processing)

Year	Barrels		Kilolitres	
	During year	Average barrels/day for year	During year	Average kilolitres/day for year
1976	140,559,679	384,043	22,347,162	61,058
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

Source: Esso Australia Ltd.

VICTORIA—GIPPSLAND BASIN COMMERCIAL HYDROCARBON RESERVES AND PRODUCTION, 30 JUNE 1981

Item	Initial	Produced	Remaining
		billions (10 ⁹) cubic metres	
Natural gas	220.4	32.9	187.5
		gigalitres	
Crude oil	465.8	219.9	245.9
Condensate	34.4	5.0	29.4
Liquefied petroleum gas	88.7	25.2	63.5

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.

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 1979 is set out in the following table:

VICTORIA—REFINING CAPACITY AT 1 DECEMBER 1979

Refinery	Location in Victoria and year refinery came on stream	Primary processing capacity (a)
Shell Refining (Australia) Pty Ltd	Corio near Geelong 1954	116,000 to 132,000 BSD
(Lubricating oil plant)	Corio near Geelong 1954	5,657,500 tonnes/year 2,200 BSD 100,000 tonnes/year
Petroleum Refineries (Australia) Pty Ltd	Altona near Melbourne 1954	100,000 BSD 4,600,000 tonnes/year
BP Refinery (Western Port) Pty Ltd	Crib Point on Western Port Bay 1966	60,000 BSD 2,500,000 tonnes/year

(a) BSD: barrels per stream day.

Source: *Oil and Australia*, Australian Institute of Petroleum Ltd, 1979.

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 MARKETED, 1979

Item	megalitres	tonnes	Item	megalitres	tonnes
Aviation gasoline	18.89	—	Industrial diesel fuel —		
Motor spirit —			Inland	106.35	89,909
Super	3,764.47	—	Bunkers	96.86	83,638
Standard	366.03	—	Total	203.21	173,547
Total	4,130.50	—	Fuel oil —		
Power kerosene	5.63	—	Inland (a)	254.17	237,996
Aviation turbine fuel	432.94	—	Bunkers	384.04	363,397
Lighting kerosene	38.59	—	Total	638.21	601,393
Heating oil	161.82	—	Grand total (b)	6,889.80	—
Automotive distillate —					
Inland	1,208.20	—			
Bunkers	51.81	43,144			
Total	1,260.01	—			

(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 1980-81, natural gas provided over 50 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 Hudbay Oil (Australia) Ltd in the offshore Gippsland Basin, with Phillips Australian Oil Company and M.I.M. Investments Pty Ltd in offshore Otway Basin, and in its own right in the onshore Otway Basin.

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 comprises:

- (1) An Energy Management School providing courses and seminars on efficient energy utilisation for plant engineers and senior management;
- (2) a consultative service offering advice on the most effective way to gain optimum results from energy used; and
- (3) a Development Division which tests and evaluates new equipment from local and overseas sources.

In 1978, the Corporation established an Energy Information Centre at 151 Flinders Street, Melbourne, to provide information to the general public on all aspects of the use of energy. It also promotes low energy housing and, in 1976, it initiated a home insulation programme resulting in insulation in Victorian homes increasing from 27 per cent to 54 per cent. 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 and commerce.

Gas supply areas

At 30 June 1981, the Corporation was supplying 872,786 consumers with gas through a network of approximately 18,600 kilometres of mains. Of these consumers, 859,368 were receiving natural gas and 13,418 were provided with a reticulated supply based on liquefied petroleum gas.

The areas provided with a reticulated gas supply at 30 June 1981 are shown in the following table:

VICTORIA—AREAS SUPPLIED WITH GAS AT 30 JUNE 1981 (a)

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

(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 gas sales have risen from 12.8 million gigajoules in 1967-68 — the last full year of manufactured gas supply — to a total of 125.8 million gigajoules in 1980-81. While the introduction of natural gas has resulted in a four-fold increase in the domestic market, from 8.8 million gigajoules in 1967-68 to 40.3 million gigajoules in 1980-81, its greatest impact has been in the industrial market where sales have risen from 2.5 million gigajoules in 1967-68 to 75.3 million gigajoules in 1980-81.

VICTORIA—COMMERCIAL SALES OF NATURAL GAS (a)

Year	Quantity	
	million m ³	million ft ³
1976	3,038.522	107,259.827
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

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

Source: Department of National Development and Energy, Canberra.

VICTORIA—SALES OF GAS
(’000 gigajoules)

Year	Gas and Fuel Corporation of Victoria
1976-77	95,396
1977-78	101,943
1978-79	108,757
1979-80	116,146
1980-81	125,771

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 the 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 ore bodies containing copper and zinc, in the Wilga and Currawong prospects. Silver is an important minor constituent of these ore bodies. Drilling to evaluate these deposits is in progress. The two ore bodies constitute the most important finds of base metals in Victoria and have stimulated exploration in the State.

Construction materials

Quarry products have maintained their place in Victoria's economy. In 1979-80, the production of construction materials, including clay and limestone for lime and cement, was approximately 36,500,000 tonnes, valued at \$122.4m. Slightly less than half of this quantity is produced and used in the Melbourne Statistical Division.

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**
(million terajoules)

Crude oil	Natural gas	Gas liquids	Brown coal	Total
17.3 (a)	8.5 (a)	3.3 (a)	442.8 (b)	471.9

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

(b) Economically recoverable at 1 July 1980.

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 1852 following the first reported discovery of alluvial gold in the previous year, 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 1976-77 to 1979-80 is shown in the following table:

VICTORIA—MINING AND QUARRYING PRODUCTION

Particulars	1976-77		1977-78		1978-79		1979-80	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metallic minerals (a)—	'000 gm	\$'000	'000 gm	\$'000	'000 gm	\$'000	'000 gm	\$'000
Gold bullion	42	112	10	35	26	129	41	456
	tonne		tonne		tonne		tonne	
Antimony ore	1,227	21	443	17	—	—	—	—
Bauxite	5,579	87	2,136	49	1,965	n.p.	1,143	n.p.

VICTORIA—MINING AND QUARRYING PRODUCTION—*continued*

Particulars	1976-77		1977-78		1978-79		1979-80	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metallic minerals (a) continued—	tonne		tonne		tonne		tonne	
Iron ore	1,785	17	473	4	8,409	n.p.	1,791	n.p.
Tin concentrate	2	10	2	15	1	n.p.	—	—
Non-metallic minerals—								
Diatomite	437	48	269	30	378	35	634	125
Fireclay	17,944	107	26,057	170	12,580	85	33,000	80
Gypsum	84,761	310	107,359	372	201,205	601	277,187	882
Kaolin, refined	18,616	1,572	23,605	2,007	30,723	2,728	42,755	4,248
Kaolin, unrefined (b)	276	4	7,088	30	5,969	25	3,568	27
Limestone (c)	2,081,201	n.a.	2,221,068	n.a.	2,141,251	7,810	2,213,455	8,761
Other clays	2,090,000	2,572	2,259,223	3,083	1,583,347	2,217	1,508,501	2,738
Silica	199,416	960	184,274	1,166	196,175	1,542	255,323	2,101
Fuel minerals—								
Briquettes	1,034,786	14,925	1,064,094	16,536	1,131,001	25,063	1,253,056	24,938
Brown coal (d)	28,231,206	55,905	27,643,837	64,925	29,094,740	79,630	32,894,505	91,821
Crude oil	'000m ³		'000m ³		'000m ³		'000m ³	
Liquefied petroleum gases (e)—	22,647		r23,475		23,074		22,080	
Commercial butane	1,324		1,387		1,687		1,561	
Commercial propane	1,207		1,267		1,542		1,553	
Natural gas (f)	million m ³	458,818	million m ³	545,374	million m ³	774,886	million m ³	980,800
Other derivatives (e)—								
Commercial ethane	103,350		110,455		144,025		147,908	
Construction materials—	'000 tonnes		'000 tonnes		'000 tonnes		'000 tonnes	
Sand	9,040	14,626	8,951	18,314	8,287	19,146	8,400	20,908
Gravel	4,683	4,367	4,807	4,626	4,759	5,387	5,131	6,272
Crushed and broken stone	17,884	48,388	18,665	62,215	18,845	68,616	18,001	80,539
Dimension stone	tonne		tonne		tonne		tonne	
	7,867	288	r19,889	r641	r14,407	r410	25,640	527
Other quarry products	'000 tonnes	3,327	'000 tonnes	r5,113	'000 tonnes	3,987	'000 tonnes	7,061

(a) See next table for assayed content.

(b) Excludes unrefined kaolin used in producing refined kaolin at or near mine.

(c) Excludes limestone used as a construction material.

(d) Excludes brown coal used in production of briquettes: 1976-77: 2,763,000 tonnes; 1977-78: 2,848,349 tonnes; 1978-79: 3,006,289 tonnes; 1979-80: 3,350,154 tonnes.

(e) Excludes manufactured liquefied petroleum gases and other derivatives from petroleum refining.

(f) Includes commercial gas and gas for field usage.

(g) Value shown is an estimate based on prices prescribed in legislation, quoted market prices, and information from government departments. Values of individual petroleum products are not available for publication.

Sources: Department of Minerals and Energy, Victoria; Fuel Branch, Commonwealth Department of National Development; and Australian Bureau of Statistics.

VICTORIA—ASSAYED CONTENT OF METALLIC MINERALS

Metal or element and mineral in which contained	1975-76	1976-77	1977-78	1978-79	1979-80
Alumina (tonne)—					
Contained in bauxite	1,214	2,829	1,110	963	520
Antimony (tonne)—					
Contained in antimony ore	60	109	49	—	—
Gold (gram)—					
Contained in antimony ore	—	—	—	—	—
Contained in gold bullion	105,582	40,175	9,238	21,752	33,709
Total gold	105,582	40,175	9,238	21,752	33,709
Iron (tonne)—					
Contained in bauxite	121	324	145	138	80
Contained in iron ore	3,990	1,071	284	5,045	1,075
Total iron	4,111	1,395	429	5,183	1,155
Rutile (tonne)—					
Contained in bauxite	118	—	—	—	—
Silica (tonne)—					
Contained in bauxite	289	—	—	—	—
Tin (tonne)—					
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
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	79,630
1979-80	—	—	32,894,505	91,821
1980-81	—	—	32,101,876	117,981

(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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