

ENERGY AND MINERALS

DEPARTMENT OF MINERALS AND ENERGY

In December 1976 the Victorian Parliament passed the *Minerals and Energy Act 1976*. It was assented to on 16 December 1976 and was proclaimed to operate from 1 September 1977. The Act provides for the amalgamation of the Ministry of Fuel and Power and the Mines Department into a Department of Minerals and Energy responsible to the Minister for Minerals and Energy. The *Fuel and Power Act 1965* was repealed and the Ministry of Fuel and Power abolished. The Mines Department was absorbed into the new department. However all legislation relating to mining and energy in the State remains in force and the provisions of the *Pipelines Act 1967* are now administered by the new Department in its entirety.

Other legislation administered by the Department includes the *Mines Act 1958*, *Petroleum Act 1958*, *Extractive Industries Act 1966*, *Petroleum (Submerged Lands) Act 1967*, *Groundwater Act 1969*, *Coal Mines Act 1958*, *Mining Development Act 1958*. The Department also plays an important role in the functioning of the *Environment Protection Act 1970* and the *Land Conservation Act 1970*.

The Minister for Minerals and Energy is the designated authority under the *Petroleum (Submerged Lands) Act 1967* and will continue to be responsible for the operation of the State Electricity Commission of Victoria and the Gas and Fuel Corporation of Victoria. Thus all legislation and activities relating to energy and mining in the State will come under the direct jurisdiction of a single Minister for Minerals and Energy.

In mid 1975 the Victorian Brown Coal Research and Development Committee was formed to study all aspects of the development of Victoria's brown coal resources other than for the generation of electricity with particular emphasis on the production of liquid hydrocarbons. On 6 May 1977 the Premier announced the formation of the Victorian Solar Energy Research Committee. Both committees are responsible to the Minister for Minerals and Energy.

The role of the Department of Minerals and Energy is to regulate the State's energy resources and broadly control their development. It also controls general mining and extractive industries. The Department promotes the exploration of the mineral, "stone", petroleum, and groundwater resources of the State; administers a system of leases, licences, and permits to enable the exploitation of those resources; and regulates their extraction to ensure that it is carried out in an efficient and safe manner. The Department also carries out geological research and surveys and publishes the results in geological maps and reports. In addition to assisting in exploration, these maps and reports provide basic information for soil surveys, land-use, environmental surveys, and

engineering undertakings. They are also of assistance to educational institutions and the general public.

The *Extractive Industries Act* 1966, provides for the regulation of quarries by leases and licences; it also involves the Department in town and country planning schemes where the location and protection of deposits of "stone" are involved. "Stone", as defined in the Act, includes basic construction materials such as hard rock for aggregates, sand, gravel, clay, limestone, etc. The Department's responsibility is to assist with the discovery of deposits of "stone" and to recommend to the various planning authorities an adequate form of zoning to protect the deposits. Sources of construction materials are an essential requirement in maintaining the development of housing, schools, factories, roads, dams, and sewerage systems, but with increasing public awareness about environmental issues, there often appears to be conflict over the use of "stone" deposits.

The planning authorities and the Department have a responsibility to plan for the future to ensure that valuable deposits of "stone" are not made unavailable by other land-use, particularly if the resource is in short supply. The siting of extractive operations can generally be planned, with due regard to the aesthetic interests and the material needs of the community.

The *Land Conservation Act* 1970 created the Land Conservation Council to investigate and publish reports on the future use of Crown lands. The Council instigates studies of areas through study groups comprised of professional officers from Victorian Government departments and authorities. Department of Minerals and Energy geologists work on these study groups and prepare reports on the physiography, geology, hydrogeology, and mineral resources of the study areas. Because important mineralised areas, deposits of "stone", and important aquifer systems often occur on Crown lands, the Department's contribution to the study groups is to point these areas out. The Department also requests that the Council recommend that the land be made available for future exploration and mining should the mineral content become of strategic significance at a later date.

Through the *Petroleum Act* 1958 and the *Petroleum (Submerged Lands) Act* 1967, the Department regulates the exploration by companies for oil and gas deposits in onshore and offshore areas. Leases and permits are issued and through a regular system of inspection of operations and of reporting from the companies, a high standard of professional efficiency and safety is maintained. On the development side, the installation of production facilities and the production and transmission of the oil and gas by pipeline are rigidly controlled. Through the late 1970s the exploration for petroleum and gas and the community's increasing dependence on a local source of supply will place major emphasis on exploration and development. The Department's task will continue to be to encourage exploration and to assist with expert technical advice and support publications on geological and engineering matters.

The Department, in collaboration with the South Australian Mines Department, carried out a major sedimentary basin study on the onshore Otway Basin during the 1960s and a comparable study is in progress on the onshore Gippsland Basin and the Port Phillip Bay area.

The *Pipelines Act* 1967 is used by the Department to regulate the route selection and the laying, operation, and inspection of all major pipelines conveying gaseous or liquid hydrocarbons and a number of other categories of pipelines such as those conveying industrial gases. Licences to own and use a pipeline are granted for a period of 21 years. Permits to use land on which a pipeline is to be laid must be obtained before a licence can be granted.

The *Groundwater Act* 1969 confirmed the Department's long standing role in the investigation and assessment of Victoria's groundwater resources and provided for the control, construction, and maintenance of water bores. The Act makes explicit provisions for the protection of groundwater from pollution from

the surface or by material injected underground and the Department is required to report on any existing or proposed disposal sites for soluble solid or liquid domestic or industrial wastes, which may overlie unconfined aquifer systems or be sited in important aquifer intake areas. Under the Act, "bore" is defined in such a way that any quarries, sandpits, or comparable excavations are included. Several geologists now work continuously on problems related to groundwater pollution and also investigate sites where disposal dumps and depots are established.

The Department's responsibilities under the Act in relation to pollution increased with the passing of the Environment Protection Act in 1970. The Department is now an investigating agency of the Environment Protection Authority in matters relating to groundwater and programmes of groundwater pollution monitoring are being jointly undertaken. The Department's work on groundwater and groundwater pollution will be increasingly integrated with environmental studies of areas such as Western Port Bay, Port Phillip Bay, and the Gippsland Lakes. No study of surface waters can be carried out effectively without a detailed study of the groundwater regime in relation to the geological and hydrological environment.

The Department is concerned not only with pollutant seeping laterally or vertically into unconfined aquifers from disposal bores or waste disposal depots, but also with the quality of surface waters flowing in streams. In an unconfined aquifer system a percentage of recharge is from the surface drainage system. Unconfined aquifer systems around the shores of bays such as Westernport and Port Phillip also discharge eventually into the bays, and the investigations in the next few years will concentrate on methods of preventing polluted groundwaters eventually reaching the shallow bays or lakes.

Victoria's major mineral resources are described on pages 335-42 of the *Victorian Year Book* 1976. A further special article on Victoria's minerals can be found on pages 1-29 of the *Victorian Year Book* 1970.

ENERGY

General

In 1975-76 about 86 per cent of Victoria's electricity needs were produced by the brown coal fired generating stations situated in the coal fields in the La Trobe valley. A further 5 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 82 per cent of Victoria's petroleum refinery crude oil input comes from the State's offshore oil fields and the balance is derived from crude oil imported from the Middle East.

During recent years natural gas has assumed an increasingly important role in the supply of energy in Victoria. Currently it provides about 16 per cent of Victoria's primary energy needs. Over 99 per cent of all gas used in Victoria for domestic and industrial purposes is produced from the offshore gas and oil fields 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 oil and gas fields.

VICTORIA—SOURCE OF PRIMARY ENERGY, 1975-76

Source	Per cent
Crude oil	42.3
Brown coal	40.2
Natural gas (including LPG)	15.5
Hydro power	1.4
Wood	0.6
Total	100.0

Source : Department of Minerals and Energy.

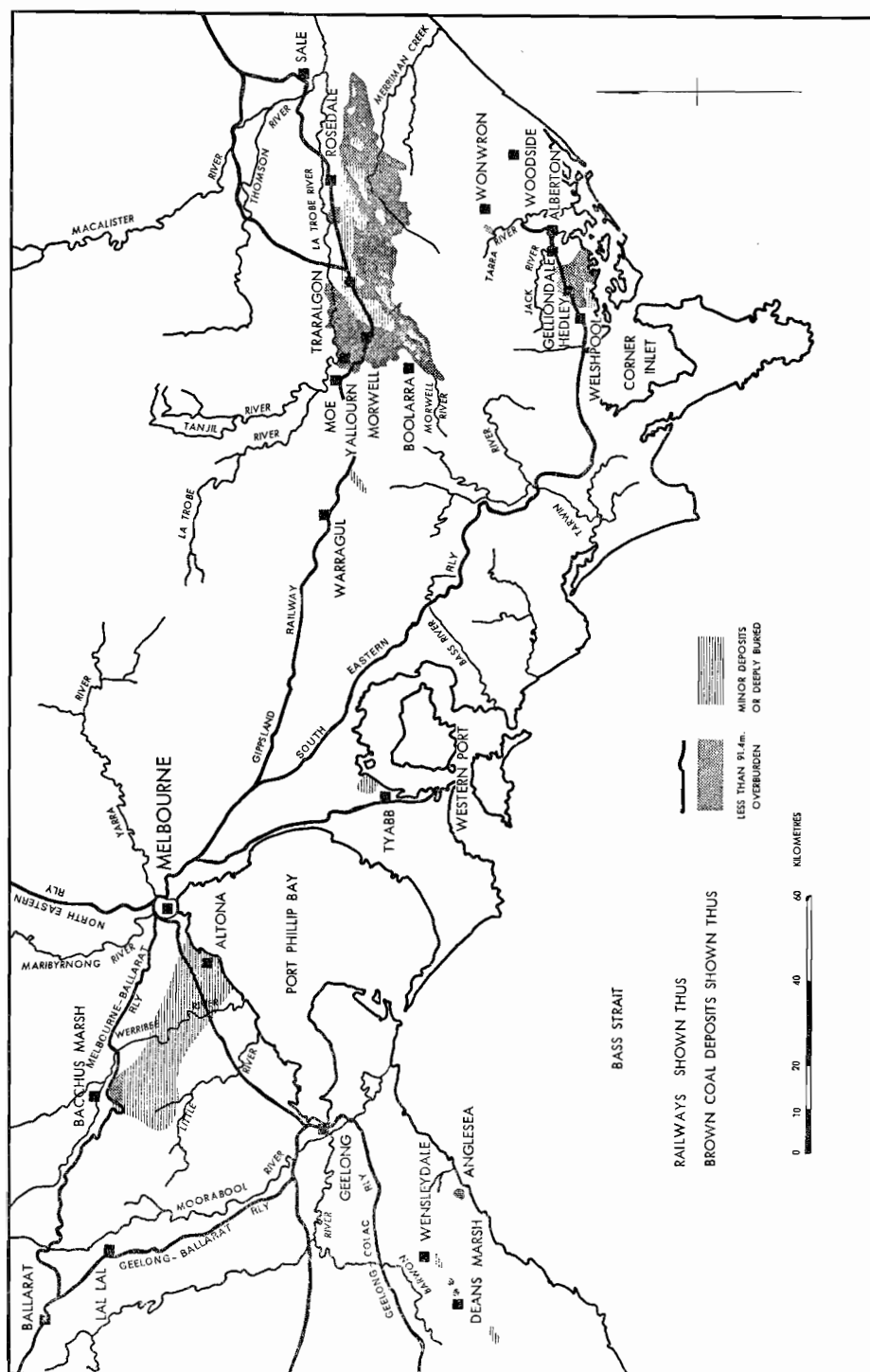


Figure 12. Brown coal areas of Victoria, June 1974.

Brown Coal*Location*

Victoria's largest resources of fossil fuels are the huge deposits of brown coal in the La Trobe valley. These extend over an area ranging from 140 kilometres to 200 kilometres east of Melbourne in the central Gippsland region. These deposits, which form the bulk of primary energy available to the State, are among the largest in the world. Smaller deposits exist in other areas in south Gippsland, in south eastern Victoria at Gelliondale and in the south-central region at Anglesea, Bacchus Marsh and Altona (see map on page 298). 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 the State.

Resources

The resources of brown coal in Victoria total about 114,000 megatonnes. This is the current geological assessment but as a result of continuing drilling programmes, knowledge of these resources is gradually being increased as more deposits are revealed in areas not yet fully explored, particularly in the eastern part of the coal bearing area of the La Trobe valley in central Gippsland.

The resources which have been proven as potentially economically recoverable are classified as reserves. The inferred or estimated balance are marginal or sub-marginal reserves but are classified as part of the total resource. This is illustrated in the following table.

VICTORIA—GEOLOGICAL RESOURCES OF BROWN COAL
(megatonnes)

Area	Reserves proved	Marginal (inferred) reserves	Total resources
Eastern Victoria—			
La Trobe valley	(a) 64,923	(a) 42,923	(a) 107,846
Stradbroke (b), Wonthaggi	502	..	502
Gelliondale	1,321	4,093	5,414
	66,746	47,016	113,762
South-central Victoria (c)—			
Anglesea	Insufficiently delineated		115
Bacchus Marsh	Insufficiently delineated		100
Altona (d)	Possibly extensive but not defined		..
			215
Total	..	..	113,977

(a) Comprises marginal and sub-marginal reserves as part of total resources.

(b) Delineation drilling of Stradbroke field by Department of Minerals and Energy still in progress in late 1977.

(c) No delineation drilling for several years.

(d) Difficult to assess as resource is covered by thick lava flows of basalt and by sediments and would be uneconomic at present.

Sources : State Electricity Commission and Department of Minerals and Energy, Victoria, 1975-76.

La Trobe valley fields

The brown coal seams in the La Trobe valley range in geological age from Eocene to Early Miocene and are therefore between 50 and 20 million years old.

The brown coal reserves in the valley comprise about 65,000 megatonnes proven and 43,000 megatonnes inferred (marginal and sub-marginal). About 35,000 megatonnes or 54 per cent of the proven reserves occur in areas where the overburden over the uppermost seam is less than 30.5 metres while 62,000 megatonnes or 95 per cent is in areas with less than 91.4 metres of overburden. The inferred reserves of 43,000 megatonnes in the La Trobe valley are mostly deeper and less accessible with only about 3 per cent occurring in areas with less than 30.5 metres of overburden.

Thick coal seams occur close to the surface in the two large areas known as the Yallourn-Morwell and the Loy Yang coalfields and in several smaller areas subject to verification. 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. Using the open-cut techniques currently in use, about 12,000 megatonnes can be readily recovered at approximately 1976 costs for the purpose of power generation and briquette manufacture.

Other fields

Stradbroke

This is a newly discovered field in the Strzelecki Ranges adjacent to the southern flank of the La Trobe valley with estimated reserves of 500 megatonnes which are in the economically winnable category. Drilling is continuing.

Gelliondale

The Gelliondale coalfield is located beneath the flat coastal plain adjacent to the south Gippsland highlands. The boundaries of the field have not been clearly defined, but an area approximately 10 kilometres 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. Proved and inferred reserves total about 5,000 megatonnes of which readily recoverable reserves are estimated at 400 megatonnes.

Production, 1975-76

During the period 1 July 1975 to 30 June 1976, 29.21 megatonnes of brown coal was mined in Victoria. Of this quantity 28.08 megatonnes was won by the State Electricity Commission of Victoria from the La Trobe valley fields and 1.13 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, 25.37 megatonnes being used in 1975-76 for this purpose. Only about 3.84 megatonnes was used during the same period for other purposes such as briquette manufacture and steam raising. During the year ending 30 June 1976 the State Electricity Commission of Victoria won 28.08 megatonnes of brown coal from the three open cuts it currently operates in the La Trobe valley.

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 million tonnes during 1966 but with the advent of natural gas declined to 947,000 tonnes in 1976.

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.

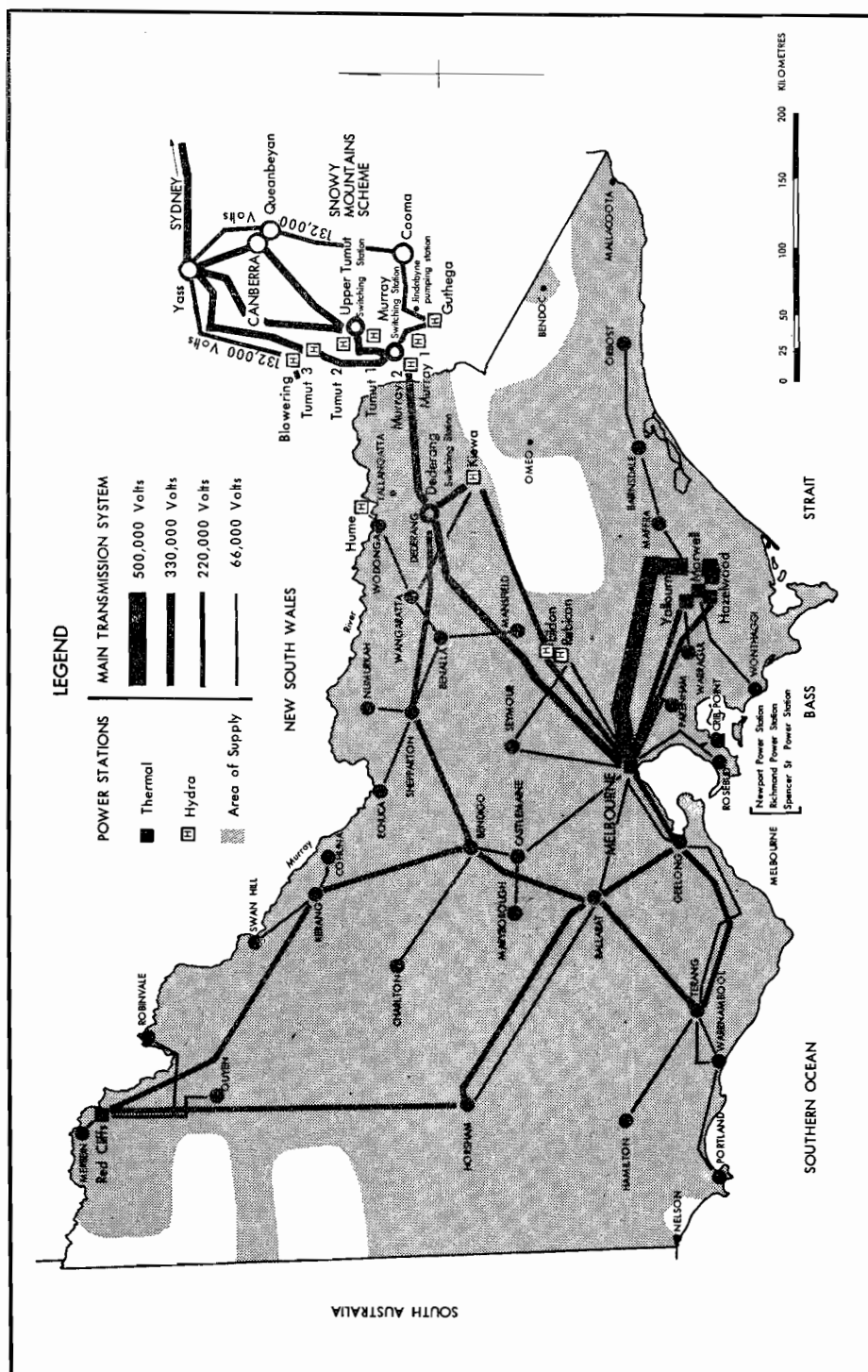


FIGURE 13. Victoria's main power transmission system, 30 June 1975.

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 1976 the Commission with 18,572 personnel and capital assets of \$1,870m distributed electricity to 1,187,000 consumers throughout Victoria. In addition eleven metropolitan municipal councils purchased electricity in bulk from the Commission for retail distribution to a further 265,000 customers. Over 115,000 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 in 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 about 140 kilometres east of Melbourne 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 1975-76, 86 per cent of Victoria's electricity needs was generated from brown coal used almost wholly in its raw state. Brown coal is also manufactured into a high quality fuel in the form of briquettes. About 17 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 fire power station at Hazelwood which alone generates nearly 50 per cent of Victoria's electricity. The other brown coal fired, base load power stations in the interconnected system are the Yallourn (which contributes 15 per cent), Morwell, and the first two sets of the new base load power station, Yallourn "W".

There are also steam stations in Melbourne (Newport, Richmond, and Spencer Street), the hydro-electric stations at Kiewa and Eildon, on the Rubicon and Royston Rivers near Eildon, and at Cairn Curran on Eppalock Reservoir on the Campaspe River near Bendigo.

VICTORIA—POWER STATIONS: LOCATION, RATING, AND PRODUCTION

Station	Maximum continuous rating (a)	Electricity production							
		1972-73		1973-74		1974-75		1975-76	
		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	8,550.4	57.2	8,510.6	52.7	8,238.0	48.1	9,132.2	49.8
Yallourn	546	2,659.2	17.8	2,480.1	15.4	2,545.1	14.8	2,360.7	12.9
Yallourn "W"	700	4.8	..	1,475.1	9.1	2,409.0	14.0	3,538.9	19.3
Morwell	170	1,134.5	7.6	1,196.9	7.4	1,263.7	7.4	1,165.3	6.3
Newport	198	140.5	0.9	181.6	1.1	136.6	0.8	133.4	0.7
Spencer Street (b)	90	15.2	0.1	12.7	0.1	1.0	..	1.2	..
Richmond	38	5.2	..	7.2	..	0.1	..	0.2	..
Red Cliffs (c)	..	0.6	..	0.5	..	0.1	..	..	..
Total SEC thermal	3,342	12,510.4	83.6	13,864.7	85.8	14,593.6	85.1	16,331.9	89.0
Hydro Stations—									
Kiewa (d)	184	286.1	1.9	452.0	2.8	451.9	2.7	394.3	2.1
Eildon (e)	135	306.4	2.1	320.7	2.0	539.1	3.1	415.5	2.3
Total SEC hydro	319	592.5	4.0	772.7	4.8	991.0	5.8	809.8	4.4
Total SEC	3,661	13,102.9	87.6	14,637.4	90.6	15,584.6	90.9	17,141.7	93.4
Net purchases	..	1,853.8	12.4	1,510.6	9.4	1,554.7	9.1	1,204.8	6.6
Total	3,661	14,956.7	100.0	16,148.0	100.0	17,139.3	100.0	18,346.5	100.0

(a) At 30 June 1976.

(b) Melbourne City Council station.

(c) Retired April 1975.

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

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

Source: State Electricity Commission of Victoria.

Transmission and distribution

The electrification of Victoria had 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 1976 comprised over 115,000 kilometres of power lines, 4 auto-transformation stations, 26 terminal receiving stations, 169 zone sub-stations, and over 70,000 distribution sub-stations. Main transmission is by 8,000 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.

*New and proposed 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.

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 the two new generators are expected to be in service in the early 1980s. The total cost of the stations is estimated to exceed \$400m.

Newport

The Victorian Government has authorised the State Electricity Commission to build a 500 MW regulating power station at the mouth of the Yarra River and construction is proceeding (see also appendix).

Gas turbine

The Commission proposes to install a 200 MW gas turbine using natural gas to provide additional generating capacity to compensate for the expected shortage in supply which will be caused through the delay in building the new Newport Station. A site has not yet been finally selected.

Dartmouth

The Commission plans to construct 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 is scheduled to commence operating in 1979.

Loy Yang

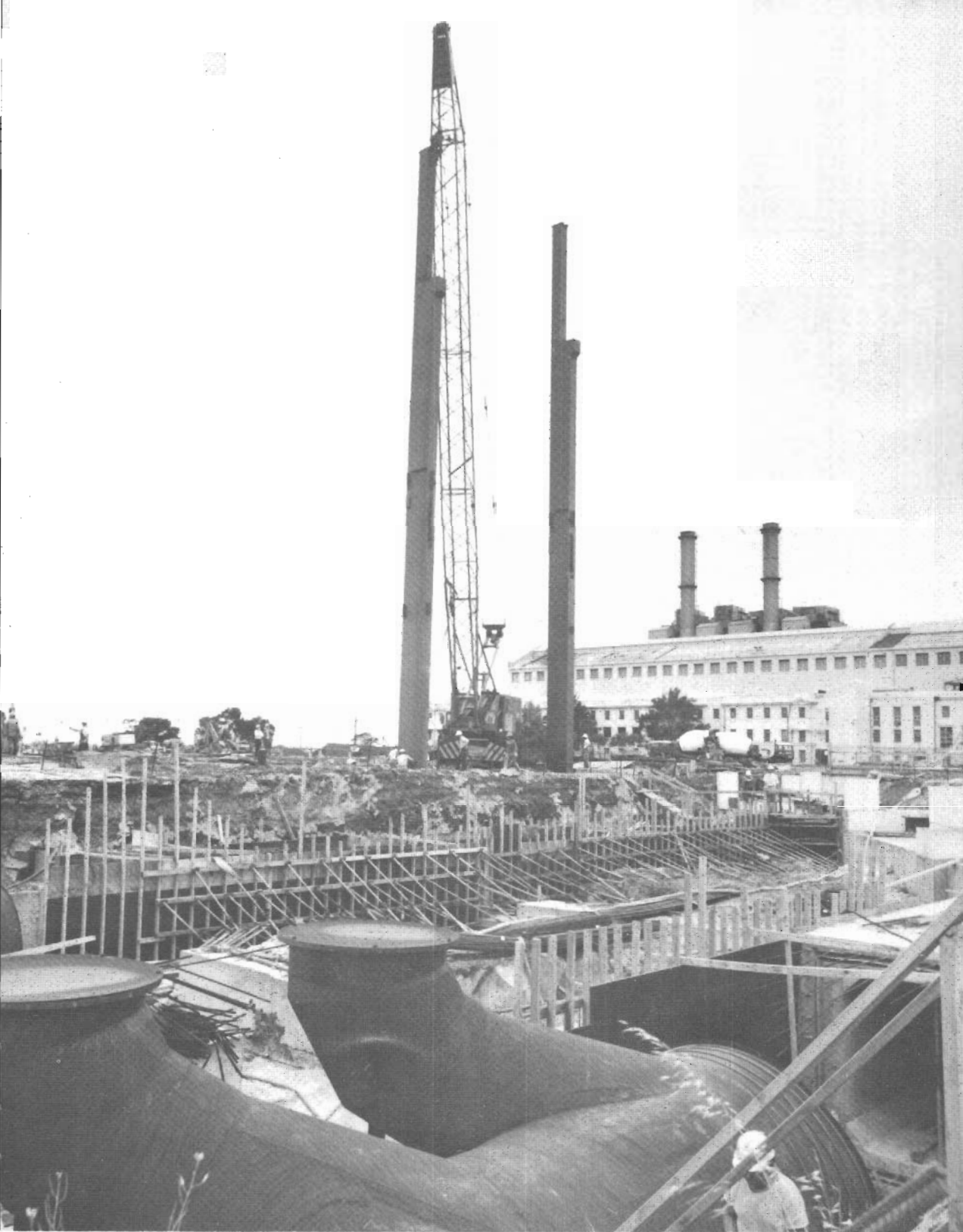
In December 1976 the Victorian Government passed an Act of Parliament authorising the construction of a power station and open cut complex at Loy Yang, 7 kilometres south east of the City of Traralgon in the La Trobe valley in central Gippsland. The development will comprise two 2,000 MW power stations with the first station (Loy Yang "A") planned to come into service between 1983 and 1988 and the second power station (Loy Yang "B") programmed to come into service between 1989 and 1992. The capacity of each power station, comprising 4 x 500 MW generating units, will be greater than that installed at either Yallourn or at Morwell-Hazelwood. Each unit will be served by a single, natural draught, cooling tower and have a single chimney stack. Site works for the construction of the first of the two 2,000 MW stations began early in 1977.

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 was a small one erected at Laverton. It 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 km from the centre of Melbourne, currently satisfy almost the whole of Victoria's market for refined products.

*Discovery and development of indigenous oil and gas fields**Exploration in the Gippsland Basin, 1960–1977*

Exploration for petroleum has been almost a continuous operation in the offshore waters of eastern Bass Strait during the past 17 years. The work has been carried out 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. through Esso Australia Ltd as the operator.



Columns for the turbine room at Newport "D" power station during an early stage in erection, January 1978.

State Electricity Commission



An artist's impression of the Loy Yang project in the La Trobe valley. This brown coal fired station is designed to produce 4,000 megawatts of power.

State Electricity Commission

Development of the Gippsland fields, 1967 to 1977

Between 1967 and 1971, four of the commercial fields discovered offshore in the Gippsland Basin in eastern Victoria were developed as an integral operation. These were the Barracouta and Marlin gas fields and the Halibut and Kingfish oilfields, together with a small oil reservoir in the Barracouta field. During 1972 and 1973 further development was carried out on the Marlin field following delays to the initial programme caused by a blow-out and a fire on the platform. At present, work on the development of the Mackerel field is well advanced. Drilling of the scheduled eighteen production wells has commenced.

During the latter part of 1976, construction of the Tuna template was completed and it was erected on site about 56 kilometres offshore in January 1977. Work on the erection of the platform continued through most of 1977 and development drilling of the scheduled 18 wells is expected to be carried out during 1978.

Production and transportation of crude oil, 1970 to 1976

The Barracouta oil reservoir, discovered during gas development drilling programmes in 1968, came on stream in October 1969, the Halibut field in April 1970, and the Kingfish field in March 1971. The crude oil from these three fields is stabilised at the Gippsland Gas Processing and Crude Oil Stabilisation Plant at Longford.

The stabilised crude is then conveyed through a pipeline to Long Island Point where it is stored in eight 268,000 barrel capacity tanks. From Long Island Point the crude oil is then taken by tankers to refineries in Sydney and Brisbane and by pipeline to Victoria's three refineries. The following table sets out the production of stabilised crude oil for the years 1971 to 1976:

VICTORIA—CRUDE OIL PRODUCTION, 1971–1976

Year	Barrels			Kilolitres		
	During year	Progressive production at 30 June	Average barrels/day for year	During year	Progressive production at 30 June	Average kilolitres day for year
1971	95,668,066	143,028,336	262,104	15,211,223	22,741,505	41,675
1972	103,262,110	246,290,446	282,136	16,418,675	39,160,181	44,860
1973	127,089,311	373,379,757	348,190	20,207,200	59,367,381	55,362
1974	126,656,461	500,036,218	347,004	20,138,377	79,505,759	55,173
1975	136,434,598	636,470,816	373,793	21,693,101	101,198,860	59,433
1976	140,559,679	777,030,495	384,043	22,347,162	123,546,022	61,058

Source: Esso Australia Ltd.

VICTORIA—GIPPSLAND BASIN COMMERCIAL HYDROCARBON RESERVES AND PRODUCTION, 1 JULY 1977

Item	Initial	Produced	Remaining	Initial	Produced	Remaining
	trillion (10 ¹²) cubic feet			billion (10 ⁹) cubic metres		
Natural gas	7.763	0.535	7.228	219.918	15.158	204.760
	million barrels			'000 kilolitres		
Crude oil	1,928	837	1,091	306,532	133,073	173,459
Condensate	173	11	162	27,506	1,749	25,757
Liquified petroleum gas	467	82	385	74,249	13,038	61,211

NOTE: All figures are for products *after processing*.

Tuna reserves were revised in BHP's Annual Report 27 August 1976.

Crude oil = C₁ + in oil reservoir; Natural gas = C₁ and C₂;

Condensate = C₃ + dissolved in gas; LPG = C₃ and C₄.

Source: Department of Minerals and Energy. Victoria, 1977.

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.

Because the characteristics of Gippsland crude oil were different from those imported from the Middle East, the three refineries modified their processes when it commenced to be used in 1970 and, in some instances, installed new plant. Refining capacity at December 1975 is set out in the following table:

VICTORIA—REFINING CAPACITY AT 30 JUNE 1976

Name of operating company	Location in Victoria and year came on stream	Plant type (a)	Primary processing units (b)
Shell Refining (Australia) Pty Ltd	Corio near Geelong 1954	D	16,536–17,490 kl a stream
		C	day (104,100–
		L	110,000BSD) 5,406,000
		B	tonnes/year
Petroleum Refineries (Australia) Pty Ltd	Altona near Melbourne 1954	D	15,900 kl (100,000BSD)
		C	4,692,000 tonnes/year
		L	
		B	
BP Refinery (Western Port) Pty Ltd	Crib Point, on Western Port Bay 1966	D	9,540 kl a stream day
		B	(60,000BSD) 2,550,000 tonnes/year

(a) Keys to type of plant : D: distillation ; C: cracker ; L: lubricating oil ; B: bitumen.

(b) BSD: barrels per stream day ; kl: kilolitres.

In addition the lubricating plant of Shell Refining (Australia) Pty Ltd at Corio has an output capacity of 350 kilolitres or 2,200 barrels per stream day. This is equivalent to 102,000 tonnes a year.

Each refinery also imports crude oil from the Middle East for the production of special products including bitumen, asphalt, and certain other heavy end 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 crude oil is shipped by tanker from the Long Island Point and Crib Point jetties at Western Port to refineries in Sydney and Brisbane. The total volume shipped by tanker during the twelve months ending June 1976 was 62,176,235 barrels or 9,885,248 kilolitres, and 159 tanker movements were involved.

During the twelve months ending 30 June 1976, the three refineries obtained by pipeline 74,834,179 barrels or 11,897,704 kilolitres of Gippsland crude and imported 6,545,000 barrels or 1,040,574 kilolitres of crude from the Persian Gulf, making a total supply of 81,379,179 barrels or 12,938,278 kilolitres of crude oil feedstocks. During the calendar year 1975 the refineries imported by ship 3,452,000 barrels or 549,200 kilolitres of wholly or partially refined products from overseas or other States in Australia and exported by ship 30,034,000 barrels or 4,774,000 kilolitres of wholly or partially refined products to overseas destinations such as New Zealand and the Pacific Islands and to other States in Australia.

Marketing

Motor spirit in two grades—98 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 4,029 retail outlets (30 June 1976), the majority of which are operated by the nine major oil

companies. At 30 June 1976 Victoria had the capacity to store 3,166,106 kilolitres of crude oil and petroleum products in bulk at 22 installations in Melbourne (15), Geelong (1), Crib Point (1), Long Island Point (1) and Portland (4), including refineries.

In 1976 a total of 8,205.16 thousand kilolitres or 26 per cent of the Australian total of the main petroleum fuels were marketed in Victoria's marketing area. The principal petroleum products marketed in 1976 are listed in the following table:

VICTORIA—PRINCIPAL PETROLEUM PRODUCTS MARKETING, 1976
(⁰⁰⁰ kilolitres)

Item	Quantity	Item	Quantity
Aviation gasoline	17.81	Industrial diesel fuel—	
Motor spirit—		Inland	269.48
Super	3,419.65	Bunkers	99.05
Standard	495.40		
		Total	368.53
Total	3,915.05	Fuel oil—	
Power kerosene	9.86	Inland (a)	306.84
Aviation turbine fuel	377.12	Bunkers	482.84
Lighting kerosene	59.94		
Heating oil	477.44	Total	789.69
Automotive distillate—		Other petroleum fuels (b)	1,122.45
Inland	1,035.80		
Bunkers	31.47	Grand total	8,205.16
Total	1,067.28		

(a) Excluding refinery fuel.

(b) Including refinery fuel.

Source: Petroleum Branch, Department of National Resources, Canberra.

Liquefied petroleum gas (propane and butane)

Liquefied petroleum gas (LPG) is produced by the Esso/BHP fractionation plant at Long Island Point and Victoria's three refineries. The Long Island facilities produce over 75 per cent of the total production of LPG in Victoria. The principal distributor in Victoria is the Gas and Fuel Corporation of Victoria which supplies over 100,000 customers by reticulation and by cylinder. A number of oil companies and other marketing companies distribute LPG throughout the State in accordance with the provisions of the *Gas Franchises Act* 1970. 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 1,200,000 tonnes. The total storage capacity at the plant comprises six tanks, each of 10,000 tonne 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 estimated to cost \$60m is now being built for Hydrocarbon Products Proprietary Limited at West Footscray.

Further reference, 1977; Natural gas and crude oil development, 1961–1972; Brown coal, 1971; Discovery and development of crude oil in Victoria, 1974

Gas industry

The gas industry in Victoria is based on natural gas which provides about 99 per cent of all gas used by industry and for domestic purposes. During recent years the structure of the industry has changed considerably. In 1969 the Gas

and Fuel Corporation of Victoria, a State instrumentality, and three privately owned gas companies operated the gas industry in the State. Since that time the three companies have been taken over by the Gas and Fuel Corporation of Victoria, which is now the sole distributor of natural gas in Victoria. At 30 June 1977, reticulated gas was being supplied to customers in Victoria through a network of approximately 14,000 kilometres of transmission pipelines and reticulation mains.

Gas and Fuel Corporation of Victoria

The Gas and Fuel Corporation of Victoria was established under the provisions of the *Gas and Fuel Corporation Act 1950* as a joint enterprise combining the State of Victoria with the shareholders of the Metropolitan Gas Company and the Brighton Gas Company. The purpose of the legislation was to provide the means for developing Victoria's brown coal resources for the production of gas, instead of using New South Wales black coal, and to consolidate and rationalise the gas industry by providing for the take-over and absorption by the Corporation of private or municipal gas utilities. The Corporation commenced operating on 1 January 1951 and, through the subsequent take-over of utilities which was authorised by legislation passed by the Victorian Parliament, became in 1974 the sole distributor of reticulated gas throughout Victoria.

Recent gas industry developments

The history of the discovery and development of the Gippsland Basin fields offshore in eastern Bass Strait is described in earlier editions of the *Victorian Year Book* and on pages 304-5 of this *Year Book*.

In 1974 the Esso/BHP partnership commenced a new stage of development of the Gippsland Basin fields. The first project to be undertaken was the enlarging of the Gippsland Gas Processing and Crude Oil Stabilisation Plant at Longford. A new gas plant, known as the Gippsland Gas Processing Plant No 2, was erected during 1974 and 1975 and commissioned in February 1976. It cost \$30m to build and is capable of treating 9.6 million cubic metres of gas a day. The new facilities are expected to meet the peak demands of the Gas and Fuel Corporation during the latter part of the current decade.

The Tuna field, which contains both natural gas and crude oil, is currently being developed and is expected to become operational about 1979. The submarine pipeline to convey the gas from the Tuna platform to the Marlin platform was laid early in 1976 and is currently being connected. The Tuna platform template was erected on site in January 1977, construction was completed during the year, and development drilling of the production wells is expected to take place during 1978. Plans are well advanced for the development of the Snapper gas field which lies between the Barracouta and Marlin fields.

Distribution and conversion

After being treated at the gas processing facilities at Longford to remove propane and butane and the pentanes, natural gas is conveyed to the Melbourne City Gate at Dandenong through a main transmission pipeline which was laid in 1968 and 1969. Natural gas first became available to users in Victoria on 14 April 1969.

The distribution and appliance conversion programmes carried out by the Gas and Fuel Corporation and the privately owned companies now absorbed into the Corporation, is described in previous editions of the *Year Book*. Early in 1974 the Gas and Fuel Corporation through enabling legislation (*Gas and Fuel Corporation (Powers) Act 1974*), acquired the Albury Gas Company Limited on the Murray River bordering New South Wales, at a cost of approximately \$800,000. This legislation facilitated arrangements for laying a pipeline from Melbourne to supply

natural gas to north-central Victoria, in particular to the Albury-Wodonga growth centre.

Laying of the 355 km long system of pipelines was completed in January 1977 to supply towns along the Hume Highway, at the Albury-Wodonga growth centre, and at Shepparton. An appliance conversion programme is currently being carried out at these localities and is expected to be completed during 1977.

In Melbourne a new pipeline has been laid from South Melbourne to the Brooklyn Compressor Station to reinforce supply in the western suburbs of Melbourne and to Geelong, Ballarat and Bendigo. At 30 June 1976 a total of 1,370,000 appliances owned by 564,000 customers had been converted to natural gas in Victoria.

Gas supply areas

At 30 June 1976 there was a total of 664,643 customers receiving natural gas in Victoria. A further 17,608 customers were using other reticulated gases, mainly reformed LPG, making a total of 682,251 customers. The areas supplied with reticulated gas at 30 June 1977 are shown in the following table :

VICTORIA—AREAS SUPPLIED WITH GAS AT 30 JUNE 1977 (a)

Supplier	Area supplied	
	Natural gas	Other gases (b)
Gas and Fuel Corporation of Victoria	Bacchus Marsh Ballarat Bendigo Castlemaine Geelong Lara Maffra Melbourne Morwell Sale Trafalgar Traralgon Warragul	Ararat Benalla Colac Hamilton Horsham Kyneton Portland Queenscliffe Seymour Shepparton Stawell Wangaratta Warrnambool Wodonga
Private suppliers— Eso Exploration and Production Australia Inc. and Hematite Petroleum Pty. Ltd. (BHP)	Western Port North Geelong	

(a) Excludes Esso/BHP own plant use at Longford and Long Island Point.

(b) In addition the Gas and Fuel Corporation supplies Maryborough and Warracknabeal with bottled LPG.

Source : Department of Minerals and Energy 1977.

Production and sales

VICTORIA—PRODUCTION OF TREATED
NATURAL GAS (a)

Year	Quantity	
	million m ³	million ft ³
1972	1,202.882	42,479.756
1973	1,793.526	63,338.363
1974	2,241.743	79,167.139
1975	2,565.355	90,557.032
1976	3,038.522	107,259.827
Total	10,842.028	382,802.117

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

Source : Department of National Resources, Canberra.

Sales rose sharply following the introduction of natural gas in April 1969. During the twelve month period ending 30 June 1968, the last full year before

the introduction of natural gas, sales showed an increase of only 5.5 per cent over the previous year. Sales during the twelve month period ending 30 June 1977 increased by 14.2 per cent.

VICTORIA—SALES OF GAS(a)
(gigajoules)

Year	Gas and Fuel Corporation of Victoria
1974-75	72,253,000
1975-76	83,628,000
1976-77	95,471,000

(a) Includes Mt. Gambier Gas Co. Ltd. in South Australia.

NOTE. 1 gigajoule = 9.479 therms. For sales of gas in Victoria for the years 1970-71 to 1973-74, see table on page 335 of *Victorian Year Book 1976*.

Source : Gas and Fuel Corporation of Victoria.

MINERALS

Economic natural resources

Introduction

Victoria lacks the diversity of mineralisation present in other Australian States. However, 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. A less spectacular development, but one equally important for Victoria's economy, was 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 Bass Strait during the 1960s from which Victoria now supplies about 64 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.

Construction materials

Apart from crude oil and natural gas, construction materials exceed other mineral production, including brown coal, in terms of quantity and value. In 1975-76, the production of construction materials, including clay and limestone for lime and cement, was approximately 35,000,000 tonnes, valued at \$73.4m. The larger portion of this quantity, estimated to be as much as 60 per cent, is both produced and used within the Melbourne Statistical Division.

Basalts from the Newer Volcanic Series remain the most important source of crushed and broken stone, although the proportion of the total production is gradually declining. The reason for this decline probably lies in the difficulties in meeting specifications and the recognition by the industry that granitic rocks and acid lavas are more uniform in quality both laterally and vertically and that the quantity of stone obtainable from a particular site is limited largely by geometrical considerations.

Fossil fuel reserves

The State's proven geological reserves of brown coal (lignite) amount to 66,700 million tonnes, of which 64,900 million tonnes occur in the extensive coal fields of the La Trobe valley. The total inferred geological reserves

down to depths at present uneconomic to mine amount to 113,700 million tonnes, but the State Electricity Commission estimates that the present economically extractable quantity is 12,200 million tonnes. This would contain an energy content of 120,000,000 terajoules.

The Bass Strait oil and natural gas fields will supply Victoria with natural gas for thirty years at the anticipated rate of consumption. It is estimated that an energy equivalent of 7,800,000 terajoules will be available if new gas fields are not discovered. The crude oil reserves, equivalent to 9,000,000 terajoules, will be seriously depleted by the late 1980s unless new discoveries are made in Victoria and Australia in the next ten years.

VICTORIA—ENERGY EQUIVALENT OF RECOVERABLE FOSSIL FUEL
(million terajoules)

Crude oil	Natural gas	Gas liquids	Brown coal	Total
9.0	7.8	2.1	120.0	138.9

The crude oil from the Bass Strait oil fields 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.

The black coal deposits of the south Gippsland coal fields such as Wonthaggi, Kilcunda, Korumburra, and Outtrim were mined during the first half of the twentieth century. The coals were of average grade, but because of thin seams and complex block faulting, mining was expensive and the final production ceased from Wonthaggi in 1968. Reserves are estimated to total 8,000,000 tonnes.

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 mineral products.

History of mining in Victoria

Victoria owes its rapid settlement and economic growth to the rich alluvial gold discoveries of the early 1850s. Although the early settlers were pastoralists, the rapid development of mining promoted the growth of industries and financial institutions. Gold mining reached a peak in 1856 with a total production of 86,000 kilograms of gold. From 1851 to 1857 the population of Victoria increased from 97,489 persons to 456,522 persons and had reached 1,000,000 persons by 1887.

One major consequence of the gold rushes was that Melbourne became an important centre of finance and maintains this role in Australia to the present day. Exploitation of the goldfields resulted in improved transportation facilities and improved access to large areas of fertile land which in itself supported the expansion of farming and pastoral industries.

Although for a long time gold production dominated the mining industry, other minerals were mined such as tin, antimony, copper, molybdenum, and wolfram. Production of some of these metals was as a by-product of gold mining. The mining activities of Victoria in the twentieth century have been characterised by marked progress in open cut mining, particularly of brown coal, limestone, and construction materials.

Discoveries of black coal in the south Gippsland area during the late nineteenth century and the early twentieth century resulted in underground mines at Coalville, Korumburra, Jumbunna, Outtrim, Kilcunda, and Wonthaggi. The black coal deposits at Wonthaggi were discovered in 1909 and the State Coal Mine operated in this area until 1968.

Brown coal mining in the Lal Lal, Bacchus Marsh, Altona, Wensleydale, Dean's Marsh, Benwerrin, Anglesea, Gelliondale, and La Trobe valley areas has continued for many years and the operations in the La Trobe valley rank among the world's largest open cut mining projects. Coal has been extracted from Yallourn North since 1889, but the major developments have taken place since 1920 when the State Electricity Commission took over the work begun by the Mines Department in 1916. Since 1924, when large-scale production began, more than 500,000,000 tonnes of brown coal have been mined from the Yallourn and Morwell open cuts.

Since the Second World War the rapid industrial development and recurrent building growth periods have made the production of construction materials the most extensive and valuable (apart from crude oil and natural gas) mining operation in Victoria. Limestones have been mined in large open cuts at Batesford and Waurin Ponds near Geelong, and at Merrimans Creek near Rosedale in Gippsland, for the manufacture of cement. Hard rock quarries supply aggregate and crushed rock for road construction and ferro-concrete buildings. Construction sands for concrete, plaster, and moulding are an important commodity and clays are mined by open cut methods for brick, tile, and pipe manufacture.

Victoria's economy was given another major impetus by the discovery in 1965 of the first of the large oil and gas deposits in the offshore fields of Bass Strait. Oil from Bass Strait now supplies approximately 64 per cent of total Australian requirements. It is estimated that sufficient reserves of natural gas exist to supply Victoria's needs as well as other markets for more than thirty years.

Geological Survey of Victoria

The Geological Survey of Victoria was formally established in 1852 following the first reported discovery of alluvial gold in the previous year. The establishment followed an appeal by Governor La Trobe to the Colonial Office in London for urgent expert geological assistance. A.R.C. Selwyn arrived in Melbourne in 1852 to become the founding Director of the Geological Survey. Selwyn immediately initiated a programme of geological mapping and mineral resource surveys to assess the distribution and nature of the gold bearing formations. In 1867 the Geological Survey was brought under the control of the Minister of Mines and at the present time functions as a division of the Department of Minerals and Energy.

The early work of the Survey included detailed surface and subsurface mapping of the important goldfield areas, and in the 1890s studies were extended to the black coal deposits in south Gippsland. This work culminated in the discovery of the Wonthaggi coal field 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 coal fields as a source of fuel before this responsibility was transferred to the State Electricity Commission 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 by the Geological Survey on the Tertiary stratigraphy and micropalaeontology of the onshore Gippsland Basin set a basis for the discovery of the oil and gas fields of Bass Strait during the middle 1960s.

In summary, the main activities of the Geological Survey are the investigation of Victoria's geological structure, 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 subsurface resources.

Mining and quarrying 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 1972-73 to 1975-76 is shown in the following table:

VICTORIA—MINING AND QUARRYING PRODUCTION

Particulars	1972-73		1973-74		1974-75		1975-76	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	'000 gm	\$'000	'000 gm	\$'000	'000 gm	\$'000	'000 gm	\$'000
Metallic minerals (a)—								
Gold bullion	148	(b)138	75	(b)81	249	225	119	343
	tonne		tonne		tonne		tonne	
Antimony ore	n.a.	n.a.	2,318	57	2,703	34	507	11
Bauxite	4,222	36	6,669	57	..	..	2,366	38
Iron ore	596	3	466	3	487	4	6,650	73
Tin concentrate	10	20	9	26	5	22	..	..
Wolfram ore	12	n.a.	..	..	..	..	..	..
Non-metallic minerals—								
Diatomite, refined	14	(c)	538	7	384	22	498	34
Fireclay	22,658	56	38,484	80	14,280	40	14,777	64
Fluorspar	1,700	79	874	49	..	..	..	..
Gypsum	43,694	154	49,825	149	54,139	161	69,006	240
Kaolin, refined	13,809	671	27,856	1,493	26,135	1,441	16,663	1,308
Kaolin, unrefined (d)	10,714	41	1,623	21	8,077	40	414	7
Limestone (e)	2,162,770	n.a.	2,424,380	n.a.	2,139,529	n.a.	2,170,684	n.a.
Other clays	2,186,698	1,858	2,736,979	2,524	2,222,221	2,343	2,478,992	3,114
Silica	109,019	339	141,832	460	142,550	445	116,273	708
Fuel minerals—								
Briquettes	1,228,005	9,173	1,163,922	11,011	1,092,134	11,391	945,793	11,974
Brown coal (f)	24,121,155	23,763	23,253,577	27,823	24,641,462	40,556	26,711,090	48,346
	'000 m ³		'000 m ³		'000 m ³		'000 m ³	
Crude oil	18,190		20,712		20,930		21,795	
Liquefied petroleum gases (g)—								
Commercial butane	988		929		1,147		1,181	
Commercial propane	798		1,123		1,025		1,051	
	million m ³	263,984	million m ³	330,060	million m ³	395,311	million m ³	455,371
		(i)		(i)		(i)		(i)
Natural gas (h)	1,473		1,998		2,284		2,641	
Other derivatives (g)—	'000 m ³		'000 m ³		'000 m ³		'000 m ³	
Commercial ethane	27,436		40,620		63,677		73,208	
Construction materials—	'000 tonnes		'000 tonnes		'000 tonnes		'000 tonnes	
Sand	6,659	8,945	7,788	11,068	7,541	11,726	7,766	12,833
Gravel	3,633	2,401	4,858	4,307	4,732	3,986	4,462	4,535
Crushed and broken stone	15,805	31,985	17,499	35,373	17,682	43,298	16,885	47,055
	tonne		tonne		tonne		tonne	
Dimension stone	14,515	284	10,937	217	12,283	262	10,621	256
	'000 tonnes		'000 tonnes		'000 tonnes		'000 tonnes	
Other quarry products	3,180	2,758	4,201	3,686	3,636	4,127	2,706	2,858

(a) See next table for assayed content.

(b) Includes gold subsidy of \$36,361 in 1972-73, and \$18 in 1973-74. Gold subsidy payments ceased at 31 December 1973.

(c) Under \$1,000.

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

(e) Excludes limestone used as a construction material.

(f) Excludes brown coal used in production of briquettes: 1972-73: 3,199,000 tonnes; 1973-74: 3,101,000 tonnes; 1974-75: 2,900,000 tonnes; and 1975-76: 2,500,000 tonnes.

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

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

(i) 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: Victorian Department of Minerals and Energy, Fuel Branch, Commonwealth Department of National Resources, and Australian Bureau of Statistics.

VICTORIA—ASSAYED CONTENT OF METALLIC MINERALS

Metal or element and mineral in which contained	1971-72	1972-73	1973-74	1974-75	1975-76
Alumina (tonne)—					
Contained in bauxite	..	1,977	2,819	..	1,214
Antimony (tonne)—					
Contained in antimony concentrate	n.a.	..	110	278	60
Contained in antimony ore	n.a.	n.a.	110	278	60
Total antimony	59	n.a.	110	278	60
Gold (gm)—					
Contained in antimony ore	..	..	158	..	..
Contained in antimony concentrate	1,586	..	..	..	..
Contained in copper concentrate	..	..	..	..	..
Contained in gold bullion	191,970	141,054	67,783	217,794	105,582
Total gold	193,556	141,054	67,941	217,794	105,582
Iron (tonne)—					
Contained in bauxite	..	310	209	..	121
Contained in iron ore	71	322	280	292	3,990
Total iron	71	632	489	292	4,111
Rutile (tonne)—					
Contained in bauxite	..	..	..	..	118
Silica (tonne)—					
Contained in bauxite	..	..	..	..	289
Silver (gm)—					
Contained in gold bullion	8,305	3,732	n.a.	n.a.	n.a.
Tin (tonne)—					
Contained in tin concentrate	18	7	7	4	..

Sources : Victorian Department of Minerals and Energy 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	(c)	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

(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.

(c) Under \$1,000.

Further reference, 1977; Mining in Victoria, 1964; Underground water, 1964; Groundwater in Victoria, 1969; Victorian clays, 1970; Minerals in Victoria, 1970; History of the Mines Department, 1970; Mineral exploration, 1972; Geological Survey of Victoria, 1975; Mineral exploration, 1975; Extractive industries, 1975; Mineral deposits in Victoria, 1976

BIBLIOGRAPHY

Victorian Office

- 8301.2 Secondary production
- 8401.2 Mining and quarrying commodity statistics

Central Office

- 5409.0 Overseas trade, part 1: exports and imports
- 5410.0 Overseas trade, part 2; comparative and summary tables
- 8402.0 Mining establishments, details of operations
- 8404.0 Mineral and mineral products
- 8405.0 Mineral production
- 8407.0 Mineral exploration
- 8409.0 Petroleum exploration