# 7

# MANUFACTURING INDUSTRY

## NATURAL RESOURCES AND LOCATION

### Natural resources

Victoria's temperate climate and its rainfall, soil, and water resources have been used to develop the production of wool, grains, fruit, dairy products, and timber. On these the State's early secondary industries were based. There are extensive fuel resources of brown coal in the La Trobe Valley. Of special importance to the industries of the State are the oil and natural gas fields in Bass Strait, the first of which was discovered in February 1965. In March 1969 natural gas for commercial use flowed from the Barracouta field and on 14 April 1969 natural gas was made available to the first domestic consumer in Victoria at Carrum. This was supplemented in 1970 from gas from the Marlin field. Oil in commercial quantities became available from the Barracouta field in October 1969 and from the Halibut field in March 1970. Reserves of gas and oil are known to be present in the Snapper and Kingfish fields, respectively.

The La Trobe Valley brown coal deposits, and to a much lesser degree those of south Gippsland and a number of small basins west of Melbourne, are now the most important mineral deposits in Victoria. The open cuts of the Yallourn–Morwell area produce about 21 million tons of brown coal annually for briquette making and electricity generation. Small quantities of black coal (35,000 tons annually) were mined in south-western Gippsland until the end of 1968.

Clay deposits for brick, tile, and pottery industries are worked east of Melbourne and near Ballarat, Bendigo, Colac, Shepparton, and Wangaratta. Sand, for the concrete and glass industries and for use in foundries, is obtained in the Port Phillip and west Gippsland areas. Stone and gravel quarries are worked in many parts of the State. The main market for quarry products is the metropolitan area and as these products are bulky and expensive to transport, most quarrying is located within a 50 mile radius of the capital. Local limestone deposits attracted the establishment of cement works at Geelong and Traralgon while the Lilydale limestones are used in the manufacture of agricultural lime.

Other mineral resources of Victoria include gold mining in the Castlemaine district; salt production from deposits of the Mallee and Wimmera lakes and the western shores of Port Phillip ; gypsum in the north-western Mallee; and bauxite deposits in south Gippsland.

The forests of Gippsland and the Central Highlands form the basis of important forestry activities, especially in Gippsland where paper is produced at Maryvale. Victorian forests provide approximately one quarter of Australia's timber.

Power supplies are essential for industrial development. The lack of black coal once necessitated significant imports from New South Wales. During 1970–71 the State Electricity Commission generated 91.6 per cent of Victoria's electricity, mostly from steam plants fired by briquettes or brown coal in the La Trobe Valley ; the balance is brought in, or produced in factories. Electricity is now transmitted throughout the State by the high voltage grid network shown on the map on page 399.

Recent discoveries of large offshore reserves of oil and natural gas in the Gippsland Basin (the potential of which has not yet been fully determined) make Victoria's power and chemical outlook promising.

Other sources of power for industry are gas, produced in Melbourne and principal country centres, and brought by pipeline from Morwell to Melbourne, and oil and liquid petroleum gas from the refineries at Altona, Geelong, and Crib Point.

Water, needed in large quantities for industry, is available throughout the State from the dams and storages in the catchment areas of the main rivers (see map on page 478 of *Victorian Year Book* 1966). In most years Melbourne is well supplied with water from the storages to the north and north-east of the city in the Plenty, Upper Yarra, Maroondah, and O'Shannassy river catchments. However, severe water restrictions were imposed during the 1967–68 summer due to State-wide drought conditions. To meet future requirements, construction works for extending the water supply are in progress. (See pages 254–5.)

## Location

The early concentration of industry in Melbourne has continued although power supplies now come largely from the La Trobe Valley. Of Victoria's 18,030 factories in 1967–68, 72.7 per cent were located in the Melbourne Statistical Division, which also had 83.0 per cent of the State's factory workers. Melbourne's factories contributed 80.6 per cent of the value added in manufacture. This concentration of manufacturing in the metropolitan area is partly due to the fact that Melbourne is Victoria's main port and the hub of the transport network. It is also the largest market in the State and the centre of comerce and finance ; it has a large labour force; and it is the administrative and educational centre of Victoria.

Many types of secondary industry are well represented in Melbourne. There are particularly high concentrations of the State's chemical, metal processing, textile, paper, furniture, food, and building materials industries in the capital. In terms of numbers employed, the engineering and metal processing industry is the major industry of Melbourne. Initially, industries developed in the inner areas of Port Melbourne, South Melbourne, Richmond, Collingwood, Spotswood, Fitzroy, and Footscray. The more recently established industries such as the motor vehicle, chemical, rubber, and refining industries, have taken up land in the outer industrial areas of

Altona, Broadmeadows, Moorabbin, Oakleigh, and Dandenong, where considerable areas of flat land are available for future expansion.

Outside the metropolitan area, Geelong is the most important industrial centre, with port facilities, close proximity to the Melbourne market, and rich surrounding rural areas. Industries established in the area include petroleum refining, and the manufacture of agricultural machinery, motor vehicles, aluminium ingots and extruded products, textiles, chemical fertilisers, clothing, carpets, foodstuffs, cement, fertilisers, sporting ammunition, and grain storage.

The other country urban areas in which more than 1,000 persons are employed in factories (ranked in order of the number of persons employed in factories) are the La Trobe Valley, Ballarat Urban Area, Bendigo Urban Area, Warrnambool City, Wangaratta City, Shepparton City, Maryborough City, and Castlemaine City. Apart from the La Trobe Valley, which is primarily engaged in power generation and ancillary activities, the factory population elsewhere is engaged in the production of food, textiles and clothing from locally produced raw materials, in engineering plants, which sometimes had their origin in the gold mining era of the nineteenth century, and more recently in decentralised plants with defence significance.

## MANUFACTURING ACTIVITY

Information on the subjects dealt with in this section of the *Year Book* is contained in the annual printed bulletins *Manufacturing Industry* and *Manufacturing Commodities* issued by the Central Office of the Bureau. Information is also published, principally at the Australian (as distinct from State) level of aggregation, as soon as the data can be prepared, in a series of thirty-five annual bulletins, *Manufacturing Industries,* each relating to a particular industry or group of industries. Advance annual information at the Australian level of aggregation is published in *A Summary of Principal Statistics of Factories* and in *Principal Factory Products,* and for Victoria in the bulletin *Factory Statistics : Preliminary Statement.* Current information on factory products is available in the *Victorian Monthly Statistical Review* and the monthly Victorian bulletin *Secondary Production.*

In addition to the above-mentioned publications there is also a series of fifty-two *Monthly Production Summaries,* each relating to the production of a particular commodity or group of commodities at the Australian level of aggregation.

In respect of the year 1968–69 the Commonwealth Bureau of Census and Statistics has conducted the annual census of manufacturing industry as part of a programme of fully integrated economic censuses covering manufacturing and mining industries, and retail and wholesale trade. For a detailed description of the purposes served by this project, and of the new concepts and methods adopted, the reader is referred to the special article on these censuses on pages 368–89 of the *Victorian Year Book* 1971. A more detailed version of this article appears as Chapter 31 of the *Commonwealth Year Book* 1970.

The integrated economic censuses have been a major undertaking involving the development of new concepts, definitions, and procedures.

Inevitably there has been a considerable delay in finalising the results of the censuses and, for this chapter on manufacturing industry, it has not been possible to provide more up-to-date statistics than those for 1967–68 which were included in the 1970, and to a lesser extent in the 1971, *Year Books*. Results of the 1968–69 censuses will be available in a set of special bulletins, extracts from which will be published in future issues of the *Victorian Year Book*.

For 1969–70 the concepts, forms, and classifications used for factories (and mines) included in the 1968–69 integrated censuses were again adopted and it is expected that information for both years will be published at about the same time.

**Manufacturing developments during 1970**

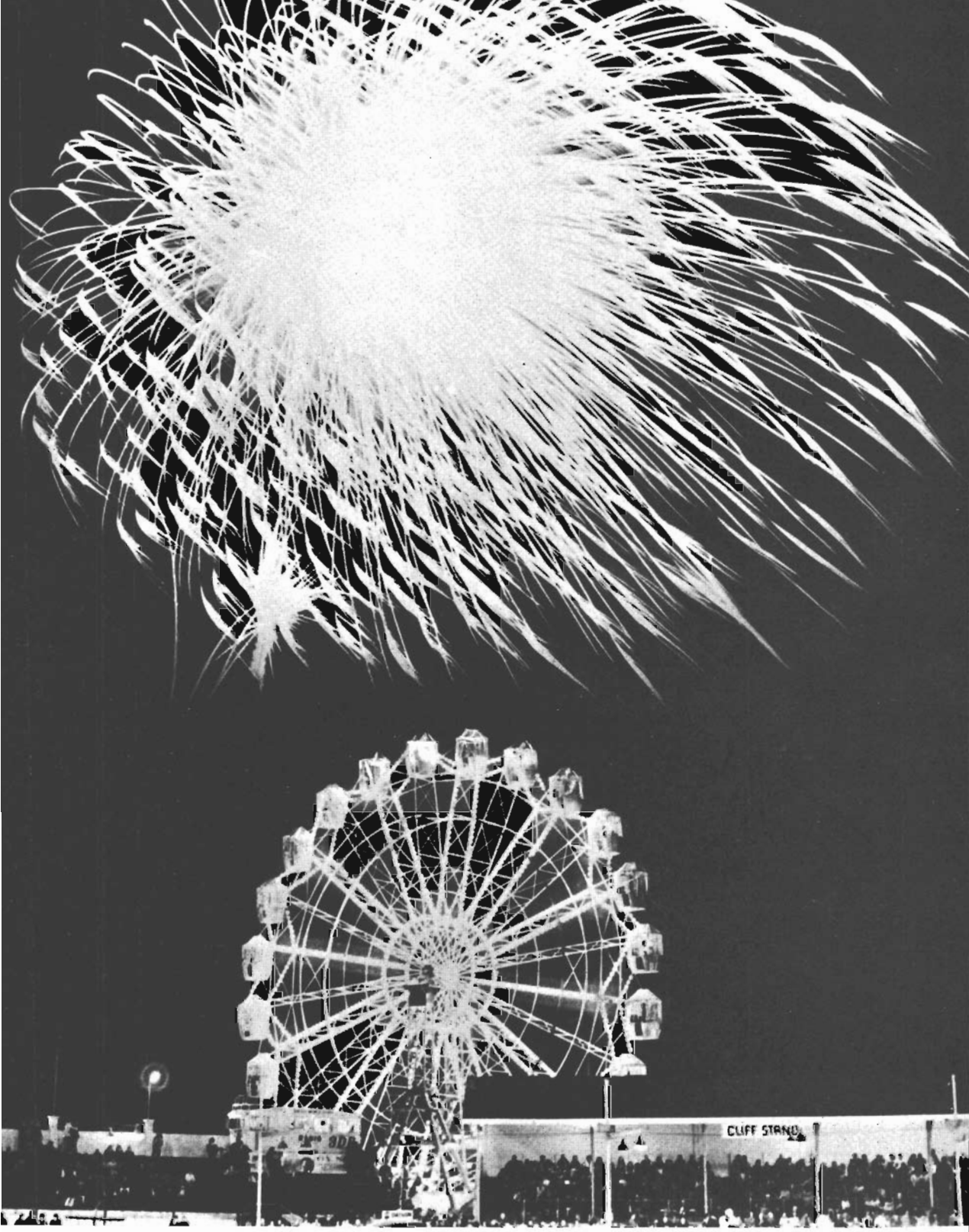
Victoria's manufacturing industries showed continued expansion in 1970. Development in the dairy products industry included the completion of a $1m manufacturing, warehousing, and administration complex at Dandenong, with proposals for a modern development laboratory for dairy products. An automatic cheese making installation at Camperdown was completed at a cost of $1.25m, and at South Melbourne a $1.2m processed cheddar cheese factory commenced production. Several million dollars were invested on developments in the fruit canning industry in Shepparton.

Investment in new plant and equipment has continued in the Victorian textile and apparel industries during 1970. A $6m factory to manufacture furnishing fabrics and mattress ticking was nearing completion at Lyndhurst. The woollen spinning mill in Wangaratta is undergoing a large expansion programme and a new wool carbonising plant with ancillary equipment has commenced operation at Williamstown. Considerable developments have taken place in Geelong, including a $1m yarn factory, a new clothing factory which commenced operations early in 1970, and the modernisation of a worsted mill plant. A second direct melt glass furnace of $1m has been added to the fibreglass textile factory at Dandenong.

Expansion of the building materials industry took place in Ballarat with the construction of a $1.5m particle board mill with an expected output of 12 million sq ft per annum. A $10m paper machine and associated plant was ordered for the pulp and paper mill at Maryvale in Gippsland, and a high speed printing machine costing more than $5m was commissioned for a Box Hill plant late in 1970.

A major development in the heavy engineering industry was the commencement of construction of the sheet steel mill at Western Port. The first stage, a cold reduction mill, will have an ultimate capacity of 1.5 million tons per annum and is expected to come into operation in 1972. The total cost of the operation is estimated at between $600m and $1,000m. The expansion of a factory for earthmoving equipment components at Tullamarine was completed during 1970 at a cost of $2.7m. A new steel fabricator is being established at Sunshine for the production of line pipe, commercial pipe, and structural tubing for general industry. This development will cost $4m.

Light engineering industries have continued to expand in 1970. Construction of a new factory to produce telecommunications equipment was completed at Mulgrave. In the automotive industry, extensive developments are being undertaken with new plants and extensions. A $1m plant to manufacture tools and fasteners was completed at North Croydon.




A rocket bursts high over the lighted ferris wheel at the Royal Melbourne Show.
*The Herald and Weekly Times Ltd*

Lake William Hovell reservoir and outlet tower on the King River shown before and after filling. The reservoir, opened in November 1971, has a storage capacity of 10,000 acre ft. It provides a water supply for the irrigated tobacco, hops, and grazing properties along the river from Cheshunt to Wangaratta.

*State Rivers and Water Supply Commission*

Developments in the chemical industry included the construction of an $18m ethylene plant in Altona ; a $1.25m extension to the drying line of a synthetic rubber plant at Altona; and the current expansion of a high-density polyethylene plant in Altona at a cost of $15m to increase capacity to 42,000 tons a year. The pharmaceutical industry has continued to expand with the completion of a $5m manufacturing plant at Boronia, the construction of a $2m factory at Altona, and a $1.75m factory at Waverley to manufacture pharmaceuticals and cosmetics. During 1970 the construction of a brown coal coking retort and pilot plant with research facilities and offices was completed at Morwell. The project cost $3m.

## Government activities

### *Industrial legislation*

The *Labour and Industry Act* 1958 represents the development and consolidation of industrial legislation which had its beginnings in 1873. Among other matters, the Act deals with the registration and inspection of factories, guarding of machinery, and conditions of employment. It also provides for the appointment of Wages Boards and of the Industrial Appeals Court. Further information on these matters may be found on pages 163–96.

### *Child labour in factories*

The Labour and Industry Act of Victoria debars employment in factories of children under the age of fifteen years, and the Victorian Education Act makes daily attendance at school compulsory between the ages of six and fifteen years.

Some children under fifteen may work in a shop or office if they are exempted under the Education Act, but the general effect of the two statutes contributes to the very low incidence of child labour in this State.

### *Decentralisation of manufacturing industries : Division of State Development*

Since the early stages of the Second World War successive State Governments have encouraged the development of existing manufacturing facilities and the establishment of new industries in country areas.

Concentration of Victoria's population in the metropolitan area of Melbourne is of increasing concern to both the people and Government alike. The inroads of mechanisation into primary industry and the subsequent lessening of employment opportunities have emphasised the need to develop other avenues for the employment of labour in the non-metropolitan parts of the State. In order to encourage establishment or expansion of secondary industry in country areas the Government offers a variety of incentives.

Crown land may be provided to industry with or without consideration. This facilitates the acquisition of a site adequate to meet all likely needs of future expansion and at the same time provides for a range of staff amenities.

Crown land, where available, may also be provided for housing purposes. Priority for houses built by the State Housing Commission may

be given for " imported " key personnel. Funds can also be made available to co-operative building societies for the express use of personnel nominated by a sponsored industry. As a further inducement to set up or expand manufacturing industry in non-metropolitan areas, loans at a moderate rate of interest are available through the Rural Finance and Settlement Commission.

To offset any locational disadvantages as compared with Melbourne, rail freight rates on raw materials and finished products are reduced to a nominal figure (as low as 10 per cent); charges for power, gas, and water can be subsidised, if necessary, to bring them in line with Melbourne rates ; and, in respect of an approved decentralised industry, restriction on the use of road transport by company vehicles is eliminated.

There are also several other concessions which in themselves are minor, but which when applied in conjunction with the above, make country operations more attractive to many industries. The main drawback to decentralised industry is the shortage of skilled labour and small markets in these areas.

In an effort to promote the development of several important provincial centres, the Victorian Government has agreed in principle with certain recommendations made by a Decentralisation Advisory Committee which was headed by the Minister of State Development. It suggested that five particular areas in Victoria (Ballarat, Bendigo, the La Trobe Valley, Portland, and Wodonga) appeared to be the most suitable for extra promotion and development. Such development could help to check the imbalance of population in the State.

Development committees have been set up in each of these centres, membership of which includes representatives of local government and leaders of commerce and industry.

These committees work towards the general development of their areas with emphasis on the development and diversification of secondary industry, and the promotion of commercial services and other opportunities. In addition to these centres, the Government has pledged its interest and support for all other areas wishing to pursue a policy of industrial development.

**Further reference, 1968**

### *Commonwealth Department of Trade and Industry*

The functions of this Department relate chiefly to the policy aspects of Australian overseas trade, both imports and exports, and the encouragement and development of Australian manufacturing industry.

It deals, among other things, with the development and diversification of Australian exports (including exports of manufactures) and, through the Office of Secondary Industry, with questions of protection to local industry against import competition, the special problems of small industries, the location of industry (decentralisation, etc.), and the efficiency of industry. It maintains liaison with such bodies as the Manufacturing Industries Advisory Council, the Export Development Council, and the Export Payments Insurance Corporation, and controls the Australian Trade Commissioner Service.

*Protection of industry*

The established policy of the Australian Government is to accord adequate and reasonable protection against import competition to economic and efficient industry. The Government seeks the advice of the Tariff Board on questions of protection for individual industries. The Board holds public inquiries into and reports on questions referred to it by the Minister. In cases of urgency, temporary protection may be accorded on the recommendation of a special advisory authority pending review by the Tariff Board.

The Customs Tariff is the accepted and normal instrument of protection to Australian industry. However, for some industries in special circumstances, assistance is accorded by means of bounties on local production. As a last resort, when other methods are inadequate, quantitative restrictions on imports are applied.

The Department of Customs and Excise administers the Customs Tariff and also operates the by-law system, under which plant and materials normally subject to protective duty may be admitted at concessional rates if no suitably equivalent products are reasonably available from local sources.

**Scientific research and standardisation**

*Commonwealth Scientific and Industrial Research Organization*

The functions of the Organization, as described in the Science and Industry Research Act, are to initiate and conduct research in connection with industries in Australia, to train research workers, to establish industrial research studentships and fellowships, to make grants in aid of pure scientific research, to establish industrial research associations in various industries, to provide for testing and standardisation of scientific equipment, to conduct an information service relating to scientific and industrial matters, and to act for Australia in liaison with other countries in matters of scientific research.

*Standards Association of Australia*

This Association is the national standardising organisation of Australia and issues standard specifications for materials and codes of practice. Specifications and codes are prepared and revised periodically in accordance with the needs of industry and standards are evolved and accepted by general consent. It is the Australian member body of the International Organisation of Standardisation and of the International Electrotechnical Commission.

*National Association of Testing Authorities*

This is the Australian organisation for approval of testing laboratories. The Association registers laboratories of governmental and industrial testing authorities, thereby organising a national testing service. Registration of laboratories is voluntary. Owners of registered laboratories are members of the Association. They have the right to endorse their test documents in the name of the Association, to indicate their technical and managerial competence.

**Summary of factory statistics**

Factory statistics compiled for 1967–68 were the last of the old series. The first bulletin of statistics from the 1968–69 Economic Censuses (see

pages 368–89 of the *Victorian Year Book* 1971 for details), *Manufacturing Establishments and Electricity and Gas Establishments : Preliminary Statement,* was issued in January 1971 and contained information in respect of ten industry subdivisions which permitted comparisons to be made between States, but did not permit comparisons to be made between 1968–69 and previous years because of the changes in the definition of the establishment, bases of classification, and forms. Accordingly, brief information in respect of factories for 1967–68 and previous years has been repeated in this *Year Book* to record the nature and location of secondary industry in Victoria, which changes little from year to year. Definitions used in the 1967–68 and previous factory censuses were published in the *Victorian Year Book* 1971 pages 394–7.

The following table shows, at intervals between 1901 and 1967–68, the development of manufacturing industry in Victoria :

VICTORIA—SUMMARY OF FACTORY DEVELOPMENT

| Year | Factories | Employment (*a*) | Salaries and wages paid (*b*) | Value of— | | | |
|---|---|---|---|---|---|---|---|
| | | | | Materials and fuel used | Production (*c*) | Output | Land, buildings, plant and machinery |
| | number | number | $'000 | $'000 | $'000 | $'000 | $'000 |
| 1901 | 3,249 | 66,529 | (*d*) | (*d*) | (*d*) | (*d*) | 24,596 |
| 1911 | 5,126 | 111,948 | 17,822 | 51,334 | 32,162 | 83,496 | 27,516 |
| 1920–21 | 6,532 | 140,743 | 42,754 | 135,171 | 76,846 | 212,017 | 70,985 |
| 1932–33 | 8,612 | 144,428 | 42,437 | 122,070 | 81,900 | 203,970 | 135,655 |
| 1940–41 | 9,121 | 237,636 | 104,590 | 240,696 | 178,002 | 418,698 | 184,100 |
| 1946–47 | 10,949 | 265,757 | 155,988 | 367,883 | 262,992 | 630 875 | 243,755 |
| 1953–54 | 15,533 | 331,277 | 472,073 | 1,154,381 | 816,629 | 1,971,010 | 678,535 |
| 1960–61 | 17,173 | 388,050 | 775,998 | 1,913,978 | 1,417,546 | 3,331,524 | 1,641,886 |
| 1963–64 | 17,597 | 413,120 | 912,424 | 2,305,046 | 1,749,776 | 4,054,822 | 2,061,518 |
| 1964–65 | 17,925 | 432,389 | 1,028,492 | 2,551,121 | 1,949,665 | 4,500,786 | 2,233,660 |
| 1965–66 | 17,980 | 439,149 | 1,077,234 | 2,597,230 | 2,027,685 | 4,624,915 | 2,385,957 |
| 1966–67 | 18,054 | 445,557 | 1,167,872 | 2,814,145 | 2,236,370 | 5,050,515 | 2,616,977 |
| 1967–68 | 18,030 | 449,945 | 1,244,216 | 2,956,509 | 2,394,801 | 5,351,311 | 2,685,255 |

(*a*) Average employment over whole year, including working proprietors.
(*b*) Excludes drawings of working proprietors.
(*c*) Value of output less value of materials, etc.
(*d*) Not available.

A comparison of Victorian factory activity with that in other States is shown in the following table :

AUSTRALIA—FACTORIES, 1967–68

| State | Factories | Employment (*a*) | Salaries and wages paid (*b*) | Value of— | | | |
|---|---|---|---|---|---|---|---|
| | | | | Materials and fuel used | Production (*c*) | Output | Land, buildings, plant and machinery |
| | number | number | $m | $m | $m | $m | $m |
| New South Wales | 24,884 | 531,185 | 1,498.1 | 3,965.5 | 3,131.0 | 7,096.5 | 3,828.2 |
| Victoria | 18,030 | 449,945 | 1,244.2 | 2,956.5 | 2,394.8 | 5,351.3 | 2,685.3 |
| Queensland | 6,154 | 120,852 | 306.0 | 1,124.4 | 657.9 | 1,782.3 | 946.7 |
| South Australia | 6,255 | 121,417 | 330.1 | 844.2 | 631.9 | 1,476.1 | 813.6 |
| Western Australia | 5,404 | 67,335 | 175.1 | 499.2 | 388.3 | 887.4 | 495.3 |
| Tasmania | 1,797 | 35,178 | 96.2 | 247.1 | 198.0 | 445.1 | 448.1 |
| Northern Territory | 188 | 1,519 | 5.0 | 9.2 | 9.7 | 18.8 | 14.9 |
| Australian Capital Territory | 241 | 3,710 | 11.3 | 16.9 | 19.3 | 36.2 | 33.4 |
| Total | 62,953 | 1,331,141 | 3,665.9 | 9,662.9 | 7,430.7 | 17,093.7 | 9,265.3 |

See footnotes to table above.

A general indication of the geographical distribution of factories in the State is shown in the next table where secondary industry in Victoria for 1967–68 is classified according to Statistical Divisions :

VICTORIA—FACTORIES IN STATISTICAL DIVISIONS, 1967–68

| Statistical Division | Factories | Employment (*a*) | Salaries and wages paid (*b*) | Value of— | | | |
|---|---|---|---|---|---|---|---|
| | | | | Materials and fuel used | Production (*c*) | Output | Land, buildings, plant and machinery |
| | number | number | $'000 | $'000 | $'000 | $'000 | $'000 |
| Melbourne | 13,108 | 370,728 | 1,035,768 | 2,327,610 | 1,934,482 | 4,262,092 | 1,946,491 |
| West Central | 651 | 20,075 | 58,271 | 191,016 | 124,002 | 315,018 | 192,878 |
| North Central | 376 | 4,774 | 10,989 | 18,794 | 20,907 | 39,701 | 19,113 |
| Western | 1,028 | 15,809 | 37,792 | 100,325 | 65,487 | 165,813 | 68,844 |
| Wimmera | 384 | 2,426 | 4,835 | 11,826 | 9,421 | 21,247 | 7,587 |
| Mallee | 315 | 2,584 | 5,222 | 9,963 | 9,316 | 19,279 | 11,412 |
| Northern | 854 | 12,229 | 31,241 | 126,963 | 64,950 | 191,913 | 80,207 |
| North Eastern | 453 | 5,457 | 13,668 | 36,120 | 29,399 | 65,519 | 78,800 |
| Gippsland | 655 | 13,630 | 41,292 | 116,481 | 127,913 | 244,395 | 269,988 |
| East Central | 206 | 2,233 | 5,139 | 17,410 | 8,924 | 26,334 | 9,935 |
| Total | 18,030 | 449,945 | 1,244,216 | 2,956,509 | 2,394,801 | 5,351,311 | 2,685,255 |

For footnotes see page 388.

Factories in the Melbourne Statistical Division constituted 72.7 per cent of the total number in Victoria in 1967–68, 83.0 per cent of the persons employed, and 80.9 per cent of the value of production.

For information regarding the actual location of the Statistical Divisions named in the table, reference should be made to the maps folded inside the back cover of this book. The number of factories and persons employed therein in each Statistical Division is shown in the following table :

VICTORIA—NUMBER OF FACTORIES AND PERSONS EMPLOYED (*a*) IN EACH STATISTICAL DIVISION : CLASSIFIED ACCORDING TO SIZE OF FACTORY, 1967–68

| Size of factory (persons) | Statistical Division | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Melbourne | West Central | North Central | Western | Wimmera | Mallee | Northern | North Eastern | Gippsland | East Central | Total |
| | NUMBER OF FACTORIES | | | | | | | | | | |
| Under 5 | 4,786 | 319 | 221 | 536 | 248 | 180 | 484 | 256 | 293 | 108 | 7,431 |
| 5–10 | 3,165 | 163 | 91 | 284 | 95 | 84 | 192 | 92 | 163 | 55 | 4,384 |
| 11–20 | 2,031 | 70 | 31 | 93 | 22 | 25 | 92 | 67 | 106 | 27 | 2,564 |
| 21–50 | 1,717 | 53 | 13 | 64 | 14 | 15 | 37 | 24 | 52 | 5 | 1,994 |
| 51–100 | 693 | 18 | 13 | 23 | 3 | 10 | 32 | 7 | 19 | 7 | 825 |
| 101–500 | 641 | 21 | 5 | 25 | 2 | 1 | 14 | 6 | 16 | 4 | 735 |
| Over 500 | 75 | 7 | 2 | 3 | .. | .. | 3 | 1 | 6 | .. | 97 |
| Total | 13,108 | 651 | 376 | 1,028 | 384 | 315 | 854 | 453 | 655 | 206 | 18,030 |
| | AVERAGE NUMBER OF PERSONS EMPLOYED DURING PERIOD OF OPERATION | | | | | | | | | | |
| Under 5 | 11,518 | (*b*) | (*b*) | 1,305 | 538 | 495 | 1,124 | (*b*) | 684 | 254 | 17,764 |
| 5–10 | 22,443 | 1,084 | 623 | 1,949 | 628 | 655 | 1,303 | 630 | 1,061 | 368 | 30,744 |
| 11–20 | 29,870 | 1,049 | 432 | 1,307 | 335 | 478 | 1,337 | 956 | 1,448 | 367 | 37,579 |
| 21–50 | 54,347 | 1,652 | 393 | 1,984 | 385 | 634 | 1,129 | 715 | 1,468 | 164 | 62,871 |
| 51–100 | 48,653 | 1,287 | 854 | 1,782 | (*b*) | (*b*) | 2,216 | 460 | 1,238 | (*b*) | 57,913 |
| 101–500 | 127,446 | 5,798 | 1,002 | 5,614 | (*b*) | (*b*) | (*b*) | 1,284 | (*b*) | (*b*) | 148,534 |
| Over 500 | 78,682 | (*b*) | (*b*) | 2,002 | .. | .. | (*b*) | (*b*) | (*b*) | .. | 97,456 |
| Total | 372,959 | 20,200 | 4,800 | 15,943 | 2,479 | 3,090 | 12,327 | 5,546 | 13,259 | 2,258 | 452,861 |

(*a*) Average employment over whole year, including working proprietors.
(*b*) Not available for publication.

The above table shows that in 1967–68 there were 832 factories each employing more than 100 persons with a total employment of 245,990 persons in Victoria. Of the 18,030 factories (452,861 persons) in Victoria, 13,108 (372,959 persons) were located in the Melbourne Statistical Division and 651 (20,200 persons) in the West Central Statistical Division which includes Geelong. The balance, 4,271 factories (59,702 persons) were distributed over the remainder of the State, principally in the Western (1,028 factories), Northern (854 factories), and Gippsland (655 factories) Statistical Divisions.

It should be noted that Geelong is located in the West Central Statistical Division, Castlemaine and Maryborough in the North Central Statistical Division, Ballarat and Warrnambool in the Western Statistical Division, Bendigo and Shepparton in the Northern Statistical Division, Wangaratta in the North Eastern Statistical Division, and Morwell and Yallourn in the Gippsland Statistical Division.

## Some of the principal factory products of Victoria and Australia

### *Annual quantity and value*

The next table shows quantities of some of the principal articles manufactured in Victoria, and corresponding figures for Australia during 1968–69 and 1969–70. Owing to the limited number of producers, it is not permissible under statute to publish particulars regarding some articles of manufacture which would otherwise appear in the following table :

VICTORIA AND AUSTRALIA—PRINCIPAL ARTICLES MANUFACTURED

| Commodity Code No. | Article | Unit of quantity | Victoria | | Australia | |
|---|---|---|---|---|---|---|
| | | | 1968–69 | 1969–70 | 1968–69 | 1969–70 |
| 023.18, 20 | Bacon and ham (*a*) | mill lb | 19 | 21 | 113 | 121 |
| 027.02–29, 72 – 77 ; 023.17 | Meat—canned (excluding baby food) | mill lb | 61 | 70 | 99 | 102 |
| 051.21–28 ; 052.42 | Milk—condensed, concentrated, and evaporated | mill lb | 101 | 139 | 159 | 156 |
| 051.31 | Butter | mill lb | 280 | 314 | 439 | 494 |
| 051.36–46 | Cheese | mill lb | 75 | 70 | 164 | 168 |
| 051.61 | Ice cream | mill gals | 11 | 12 | 39 | 42 |
| 051.72–73 | Milk—powdered : full cream | mill lb | 31 | 27 | 54 | 52 |
| 062.01, 32 | Flour, plain–wheaten (including sharps) | '000 short ton | 391 | 391 | 1,363 | 1,364 |
| 063.11, 21, 31 | Malt | mill bush | 8 | 9 | 14 | 14 |
| 064.21 | Biscuits | mill lb | 84 | 90 | 239 | 243 |
| 076.08, 15, 22 | Canned or bottled apricots, peaches, and pears | mill lb | 210 | 306 | 321 | 421 |
| 076.60 | Jams, fruit spreads, fruit butters, etc. | mill lb | 43 | 38 | 92 | 80 |
| 094.02–47 | Vegetables canned or bottled (including pickled) | mill lb | 43 | 43 | 192 | 206 |
| | Confectionery— | | | | | |
| 104.06–18 | Chocolate base | mill lb | 45 | 43 | 109 | 103 |
| 104.21–29 | Other without chocolate | mill lb | 46 | 51 | 114 | 123 |
| 123.18 | Sauce—tomato | mill imp pint | 21 | 19 | 30 | 28 |
| 152.06 | Pollard | '000 short ton | 88 | 88 | 312 | 312 |
| 171.03, 07, 08 | Aerated and carbonated waters, canned or bottled (*b*) | mill imp gals | 34 | 37 | 134 | 143 |
| 242.07–11 | Wool—scoured or carbonised | mill lb | 58 | 62 | 156 | 162 |
| 242.33, 35, 46, 47 | Wool tops—pure and mixed | mill lb | 23 | 22 | 55 | 54 |
| 261.41 | Briquettes—brown coal | '000 ton | 1,471 | 1,539 | 1,471 | 1,539 |
| 372.22–50 | Cloth piece goods woven—Woollen or predominantly woollen | mill sq yd | 10 | 12 | 24 | 25 |
| 372.52–62 ; 374.51-55 | Blankets, bed (*c*) | '000 | 733 | 788 | 1,489 | 1,596 |
| 401.57 | Acid—sulphuric | '000 ton | 509 | 495 | 1,853 | 1,748 |

VICTORIA AND AUSTRALIA—PRINCIPAL ARTICLES MANUFACTURED—*continued*

| Commodity Code No. | Article | Unit of quantity | Victoria | | Australia | |
|---|---|---|---|---|---|---|
| | | | 1968–69 | 1969–70 | 1968–69 | 1969–70 |
| 403.02, 18, 20, 52-92, 96; 404.01-98 | Plastics and synthetic resins | '000 cwt | 1,846 | 2,200 | 3,860 | 4,394 |
| 472.01, 03 | Bricks—clay | mill | 422 | 437 | 1,612 | 1,697 |
| | Tiles, roofing— | | | | | |
| 474.12 | Terracotta | mill | 14 | 15 | 50 | 53 |
| 475.30 | Concrete | mill | 38 | 41 | 116 | 131 |
| 479.32, 33 | Plaster sheets | mill sq yd | 15 | 16 | 35 | 40 |
| 503.21–32 | Electric motors | '000 | 726 | 786 | 3,203 | 3,359 |
| | Finished motor vehicles (*d*)— | | | | | |
| 581.02–08, 10–16 | Cars | '000 | 150 | 180 | 342 | 394 |
| 582.04–28 | Other | '000 | 21 | 23 | 53 | 57 |
| 651.11–17 | Radiators and electric fires (domestic) | '000 | 777 | 683 | 803 | 714 |
| 661.21–23 | Toasters (domestic) | '000 | 221 | 203 | 392 | 375 |
| 671.14 | Sinks—stainless steel | '000 | 80 | 101 | 220 | 249 |
| 773.02–35 | Shirts (men's and boys') | '000 doz | 1,058 | 1,128 | 2,326 | 2,491 |
| | Underwear— | | | | | |
| 773.90, 94; 774.01–17, 36–39, 96, 97 | Men's and boys' | '000 doz | 1,041 | 1,063 | 2,387 | 2,502 |
| 774.44, 46, 48, 48.61, 63, 68–73 | Women's and girls' | '000 doz | 2,589 | 2,732 | 4,303 | 3,959 |
| 775.01–19 | Stockings—women's (*e*) | '000 doz pair | 4,766 | 4,972 | 5,622 | 5,859 |
| 775.51–82, 91–98, 776.01-42 | Socks and stockings—men's, children's and infants' | '000 doz pair | 2,725 | 2,851 | 2,999 | 3,067 |
| | Footwear— | | | | | |
| | Boots, shoes, and sandals (*f*)— | | | | | |
| 791.01, 03, 09, 10, 15, 17, 18, 20–22, 28, 29 | Men's and youths' | '000 pair | 6,219 | 6,701 | 11,349 | 11,882 |
| 791.31, 33, 39, 40, 45, 47, 48, 50–53, 58, 59 | Women's and maids' | '000 pair | 14,216 | 14,417 | 20,088 | 20,394 |
| 791.61, 62, 66, 69, 70–74, 76, 82, 79, 81, 78, 87–89, 91–97, 99 | Children's (including infants') | '000 pair | 4,459 | 4,900 | 6,733 | 6,921 |
| 791.05, 07, 35, 37, 63 64, 83, 85, 86 | Slippers | '000 pair | 3,267 | 3,208 | 3,972 | 3,818 |
| | Soaps and soap based products— | | | | | |
| 805.01–13 | Personal toilet use | '000 cwt | 119 | 122 | 502 | 523 |
| 805.22–60 | Other purposes | '000 cwt | 120 | 196 | 890 | 781 |
| 844.22–67 | Mattresses—all types | '000 | 476 | 512 | 947 | 1,031 |

(*a*) Cured bone-in weight of smoked and cooked bacon and ham.
(*b*) From October 1969 includes bulk aerated and carbonated waters.
(*c*) Double, three quarter, single ; wool, wool mixture and other fibre.
(*d*) Excludes vehicles finished by specialist body building works outside the motor vehicle manufacturers' organisation.
(*e*) Includes panty hose.
(*f*) Excluding wholly of rubber.

## *Monthly production statistics*

The Bureau collects monthly production returns and makes available printed tables of Australian production statistics within a few weeks of the month to which they relate. A list of the subjects included in these production summaries is given below.

In addition, statistical bulletins for the Meat, Gold Mining, and Dairying Industries, and Minerals and Mineral Products are issued each month. Australian totals for a greater range of commodities are published in these bulletins and production summaries than are published in the *Monthly Bulletin of Production Statistics.* Victorian figures are published in the Victorian monthly bulletin *Secondary Production.*

AUSTRALIA—PRODUCTION SUMMARIES

| Ref. No. | Subject | Ref. No. | Subject |
|---|---|---|---|
| 1 | Automotive Spark Plugs and Shock Absorbers | 28 | Footwear |
| 2 | Chemicals, etc. | 29 | Biscuits, Cocoa, Confectionery, Ice Cream |
| 3 | Plastics and Synthetic Resins and Plasticisers | 30 | Storage Batteries—Wet Cell |
| 4 | Paints and Other Surface Coatings | 32 | Perambulators, Pushers and Strollers |
| 5 | Electricity and Gas | 33 | Motor Vehicles |
| 6 | Soaps, Detergents, Glycerine and Fatty Acids | 34 | Television, Radios, Other Sound Equipment: Transistors |
| 7 | Internal Combustion Engines | 35 | Bed Bases and Mattresses |
| 8 | Lawnmowers | 36 | Processed Milk Products |
| 9 | Electrical Appliances | 38 | Fish Preserving |
| 10 | Motor Bodies, Trailed Vehicles, Lift-on Freight Containers, etc. | 39 | Jams, Preserved Fruit, Quick Frozen Vegetables and Potato Crisps |
| 11 | Pedal Cycles | 40 | Cereal Products |
| 12 | Meters | 41 | Vegetable Oils, Margarine and other Edible Processed Fats |
| 13 | Building Fittings | 42 | Malt and Beer |
| 14 | Cotton Goods | 43 | Stock and Poultry Foods and Canned Pet Food |
| 15 | Fellmongering, Woolscouring and Carbonising | 45 | Phonograph Records |
| 16 | Wool Top Making and Yarn Produced | 47 | Aerated and Carbonated Waters, Cordials and Syrups |
| 17 | Wool Woven Fabric, etc. | 48 | Sports Goods |
| 18 | Hosiery | 49 | Building Materials |
| 19 | Women's, Maids' and Girls' Clothing, and Infants' and Babywear | 50 | Electrodes for Manual Welding |
| 20 | Cellulosic and Synthetic Fibre Tops, Yarns and Woven Fabrics | 51 | Hides and Skins Used in Tanneries |
| 21 | Paper, Wood Pulp and Adhesive Tapes | 52 | Electrical Power Frequencies, Transformers, Chokes and Ballasts |
| 22 | Floor Coverings and Felts | 53 | Plastics Film, Sheeting and Coated Materials |
| 23 | Electric Motors | 55 | Butter and Cheese |
| 24 | Men's, Youths' and Boys' Clothing | 56 | Canned Meat |
| 25 | Foundation Garments | 58 | Steel Wire and Wire Products |
| 27 | Gloves and Slide Fasteners | 59 | Non-ferrous Rolled, Extruded and Drawn Products |

## INDIVIDUAL INDUSTRIES

Details of most individual industries published in previous *Victorian Year Books* have been deleted in this edition. However, publication will be resumed when the results of the integrated censuses are known.

### Light engineering

The light engineering industry in Victoria plays a significant part in the economy, both as an employer and through the manufacture of a variety of goods sold within Australia and exported to other countries.

The term light engineering covers the manufacture of various industrial and domestic products and small components produced by a variety of methods for use in many industries both within the light engineering and other manufacturing fields. In Victoria the industry tends to be centred in the Melbourne metropolitan area and the cities of Geelong, Ballarat, and certain other country centres.

Major factors which have affected and accelerated the growth of the industry in Victoria have been improvements in technology, rising living standards and the growing demand for a variety of goods, many of which had previously been regarded as luxuries, but are now regarded as necessities.

*History*

Before the First World War the light engineering industry in Victoria was in its infancy. The demands for the manufacture of machines, the level of technology existing at the time, the subordinate position of Australia in terms of world trade, the general standard of living, and the practice of importing rather than manufacturing so many of the items used all combined to produce a very limited demand for light engineering facilities and services. Most activity in this field was aimed at the local market by way of repair and maintenance of imported equipment. There was, however, a growing expansion of some light engineering which was geared to the expansion of certain manufacturing industries. This expansion was accelerated by the demands placed on the industry by the First World War, when local manufacturers were called upon to produce many components and machines previously imported.

In the period between the First and Second World Wars the industry, although affected by the economic depression of the early 1930s, continued to expand and diversify to meet the growing demands of an increasing population. Many new manufacturing industries emerged, all placing demands either directly or indirectly on light engineering, facilities for improved methods and technology in design, and the manufacture of more sophisticated machines and tooling. The major example in Victoria of the changes which were taking place in the light engineering industry in the 1920s was the manufacture of motor cars which were transformed from custom built items to mass-assembled articles for a growing market.

The assembly of motor vehicles in Australia, mainly from imported components has been a well established industry since 1925 when a vehicle assembly line was set up in Geelong. By the end of the 1920s Australian manufacturers, with encouragement from the Commonwealth Government, had obtained a large share of the market for the supply of new and replacement parts such as springs and other such generally uniform parts required in large quantities for incorporation in locally assembled vehicles and for use in repairs. The vehicle industry in Victoria has in fact relied to an increasing extent on the expanding facilities of the light engineering industry for the manufacture of precision components and accessories.

When the Second World War began, demands on the industry again increased because of restrictions on the import of engineering products. Much of this then had to be manufactured locally to meet the demands of Australia and her allies. The war brought with it the direct threat of invasion and the inability to obtain imported supplies stimulated industry to expand plant and capacity on an unprecedented scale. It resulted in a large measure of industrial maturity for Victoria and Australia as a whole which is shown by such achievements in light engineering as the production of a wide range of communications equipment, machine tools and precision instruments, engines of many types not previously made here including marine and aero engines, and aircraft and diesel injection equipment. Many of the products produced in quantity by Australian industry during the war had previously been considered to be beyond its capacity.

Much of this capacity was turned to civilian production in the post-war years. The range and variety of production was expanded, new industries were

established, and overseas capital and technical knowledge assumed greater importance. Whereas the methods and the speed of manufacture in the early decade of the century were limited by the range of machinery and level of technology then existing, the light engineering industry, through the introduction of more efficient and versatile machinery gradually enabled a wider range of items to be manufactured. Items which were once regarded as heavy industry products were increasingly being produced in quantity by the light engineering industry. Examples include the manufacture of parts and components for motor vehicles, agricultural and earthmoving machinery, etc. Improvements in the type and variety of metals available also assisted the industry and this, together with the improvements noted above, made for greater speed and volume of production.

*Present situation*

The light engineering industry in Victoria is important because so many manufacturing processes, both engineering and otherwise, rely to some degree on this branch of industry to supply, service, and repair their equipment and the components used in manufacture. Much of the machinery and replacement parts used in industries such as packaging, printing, food, chemicals, textiles, clothing, etc., are manufactured by the light engineering industry which also supplies components to the vehicle, aircraft, building, furniture, and other industries. The light engineering industry provides a wide range of products made of sheet metal. These include components for household appliances, office and other fabricated equipment, architectural work, aircraft, steel and light alloy fabricated equipment, and fabrication of air-conditioning systems. Instrumentation is another important area where the manufacture and repair of instruments is carried out for many industries, including petrochemical, plastics, aircraft, printing, etc.

There are many examples of light engineering industries which have expanded greatly since 1940. These include such sections of the electrical goods manufacturing industry as the manufacture of radio and television receivers, switch gear, telephone and other communications equipment, electric motors, domestic appliances used for heating, cooking, and refrigerating, washing machines, motor mowers, electric hand tools, fans, and air conditioners. Many products which did not exist in 1940 have been developed and are now manufactured in quantity. Aluminium window frames and television receivers are examples of such products.

Machines and equipment used in the light engineering industry are hydraulic and mechanical presses, guillotines, lathes (automatic, semi-automatic, and manually operated), drilling and tapping machines, welding machines (both automatic and manual), special purpose forming and cutting machines, and die-casting machines. Products of the industry are made by such operations as machine fabricating, cutting, joining by bolt, rivet, or screw or welding, and the assembly of machined or formed components.

Individual companies engaged in the field are involved in the mass-production of components for particular industries, the manufacture to order of individual items, and the manufacture of completed products, machines, etc., for domestic or industrial use. Others offer service or repair facilities to industry generally.

Some products of the light engineering industry made in Victoria, together with the names of some of the companies making these articles are shown in the following table :

| Product | Company |
|---|---|
| Air conditioning and refrigeration equipment | Crockford & Robertson Pty Ltd<br>Email Ltd |
| Automotive components | Robert Bosch (Aust.) Pty Ltd<br>Joseph Lucas (Aust.) Pty Ltd<br>Repco Ltd |
| Cutlery manufacturers | Mytton Grosvenor Ltd<br>Rodd (Aust.) Ltd |
| Electric fans | Mistral Fans Co.<br>Warner-Drayton Co. of Aust Pty Ltd |
| Electric hand tools | Black & Decker (A'asia) Pty Ltd<br>Skil-Sher Pty Ltd |
| Electrical apparatus, radio, television, etc. | Radio Corporation Pty Ltd<br>Thorn Electrical Industries (Aust.) Pty Ltd |
| Electrical domestic appliances | Metters Ltd<br>Vulcan Aust. Ltd |
| Engineers' small tools | Patience & Nicholson Pty Ltd<br>Sutton Tools Pty Ltd |
| Hardware and hand tools | Cyclone Forgings Pty Ltd<br>Ogden Industries Pty Ltd<br>Trojan Pty Ltd |
| Motors (electric) | ASEA Electric (Aust.) Pty Ltd<br>Brehaut, H. E. Pty Ltd<br>Busch Electric Co. Pty Ltd<br>McColl Electric Works Pty Ltd |
| Office and storage equipment | Bendix Consolidated Industries Ltd<br>Brownbuilt Ltd<br>Steelbuilt Aust. Pty Ltd |
| Telephone equipment | G.E.C. (Australia) Pty Ltd<br>L. M. Ericsson Pty Ltd<br>Siemens Industries Ltd |
| Toolmakers | W. G. Goetz and Sons Ltd<br>Zenford Pty Ltd |
| Welding equipment | Commonwealth Industrial Gases Ltd<br>Liquid Air Aust. Ltd |
| Stoves, ranges, cookers | Craig and Seeley Ltd<br>Hecla Electrics Pty Ltd<br>Radiation (Australia) Ltd |
| Wire fabricators | Cyclone K-M Products Pty Ltd<br>Greer and Ashburner Pty Ltd |

**History of manufacturing, 1961; Motor vehicle industry, 1962; Chemical industry, 1963; Petrochemical industry, 1964; Glass industry, 1965; Agricultural machinery industry, 1966; Aluminium industry, 1967; Automation and technical development in industry, 1967; Textile industry, 1968; Canning of foodstuffs, 1969; Butter, cheese, and processed milk products, 1970; Heavy engineering, 1971**

## ENERGY

### Ministry of Fuel and Power

Following the discovery of natural gas off the east Gippsland coast early in 1965, and anticipating the discovery of oil, the Government, reviving an earlier proposal, passed the *Fuel and Power Act* 1965, establishing the Ministry of Fuel and Power, to determine the means by which the present and future supplies of fuel and power could be developed and utilised.

Private oil and gas companies may refer legislative and other problems concerned with the production and marketing of energy to the Ministry, which has authority to examine proposals and give decisions.

The Minister of Fuel and Power is responsible for the operations of the State Electricity Commission of Victoria and the Gas and Fuel Corporation of Victoria. The Victorian Pipelines Commission was established on 1 March 1967 under the provisions of the *Victorian Pipelines Commission Act* 1966 to lay pipelines for the transmission of gas throughout Victoria (see pages 370 and 372). The Commission was abolished on 1 July 1971 and its assets and function were transferred to the Gas and Fuel Corporation.

**Further reference, 1971**

## State Electricity Commission of Victoria

The State Electricity Commission, which was constituted by the *Electricity Commissioners Act* 1918, is a semi-governmental authority administered since 1921 by a full-time chairman and three part-time commissioners. The principal duty of the Commission is to co-ordinate and extend on an economic basis the supply of electricity throughout Victoria.

For this purpose it is vested with power to erect, own, and operate power stations and other electrical plant and installations, supply electricity retail to individual consumers or in bulk to any corporation or public institution, acquire and operate electricity undertakings, develop, own, and operate brown coal open cuts and briquetting works, develop the State's hydro-electric resources, and form or acquire interests in any company for the purpose of selling char, coal, and briquettes.

From its own revenues, which it controls, the Commission must meet all expenditure in the operation of its power, fuel, and subsidiary undertakings, and all interest and other charges incurred in the service of its loans and other capital commitments.

The Commission is the controlling authority for all electrical undertakings in Victoria. It is responsible for the registration of electrical contractors, the licensing of electrical mechanics, the control of installation methods and material, and the testing and approval of electrical equipment and appliances.

### *Electricity generation*

Since it began operating in 1919 the State Electricity Commission has expanded and co-ordinated the production and supply of electricity on a State-wide basis to the point where its system now generates almost all the electricity produced in Victoria and serves virtually all the population.

Development of Victoria's electricity system is based on the utilisation for both power and fuel of Victoria's extensive brown coal resources in the La Trobe Valley in Gippsland, with supplementary development of the hydro-electric potential of north-eastern Victoria. Victoria is entitled to one third of the electricity from the Snowy Mountains Hydro-electric Scheme, after the Commonwealth has taken the power it needs. Victoria also shares with New South Wales in the electricity generated at the Hume Hydro Station on the River Murray.

By far the greater part of the State's electricity is generated from brown coal, either used in its raw state or manufactured into higher quality

fuel in the form of brown coal briquettes. All the brown coal and briquette fuel is supplied by undertakings which the Commission itself owns and operates. Output of brown coal in 1970–71 from the three open cuts at Yallourn, Yallourn North, and Morwell totalled 21.5 million tons, of which 17.4 million tons were used in the Commission's own power stations, and 3.8 million tons were manufactured into 1.4 million tons of brown coal briquettes, 16 per cent of the briquette output then being used for electricity production, mainly in Newport Power Station. The two functions, generation of electricity and production of fuel, are closely integrated. Apart from the large proportion of brown coal and briquette fuel consumed in the power stations, the process of briquette manufacture results also in the generation of electricity, since the steam needed for processing the raw coal for briquetting is first used to operate turbo-generators.

### *Electricity supply*

At 30 June 1971 the number of ultimate consumers in Victoria was 1,286,902. All of these were served by the State system except for 182 served by local country undertakings at Bendoc and Mallacoota in the far east of the State. The State system supplies all the Melbourne metropolitan area and 2,297 other centres of population.

By 30 June 1971 almost all the dwellings in the State, and 73,801 of Victoria's 75,000 possible farm connections were supplied with electricity.

Electricity supply has been extended almost throughout the State and there are now only a few remote areas not served by the State distribution system.

The Commission sells electricity retail in all areas except part of the metropolitan area, where it sells in bulk to eleven municipal undertakings which operate as local retail supply authorities under franchises granted before the Commission was established. Bulk supply is also being provided at present to several New South Wales municipalities and irrigation settlements bordering the River Murray. The number of consumers served by the State system outside the Melbourne metropolitan area is 624,476.

The Commission's retail consumers numbered 1,045,287 at 30 June 1971. Retail supply is administered through the Metropolitan Branch and nine extra-metropolitan branches (Barwon, Eastern Metropolitan, Gippsland, Mallee, Mid-Western, North-Eastern, Northern and Midland, South-Western, and Wimmera). At 30 June 1971 there were branch and district supply offices in Melbourne and 94 other cities and towns in Victoria.

### *Electricity production, transmission, and distribution*

Electricity generated in the State system or purchased by it totalled 14,086 million kWh in 1970–71, or more than 99 per cent of all Victoria's electricity for public supply. The system comprises a series of thermal and hydro-electric power stations. Inclusive of generator capacity both within the State and available to the Victorian system from outside the State, the total installed generator capacity at 30 June 1971 was 3,530,565 kW. Power stations are interconnected and feed electricity into a common pool for general supply.

The major power station in this interconnected system is the brown coal burning power station at Hazelwood, which alone generates 53 per

cent of Victoria's electricity. It became fully operational with eight 200 MW generating sets in service in 1971. Other power stations in the interconnected system comprise two further base-load power stations—Yallourn (which contributes 20 per cent) and Morwell ; steam stations in Melbourne (Newport, Richmond, and Spencer Street), Geelong, and Ballarat, and also at Red Cliffs, which has, in addition, some internal combustion plant ; and hydro-electric stations at Kiewa, at Eildon, on the Rubicon and Royston Rivers near Eildon, and at Cairn Curran, on Eppalock Reservoir on the Campaspe River near Bendigo. All major power stations within Victoria are Commission owned, except Spencer Street Power Station, which remains the property of the Melbourne City Council, although operated as a unit in the interconnected system.

The following table shows the predominant part taken by the State Electricity Commission in the generation of public supply electric power in Victoria, the amount of power generated by water power and other sources, and the relative importance of the main power stations :

VICTORIA—PUBLIC SUPPLY ELECTRICITY GENERATED, POWER STATIONS, AND SOURCES OF POWER, 1970–71

| Station or origin of power | Source T = Thermal (*a*) H = Hydro | Quantity | Percentage of production |
|---|---|---|---|
| | | mill. kWh | |
| State Electricity Commission— | | | |
| Own generation— | | | |
| Hazelwood Power Station | T | 7,423.6 | 54.2 |
| Yallourn Power Station and Briquette Factory | T | 2,860.2 | 20.9 |
| Morwell Power Station | T | 1,109.2 | 8.1 |
| Newport Power Station | T | 202.1 | 1.5 |
| Spencer Street Power Station (*b*) | T | 63.5 | 0.4 |
| Richmond Power Station | T | 35.7 | 0.3 |
| Provincial thermal power stations | T | 2.3 | .. |
| Total S.E.C. thermal generation | T | 11,696.6 | 85.4 |
| Eildon | H | 403.2 | 2.9 |
| Kiewa | H | 445.3 | 3.3 |
| Total S.E.C. hydro generation | H | 848.5 | 6.2 |
| Other public supply generation | T | 0.2 | .. |
| Total generation by public supply undertakings | T and H | 12,545.3 | 91.6 |
| Net interstate purchases | T and H | 1,151.3 | 8.4 |
| Total | T and H | 13,696.6 | 100.0 |

(*a*) Includes internal combustion.
(*b*) Melbourne City Council.

A 330 kV transmission line links the Victorian system with the Snowy Mountains undertaking, and also provides facilities for interconnection between the Victorian and New South Wales State generating systems. Also linked with the Victorian interconnected system is the hydro station at Hume Reservoir on the River Murray. This power station is operated by the Electricity Commission of New South Wales. Output and operating costs are shared by Victoria and New South Wales.

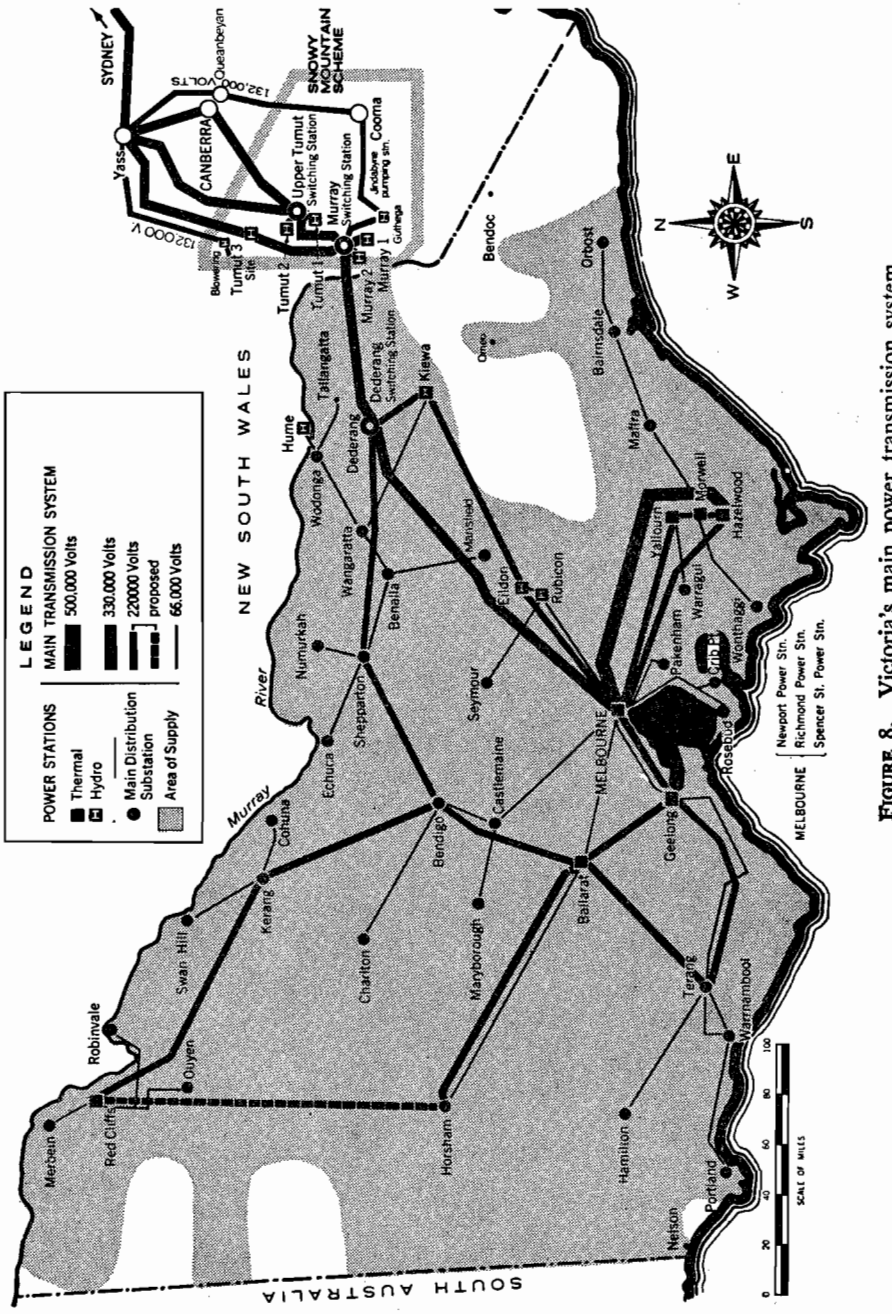



FIGURE 8. Victoria's main power transmission system.

In meeting the total demand on the system, which fluctuates throughout the day and from month to month, each group of stations in the interconnected system is assigned a predetermined function dependent upon the availability of power from each group and the economics of generation. The various stations are utilised in the combination that will meet the system load most economically at a given time.

The electrical transmission and distribution system in the State supply network at 30 June 1971 comprised 62,471 miles of power lines, 4 auto-transformation stations, 26 terminal receiving stations, 161 zone substations, and over 64,200 distribution substations. Main transmission is by 500 kV, 330 kV, 220 kV, and 66 kV power lines which supply the principal distribution centres and also provide interconnection between the power stations. The 500 kV, 330 kV, and 220 kV systems total 1,945 route miles.

The transmission of energy from Hazelwood at 500 kV is at the highest voltage for electricity transmission in the southern hemisphere. A second 500 kV transmission line from the La Trobe Valley came into service in 1971.

*Hazelwood Power Station*

Hazelwood Power Station is the largest generating project so far constructed by the State Electricity Commission of Victoria and is a major power development by world standards. It has a capacity of 1,600,000 kW, or about 40 per cent of all the generating capacity available to Victoria in 1972. At present it is the largest power station in Australia.

Located two miles south of Morwell and about 90 miles east of Melbourne, Hazelwood is the third power development of the State Electricity Commission on the brown coal fields of the La Trobe Valley. The station consists of eight 200,000 kW turbo-generators each having a single boiler burning brown coal supplied from a large open cut at Morwell. Together with the Yallourn and Morwell power stations, it produces more than 85 per cent of Victoria's annual electricity requirements.

The Hazelwood project was approved by the Victorian Parliament in 1959 as a 1,200,000 kW station to be built in three stages, each of 400,000 kW. The addition of a fourth 400,000 kW stage was authorised by Parliament in 1965. Initial site works for the station were begun towards the end of 1960 and the first boiler-generator unit was placed in service in 1964. The other seven units were installed at approximately yearly intervals until the project was completed early in 1971. The capital cost of the station was $232m.

Each of Hazelwood's eight turbo-generators is designed to produce 1,400 million kWh of electricity annually. The machines, each approximately 100 ft in length and weighing approximately 750 tons, operate at a speed of 3,000 revolutions per minute and generate electricity at 16,500 volts.

The operation of the station is largely automated. From each of four unit control centres a group of two turbo-generators and their associated boilers are operated by remote supervisory control. There is also a main control centre which is designed to co-ordinate the operation of the four unit control centres and supervise the channelling of the station's electrical output into Victoria's transmission network.

The Hazelwood boilers are among the largest in the world designed for the combustion of raw brown coal. This low-grade fuel, with its high moisture content, necessitates much larger boiler plant than is required by black coal power stations to produce the same steam output. Each of the eight boilers is 200 ft high and has a single reinforced concrete chimney rising 450 ft above ground. At full load each boiler burns about 300 tons of brown coal an hour. The station's annual fuel consumption is 15 million tons.

Advances in power plant design and the use of brown coal which is not quite as wet as the coal from the original Yallourn open cut contribute largely to the station's generating efficiency. The coal consumption per kWh of electricity generated has been reduced to less than half the average rate of consumption in pre-war La Trobe Valley plant.

Coal for Hazelwood is delivered in a continuous flow by a belt conveyor system from dredgers operating at the coal faces in Morwell open cut to the station's main storage bunker, which has a capacity of 30,000 tons. From this main bunker other conveyor lines go out to feed smaller bunkers situated above each of the boilers.

Cooling water for the power station's steam condensers is drawn from a large artificial pondage, which was formed by damming a small tributary of the Morwell River. The pondage, with a surface area of approximately two square miles, holds 6,500 million gallons of constantly circulating water.

Power generated at Hazelwood is transmitted from the La Trobe Valley at 220 kV and 500 kV to Keilor and Rowville, two of the main transmission stations in the metropolitan area. These La Trobe Valley lines are linked into the main transmission grid to feed the State supply system.

### *Local country electricity undertakings*

The operation of independent undertakings is governed by the *Electric Light and Power Act* 1958, which is administered by the State Electricity Commission. Under the Commission's rural electrification programme, the Mallacoota undertaking, the only remaining independent electricity undertaking in Victoria, is shortly to be acquired and absorbed into the State system.

The only other Victorian public supply not provided by the Commission is in the Bendoc area, which is served by the Monaro County Council in New South Wales. The number of consumers in the Mallacoota and Bendoc areas was 182 at 30 June 1971.

## Gas industry

The gas industry in Victoria provides a reticulated gas supply to the Melbourne metropolitan area and to twenty-four centres throughout the State. In the year ended 30 June 1971 total gas sales increased by 32 per cent over the previous year.

At 30 June 1971 gas was supplied by the Gas and Fuel Corporation of Victoria, a public authority of the State, and one privately-owned public company, The Colonial Gas Association Ltd. Statistics for the industry for the year ended 30 June 1971 are set out in the following table :

VICTORIA—GAS STATISTICS, 1970–71

| Undertaking | At 30 June 1971— | | Sales 1970–71 |
|---|---|---|---|
| | Mains | Consumers | |
| | miles | number | million therms |
| Gas and Fuel Corporation of Victoria (*a*) | 5,805 | 496,200 | 181.9 |
| The Colonial Gas Association Ltd | 1,448 | 89,000 | 35.7 |
| Total | 7,253 | 585,200 | 217.6 |

(*a*) Includes sales during 1970–71 of former Gas Supply Company Ltd branches and the Geelong Gas Company.

On 12 August 1970 an agreement was executed between the Gas and Fuel Corporation of Victoria and The Gas Supply Company Ltd whereby the Corporation purchased all gas undertakings operated in Victoria by The Gas Supply Company Ltd. Legislation ratifying this agreement was passed by the Victorian Parliament in November 1970 and, as from 1 December 1970, the Corporation assumed responsibility for the operation of the Company's undertakings in Ararat, Bacchus Marsh, Ballarat, Colac, Hamilton, Portland, Stawell, Warracknabeal, Warrnambool, and Wodonga.

On 5 May 1971 the Gas and Fuel Corporation made an offer to purchase the shares of The Geelong Gas Company. This offer was subsequently accepted by over 90 per cent of the shareholders and control of the Company passed to the Corporation on 9 June 1971. The Company, which was incorporated by Act of Parliament in 1858, is at present operating under its own name as a subsidiary of the Corporation.

*Gas and Fuel Corporation of Victoria*

The Gas and Fuel Corporation of Victoria came into being by Act of Parliament in 1950. It was formed by the merger of the Metropolitan and Brighton Gas Companies which supplied gas to adjoining areas. The privately held shares in the two companies were exchanged for fully paid up preference shares in the Gas and Fuel Corporation and the State Government of Victoria invested $8m which was held as ordinary shares in the Corporation. Three directors are appointed by the preference shareholders and the chairman and three other directors are appointed by the Government. The *Gas Franchises Act* 1970 gives the Corporation an exclusive franchise to supply reticulated gas in the Melbourne metropolitan area (excluding defined areas in the Footscray and Box Hill districts which are supplied by The Colonial Gas Association), in associated areas in Gippsland, on the Mornington Peninsula, and in the following other country centres : Ararat, Bacchus Marsh, Ballarat, Bendigo, Castlemaine, Colac, Hamilton, Kyneton, Maryborough, Portland, Stawell, Warracknabeal, Warrnambool, and Wodonga. At 30 June 1971 reticulated gas was supplied to all of these areas except Maryborough and Warracknabeal and also to Geelong, Maffra, Morwell, Sale, Trafalgar, Traralgon, and Warragul.

The Corporation was originally formed to make possible the use of the vast resources of brown coal in the La Trobe Valley for town gas production. Its duties include, among other things, the duty of encouraging and

promoting the use of gas and the task of advising the Government on the steps necessary to secure a safe, economical, and effective supply of gas in Victoria. The erection of a Lurgi high pressure gasification plant at Morwell commenced in 1951 and was completed in 1956. This plant, producing town gas from brown coal briquettes, made a significant contribution to the Corporation's total gas issues until 26 November 1969, when it was shut down as part of the programme of progressive phasing out of manufacturing plant with the introduction of natural gas.

Changes in raw material availability and parallel development of new gas making processes led to considerable diversification in the methods of gas production over the years. The Corporation progressively introduced new gasification processes making use of new feedstocks to achieve minimum production costs. This diversification is illustrated in the following table :

VICTORIA—GAS AND FUEL CORPORATION OF VICTORIA : GAS MADE AND PURCHASED

| Type of gas | 1959–60 | | 1968–69 | | 1970–71 | |
|---|---|---|---|---|---|---|
| | Million therms | Percentage of total | Million therms | Percentage of total | Million therms | Percentage of total |
| Brown coal gas (Lurgi) | 20.4 | 27.5 | 36.7 | 31.3 | .. | .. |
| Black coal gas | 24.8 | 33.5 | 6.6 | 5.6 | 0.7 | 0.3 |
| Water gas/Reformed gas | 8.0 | 10.8 | 2.4 | 2.1 | 1.8 | 0.9 |
| Oil gas | .. | .. | 20.8 | 17.8 | 5.3 | 2.7 |
| Refinery gases | 20.9 | 28.2 | 45.4 | 38.7 | 10.9 | 5.6 |
| Natural gas | .. | .. | 5.2 | 4.5 | 177.0 | 90.5 |
| Total gas issued | 74.1 | 100.0 | 117.1 | 100.0 | 195.7 | 100.0 |

Victoria's natural gas supplies come from gas fields in the offshore Gippsland Basin. Construction of the 30 inch diameter high pressure (1,000 psig) transmission pipeline from Longford to Dandenong commenced in February 1968 and was completed in January 1969. Transmission from the Esso-Hematite joint venture treatment plant at Longford to the various markets in the State is the responsibility of the Gas and Fuel Corporation of Victoria.

A major feature of the Corporation's distribution system is a high pressure ring main operating at pressures up to 400 psig. This ring main consists of a 51 mile long, 18 inch diameter northern loop running between Dandenong, Doncaster, Keilor, North Melbourne, and West Melbourne, which is joined by a 22.6 mile, 30 inch diameter loop between Dandenong and West Melbourne. The northern loop was constructed and commissioned in sections. Construction commenced in October 1966 and was completed in October 1969. Construction of the 30 inch diameter section began in December 1968 and was completed in May 1970. This ring main, which cost $11m, plays a vital part in supplying natural gas to the Corporation's 435,000 consumers in the metropolitan area. It will also transport natural gas across Melbourne for The Colonial Gas Association and onward supply to Geelong.

Natural gas was turned into the Corporation's metropolitan distribution

system on 31 March 1969 and, on 14 April 1969, the task of converting gas appliances owned by the Corporation's customers began. Conversion of 1,093,000 appliances in the premises of 445,000 consumers was completed on 22 December 1970.

On 7 December 1970 gas production in the metropolitan area ceased with the closure of the West Melbourne Works. These Works, which first produced gas in January 1856 and played a vital role in Melbourne's gas supply system for over a century, produced a total of 10.5 million therms of gas in the last financial year compared to a peak output of 55 million therms in 1967.

Construction of a 32 mile, 14 inch diameter high pressure (1,000 psig) pipeline from Brooklyn to Corio was completed in February 1971 and supply of natural gas to Geelong commenced on 15 March 1971. Conversion of consumers' appliances to burn natural gas was completed on 25 August 1971.

In May 1971 the Government approved a proposal by the Corporation to supply natural gas to Ballarat and Bendigo by the winter of 1973 and design of the necessary transmission system is now in progress.

Introduction of natural gas has resulted in reduced tariffs and substantially increased consumption by domestic, industrial, and commercial gas users. The widespread acceptance of natural gas by the community will lead to the gas industry playing an increasing role in the fuel economy of the State. At the same time, substitution of natural gas for other fuels will make a contribution towards the reduction of atmospheric pollution.

### *The Colonial Gas Association Ltd*

The Colonial Gas Association Ltd was incorporated in 1888. It has a franchise to supply gas in the Footscray and Box Hill areas of Melbourne and in the country centres of Benalla, Horsham, Seymour, Shepparton, and Wangaratta. Until 1959 the Association's gas works operated using conventional carbonisation methods to produce gas from black coal imported from New South Wales. Between 1959 and 1963 its country undertakings were modified to operate on tempered liquefied petroleum gas and, at the same time, liquefied petroleum gas became a significant feedstock in its metropolitan gas undertakings.

The Association purchased its first supplies of natural gas from the Esso–Hematite joint venture on 5 May 1969 and immediately commenced the conversion of consumers' appliances in its area of supply in the eastern suburbs of Melbourne. This area was converted by November 1969 and the conversion operation then moved to the Association's franchise area in the western suburbs. The total operation, which involved the conversion of 177,200 appliances, was completed on 5 March 1970.