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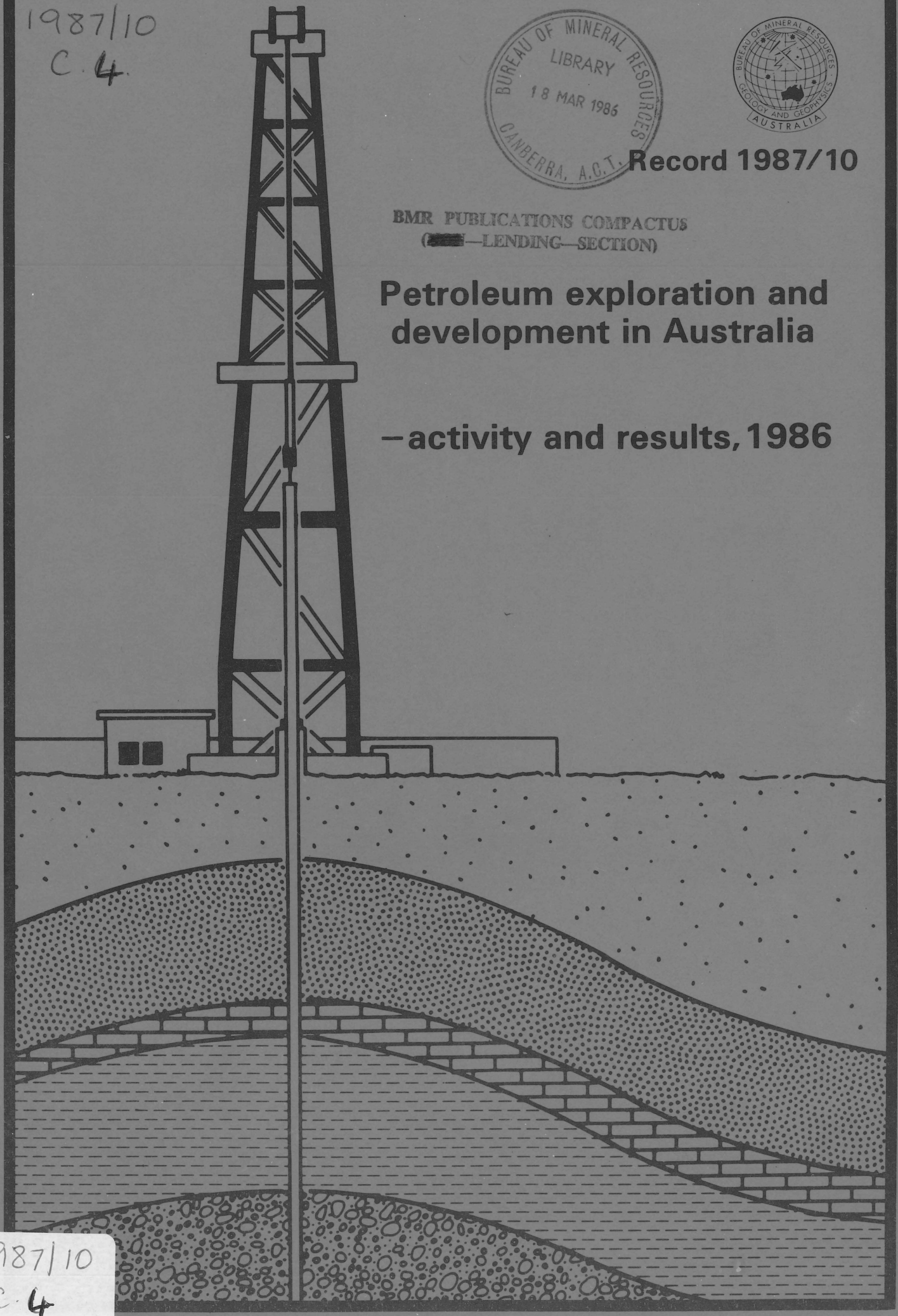
Petroleum exploration and development in Australia

—activity and results, 1986



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Petroleum exploration and development in Australia - activity and results, 1986

Compiled by the Petroleum Branch, Resource Assessment Division, Bureau of Mineral Resources, Geology and Geophysics, Canberra

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CONTENTS

FIGURES

TABLES

INTRODUCTION

This report has been prepared by the staff of the Petroleum Branch of the Resource Assessment Division of BMR. The functions of the Petroleum Branch include the monitoring of petroleum exploration and development activity, the preparation of estimates of petroleum reserves and resources and their availability through time, and the provision of technical advice in relation to Commonwealth legislation and policies concerning petroleum exploration and production.

The report provides a preliminary summary of petroleum exploration and development activity in Australia during 1986. It also summarises BMR's assessment of Australia's identified petroleum resources (reserves) and undiscovered petroleum resource potential.

In addition to a summary of activity in 1986 in each of the major onshore and offshore sedimentary basins, the report includes a list of the major events in the history of the Australian petroleum industry and a summary of the wells and metres drilled to the end of 1986.

5

1986 IN RETROSPECT

The levels of petroleum exploration and development activities in Australia dropped significantly in 1986 as a result of the worldwide decline in crude oil prices. Australian companies reduced expenditure to about the level of the early 1980s, drilled fewer exploration and development wells and deferred some major proposed development projects. Exploration was concentrated mainly in low-risk areas onshore with ready access to markets, however the number of exploration wells drilled and seismic traverses surveyed also dropped to about the levels of the early 1980s and were about half the record levels of 1985. Although there was a slight increase in offshore development drilling this was offset by a large reduction in onshore drilling resulting in a drop in the total development drilling to its lowest level since 1980.

The highest proportion of exploration wells, wells to test extensions of fields and appraisal wells, were drilled in the Cooper/Eromanga and Bowen/Surat Basins. Other onshore basins which were actively explored were the Amadeus, Arckaringa, Browse, Canning, Carnarvon, Gunnedah, Murray, Otway and Sydney Basins. Most exploration wells drilled offshore were in the Bonaparte and Carnarvon Basins; other offshore wells were drilled in the Arafura/Money Shoal, Bass, Gippsland, Great Australian Bight, and Otway Basins. Onshore seismic surveying was mainly in the Cooper/Eromanga, Bowen/Surat and Canning Basins and offshore most seismic surveys were carried out in the Bonaparte, Browse, and Carnarvon Basins.

Forty-five oil, gas and condensate discoveries were made during 1986; 16 oil, ten gas, five oil and gas, and seven gas/condensate discoveries were made onshore and one oil, two gas, two oil and gas, and two gas/condensate discoveries were made offshore. Major oil accumulations were confirmed in the Challis field in the Bonaparte Basin and in the Saladin field in the Carnarvon Basin, however crude oil discoveries were generally in relatively small fields and Australia's economic demonstrated resources of crude oil decreased slightly in most areas through production exceeding additions to reserves. Sub-economic oil resources remained relatively unchanged in most areas except in the Carnarvon Basin where they increased significantly. There was little change in economic demonstrated gas resources, however sub-economic demonstrated gas resources decreased substantially; large increases in the Gippsland Basin, through the discovery of gas in the Kipper field, and in the Carnarvon Basin were offset by reductions in the sub-economic resources of the Bonaparte, Browse and Cooper/Eromanga Basins.

6

Oil production from the Jabiru field in the Bonaparte Basin and the Harriet-Lenita field in the Carnarvon Basin, and gas production from the North Paaratte field in the Otway Basin commenced during 1986. Another significant development in the production area was the commencement of Australia's first enhanced oil recovery project in the Tirrawarra and Moorari oil fields in South Australia which is expected to double the amount of recoverable oil from the fields. However the most significant new development was the completion of the 1500 km natural gas pipeline from the Palm Valley gas field in Central Australia to Darwin. Several new natural gas pipeline projects have also been initiated in Queensland: pipelines are planned to link the gas fields in Southwest Queensland to Moomba in South Australia; proposals have been made to supply gas from the Gilmore field in the Adavale Basin to a fertiliser plant in Blackall, and licences have been granted for construction of a pipeline to supply gas from the Denison Trough to the Gladstone area.

Major development projects which are continuing include the construction of facilities on the North West Shelf to supply LNG to Japan, and construction of a new production platform on the Bream structure in the Gippsland Basin which is nearing completion.

PETROLEUM GEOLOGY, RESOURCES AND PRODUCTION

Geology

Sedimentary rocks ranging in age from Proterozoic to Cainozoic underlie about 4.3 million km^2 or about one half of the land area of Australia, and about another 2 million km^2 of the continental shelf (Fig. 1). Forty-eight sedimentary basins are presently recognised, 20 of which lie wholly or partly offshore.

Proterozoic and early-middle Palaeozoic basins occur mainly in the central and western parts of the continent and in some places extend offshore. Basins that have developed during the late Palaeozoic and Mesozoic underlie large areas of eastern Australia, and exist onshore and offshore around the continental margins. Tertiary strata overlie many of the older basins. The Tertiary basins, and basins that continued to develop into the Tertiary, are mostly distributed along the southern coastline.

Australia's petroleum reservoirs range in age from Precambrian to early Tertiary. Most of the oil resources discovered so far are in offshore early Tertiary reservoirs in the Gippsland Basin. The petroleum reservoirs in the Carnaravon and Browse Basins are Mesozoic, and both Mesozoic and Permian reservoirs exist in the Bonaparte Basin. Onshore, petroleum occurs in Jurassic and Cretaceous reservoirs in the Eromanga Basin, and Jurassic reservoirs in the Surat Basin. The reservoirs are of Permian and Triassic age in the Perth, Bowen, and Cooper Basins, and in the Canning and Adavale Basins which are of Permian and Devonian, and Devonian age respectively. Late Precambrian to late Ordovician reservoirs occur in the Amadeus Basin.

The early-mid Palaeozoic reservoirs in the Amadeus and Adavale Basins are in shallow-marine sedimentary sequences. However, most of Australia's petroleum resources have been discovered in Tertiary, Mesozoic, and late Palaeozoic sequences that were deposited in marginal marine or non-marine environments and which commonly contain extensive coal measures.

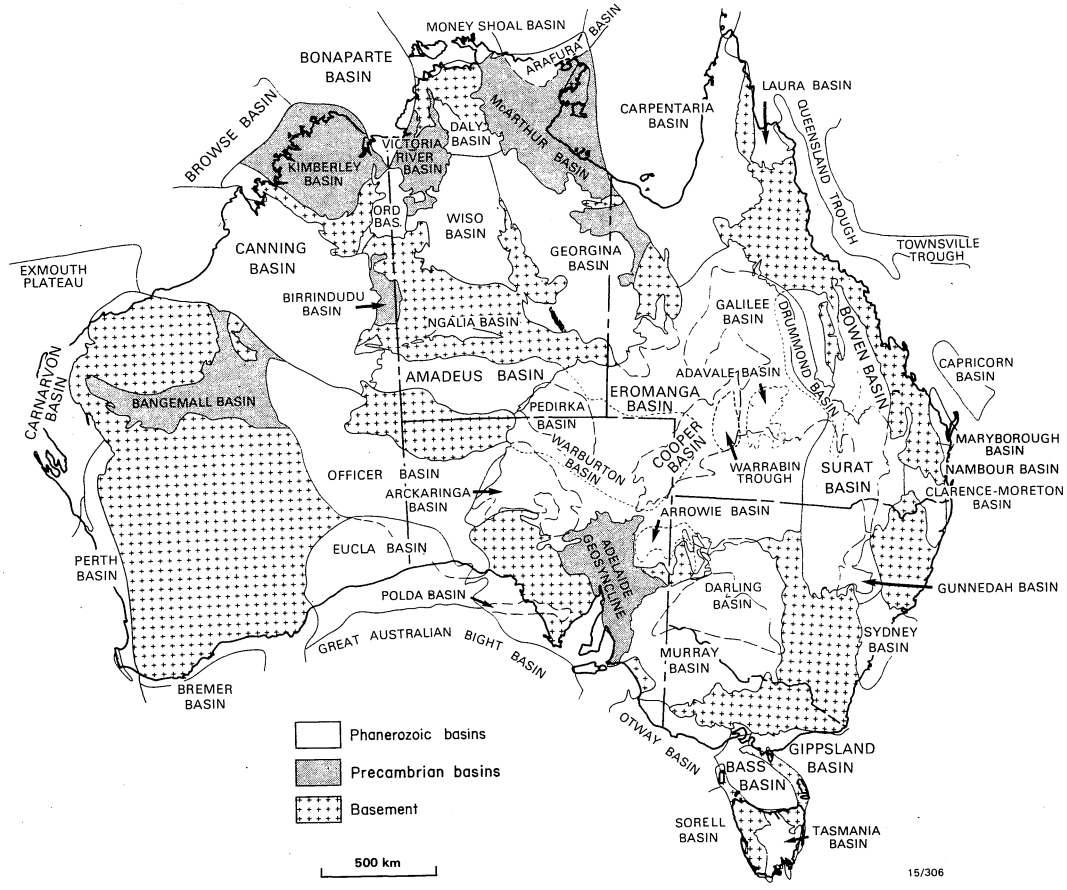
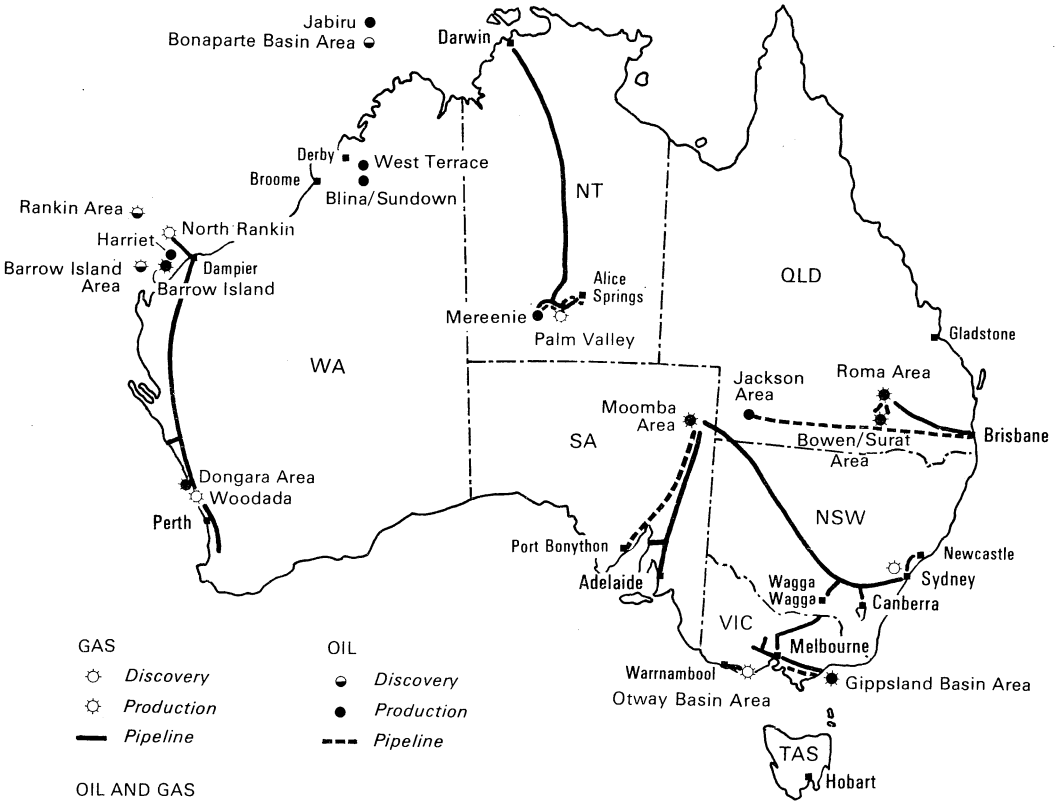


Fig. 1. Australia's sedimentary basins. 'Basement denotes regions generally unprospective for petroleum - mainly areas underlain by crystalline rocks or by tightly folded or metamorphosed strata. The dashed lines are boundaries of concealed basins; locally relationships are complex, e.g. the Galilee Basin overlies the Adavale Basin and underlies the Eromanga Basin.



FIELD DISCOVERIES IN 1986

Bowen/Surat Area
- McGregor
- Narrows
- Taylor

Jackson Area
- Black Stump
- Byrock
- Cooroo
- Cooroo Nth
- Dilkera
- Ipundu
- Kihee
- Macadama
- Okotoko
- Tennaperra
- Thungo
- Toobunyah Sth

Moomba Area
- Alkoomi
- Bagundi
- Bimbaya
- Calamia West
- Cowralli
- Daralingie 17
- Dirkala
- Garanjanie
- Goyder
- Kidman 5
- Kidman Nth
- Merupa
- Mundi
- Nanima
- Nungeroo
- Pira
- Spectre
- Spencer 3
- Swan Lake
- Tarwonga
- Thurakinna

Gippsland Basin Area
- Kipper
- Snapper 6

Otway Basin Area
- Westgate

Barrow Island Area
- Campbell 2

Sydney Area
- Cut Hill 3A

Bonaparte Basin Area
- Skua 2

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Fig. 2. Location of oil and gas production, pipelines and discoveries in 1986.

Resources

Most of Australia's identified resources of crude oil occur in the Gippsland Basin (Fig. 2, Table 1); smaller amounts exist in the Carnarvon, Canning, Perth, Bonaparte, Cooper, Eromanga, Bowen, Surat, and Amadeus Basins. Most identified resources of natural gas occur in the Carnarvon, Gippsland, Cooper and Bonaparte Basins. Gas has been discovered in all basins known to contain resources of crude oil, and additionally in the Otway, Browse, Bass, and Adavale Basins, and the Exmouth Plateau.

Australia's demonstrated recoverable resources of crude oil, condensate, liquified petroleum gas (LPG), and sales gas ('sales gas' is the principal component of natural gas) are shown in Table 1 (see also Figure 3). Table 1 is based on the McKelvey classification, which subdivides resources in terms of their economic feasibility of extraction and geological certainty of occurrence. **Economic demonstrated resources** of petroleum are judged to be economically recoverable, their quantity and quality being assessed partly from specific measurements and partly by extrapolation for a reasonable distance on geological evidence; **subeconomic demonstrated resources** are similar in terms of certainty of occurrence but, although physically recoverable, are judged at present to be subeconomic.

TABLE 1. LOCATION AND MAGNITUDE OF AUSTRALIA'S DEMONSTRATED RECOVERABLE PETROLEUM RESOURCES, 30 JUNE 1986

Basin	Crude Oil ($x10^6 m^3$)	Condensate ($x10^6 m^3$)	LPG ($x10^6 m^3$)	Sales Gas ($x10^9 m^3$)
Economic Demonstrated Resources				
Amadeus & Bonaparte	9	-	1	164
Bowen/Surat	*	*	*	2
Carnarvon & Canning	15	52	27	412
Cooper/Eromanga	16	7	14	93
Gippsland	184	21	46	168
Otway	-	-	-	*
Perth	*	*	-	2
Total	224	80	88	691

Basin	Crude Oil ($x10^6 m^3$)	Condensate ($x10^6 m^3$)	LPG ($x10^6 m^3$)	Sales Gas ($x10^9 m^3$)
Subeconomic Demonstrated Resources				
Adavale	-	-	-	1
Bowen/Surat	*	*	*	5
Cooper/Eromanga	-	1	1	10
Gippsland, Bass	36	9	5	50
Perth, Carnarvon, Browse, Bonaparte	18	27	14	737
Total	54	37	20	803

* refers to volumes less than 1.

Exploration Potential

BMR completed a comprehensive re-assessment of Australia's undiscovered crude oil and sales gas resources (Forman, 1986), and a re-assessment of undiscovered condensate.

The oil assessment indicates an 80 percent chance of finding at least another 190 x $10^6 m^3$ (1200 x 10^6 barrels) of crude oil and a 20 percent chance of finding more than another 460 x $10^6 m^3$ (2900 x 10^6 barrels). The average of the assessment is 380 x $10^6 m^3$ (2400 x 10^6 barrels) of crude oil. The gas assessment indicates an 80 percent chance of finding at least another 400 x $10^9 m^3$ (14 TCF) of sales gas and a 20 percent chance of finding more than another 820 x $10^9 m^3$ (29 TCF). The average of the assessment is 650 x $10^9 m^3$ (23 TCF).

The condensate assessment indicates an 80 percent chance of finding at least another 60 x $10^6 m^3$ (380 x 10^6 barrels) of condensate and a 20 percent chance of finding more than another 110 x $10^6 m^3$ (700 x 10^6 barrels). The average of the assessment is 90 x $10^6 m^3$ (550 x 10^6 barrels).

The assessments refer to the oil and gas resources remaining to be discovered in Austsralia's Phanerozoic sedimentary rocks as at May 1986. They include the resources of all onshore and offshore areas, except for

Australia's remote offshore territories. Part of the resources may occur in fields that are too small to produce at today's prices and part may occur in remote deep water areas that are unlikely to be exploited for the next 15 to 20 years.

Production

Commercial production of oil began in Australia in 1964, from the Moonie field in the Surat Basin (Fig. 1, Tables 2 and 3; see also Fig. 3). Production from Barrow Island (Carnarvon Basin) began in 1967, and from Bass Strait (Gippsland Basin) in 1969. The Gippsland Basin is the major source of petroleum liquids in Australia (81 percent) and with the completion of a liquids pipeline from Moomba to Stony Point (1982) and the Jackson to Moonie pipeline (1983), the Cooper/Eromanga Basin is presently the nation's second largest liquids producer.

Natural gas was first delivered to Brisbane, Melbourne, and Adelaide in 1969 from the Surat, Gippsland, and Cooper Basins respectively. In 1983 the Palm Valley field in the Amadeus Basin supplied gas to the Alice Springs power station, and in 1984 North West Shelf gas reached the Perth market to supplement the gas from the Dongara field (Perth Basin) first supplied in 1971. Since 1976 Sydney has received its gas from the Moomba and adjoining fields (Cooper Basin). Other major centres, particularly in Victoria and New South Wales, have also been connected to gas supplies. A 1500 km gas pipeline from Palm Valley to Darwin has been completed.

In 1985-86, Australia's crude oil and condensate production were at record levels of 31.7 x $10^6 m^3$ (198.8 x 10^6 barrels), which averaged approximately 86000 m^3 per day - an increase of 2.2 percent over output for the preceeding year. Production from the Bass Strait fields decreased from the previous year (down from 86 percent to 81 percent of Australian total production). This is mainly a reflection of the maturity of the basin and in particular the depletion of the Kingfish and Halibut fields.

The production of sales gas was down 3.4 percent from the preceding year while LPG was down 5.2 percent.

Imports of crude oil and other refinery feedstock were valued at $1191 million, a 31 percent increase from 1984/85.

TABLE 2. COMMERCIAL PRODUCTION OF PETROLEUM IN AUSTRALIA, 1985-86(a)

Basin	Crude Oil ($x10^6 m^3$)(c)	Condensate ($x10^6 m^3$)(c)	LPG ($x10^6 m^3$)(c)	Natural Gas (b) ($x10^9 m^3$)(c)
Amadeus	0.19	-	-	0.03
Bowen/Surat	0.09	0.06	0.06	0.51
Canning	0.06	-	-	-
Carnarvon	1.36	0.34	-	2.37
Cooper/Eromanga	3.01	0.78	1.00	5.30
Gippsland	25.04	0.73	2.95	5.51
Perth	0.01	-	-	0.56
Total	29.76	1.91	4.01	14.28(d)

Source: Bureau of Resource Economics, Department of Resources & Energy.

(a) Fiscal year ending 30 June 1986. (b) Commercial sales plus field and plant usage. (c) 1 m^3 = 6.29 barrels (liquids), 35.315 ft^3 (gas).
(d) Production of sales gas was 13.06 x $10^9 m^3$.

TABLE 3. CUMULATIVE COMMERCIAL PRODUCTION OF PETROLEUM IN AUSTRALIA TO 30 JUNE 1986

Basin	Crude Oil ($x10^6 m^3$)	Condensate ($x10^6 m^3$)	LPG ($x10^6 m^3$)	Natural Gas (a) ($x10^9 m^3$)
Amadeus	0.27	-	-	0.13
Bowen/Surat	3.91	0.28	0.09	5.54
Canning	0.10	-	-	-
Carnarvon	34.34	0.58	0.05	6.46
Cooper/Eromanga	6.59	2.56	4.01	43.50
Perth	0.14	0.05	-	11.42
Total	378.45	12.75	44.41	130.03

(a) Commercial sales plus field and plant usage.

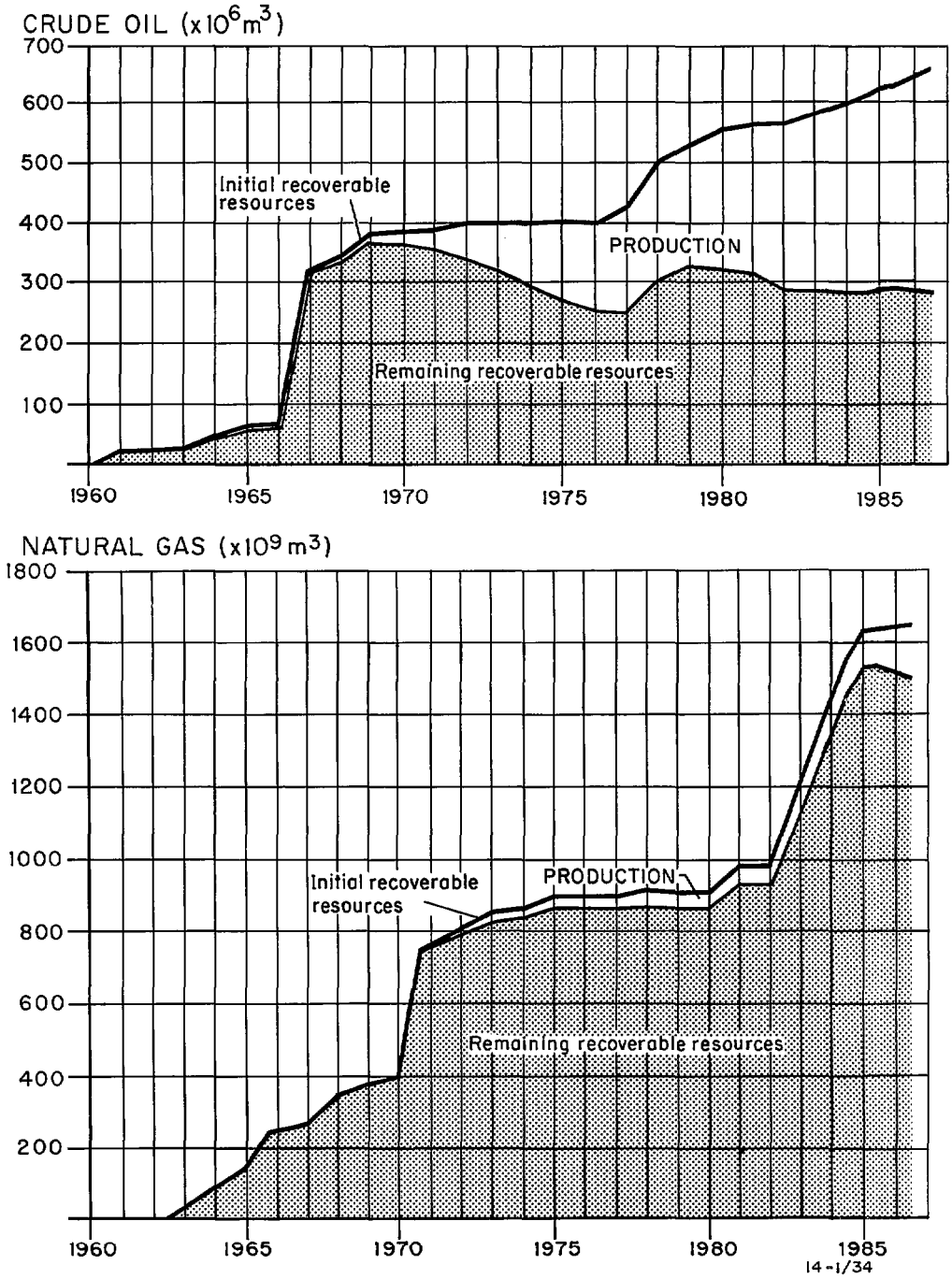


Fig. 3. Australia's demonstrated recoverable resources of crude oil and natural gas. Remaining recoverable resources at 30 June 1986 were: crude oil, 278 million m^3 (natural gas) sales gas, 1494 billion m^3.

SUMMARY OF PETROLEUM EXPLORATION IN 1986

Statistics of petroleum exploration and development activity in recent years are given in Table 4 and Figure 4. Discoveries of petroleum in 1986 are listed in Table 5.

The latest data indicate that some $480 million were spent on exploration in 1986, compared with $774 million in 1985 and the record level of $957 million in 1982. A total of 175 wells were drilled in 1986 (lowest level since 1980) and exploration drilling accounted for 140 wells. Of these exploration wells, 112 (80 percent) were onshore and 28 (20 percent) were offshore.

Onshore exploration drilling was concentrated in the Cooper/Eromanga and Bowen/Surat Basins which accounted for 83 percent of the onshore exploration wells drilled throughout 1986. Other onshore exploration wells were drilled in the Arckaringa, Browse, Canning, Carnarvon, Gunnedah, Murray, Otway and Sydney Basins. Onshore exploration drilling accounted for 16 oil discoveries, ten gas discoveries, five oil and gas discoveries and seven gas/condensate discoveries. In addition, extensions to known fields in the Bowen/Surat, and Cooper/Eromanga Basins were successfully proved by appraisal drilling.

The Cooper/Eromanga Basins continued to be the most prolific onshore exploration area in 1986 and accounted for 33 of the 38 onshore petroleum discoveries. In the Bowen Basin in Queensland, the Taylor No 1 well set a record gas flow of $0.6 \times 10^6 m^3/d$ for the basin.

Offshore exploration drilling was undertaken in the Bass, Bonaparte, Carnarvon, Gippsland, Great Australian Bight, Money Shoal /Arafura and Otway Basins. The Bonaparte and Carnarvon Basins accounted for 19 wells (68 percent) of the total offshore exploration wells drilled. Offshore there was one oil discovery, two gas discoveries, two oil and gas discoveries and two gas/condensate discoveries. In addition, extension/appraisal drilling was carried out at Challis, Saladin, Goodwyn and Snapper fields.

The Kipper No 1 well drilled in the eastern part of the Gippsland Basin discovered a gross gas column 287 metres thick and production testing of the upper part of the column flowed gas at a rate of 0.7 x $10^6 m^3/d$ and condensate at a rate of 85 m^3/day. Further appraisal drilling at the Challis field in the Bonaparte Basin has significantly upgraded the commercial potential of the field and considerably enhanced the prospectivity of the area near the producing Jabiru oil field located 60 km north. Additional appraisal drilling at the Goodwyn field indicated further high volumes of potentially recoverable condensate and gas which may lead to the area assuming a major role by the mid 1990s in Australia's indigenous oil production.

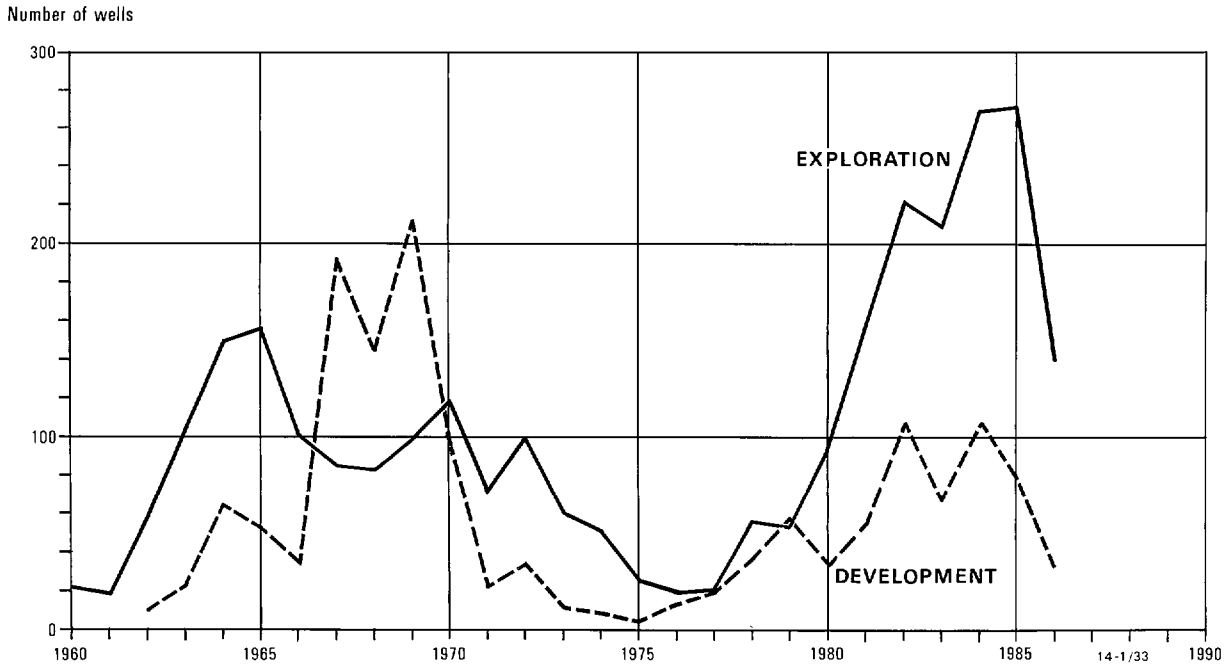
Preliminary figures for seismic work in 1986 (Table 4) indicate that a total of 47556 line kilometres was surveyed - 27192 offshore and 20364 onshore which is 36 percent and 58 percent respectively lower than in 1985.

The total number of drilling rigs in Australia decreased by one from the end of 1985 to 51 at the end of 1986 - land rigs (including those used on offshore production platforms) remained at 47 in 1986. There were four offshore drilling vessels at the end of 1986, one less than at the end of 1985. The availability of onshore or offshore rigs is not expected to be a factor limiting exploration drilling in 1987.

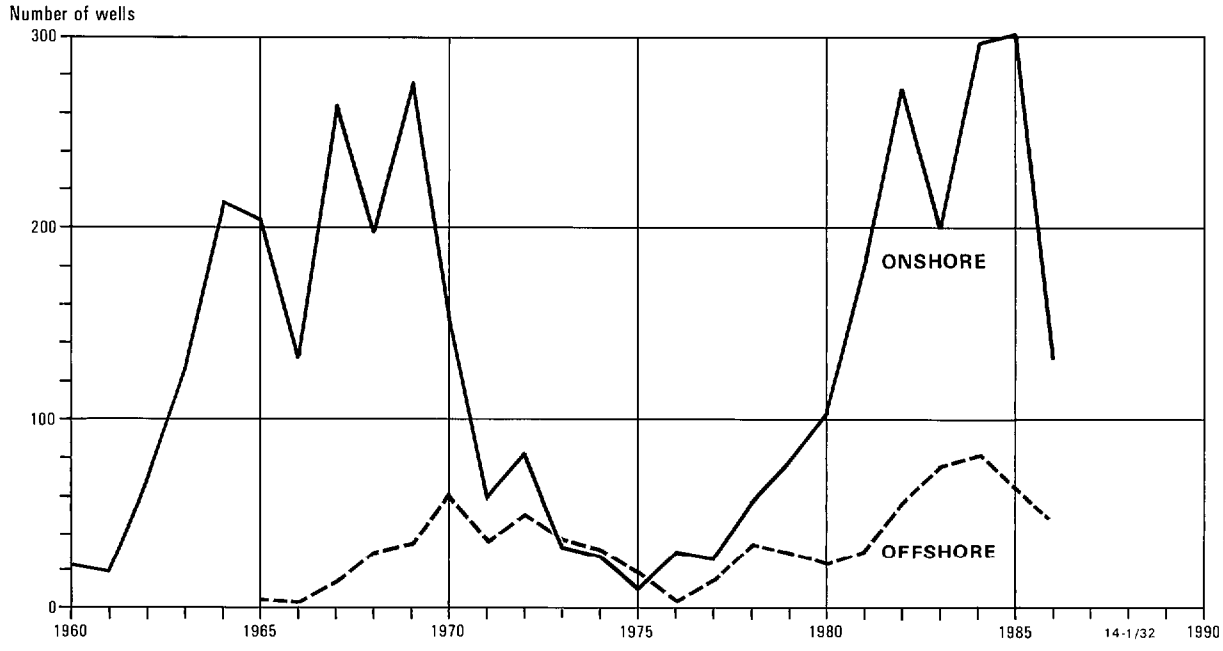
TABLE 4. PETROLEUM EXPLORATION AND DEVELOPMENT EXPENDITURE AND ACTIVITY, 1976-85

	Exploration expenditure ($ million)	Development (including production expenditure) ($ million)	Seismic surveys (line-km)	Exploration wells drilled	Development wells drilled
1976	49	94	94200	19	13
1977	82	114	11600	21	20
1978	112	216	44421	55	37
1979	222	236	41539	52	57
1980	290	358	55445	94	33
1981	458	944	74438	158	55
1982	957	1263	95253	221	108
1983	731	1022	38761	209	66
1984	748	734	61941	264	109
1985	784	1065	90169	270	94
1986(a)	480	1100	47556	140	35

(a) Preliminary



Petroleum exploration and development wells drilled in Australia



Petroleum wells drilled onshore and offshore in Australia

Fig. 4. Petroleum exploration and development, onshore and offshore wells drilled in Australia 1960-1986.

SUMMARY OF PETROLEUM DEVELOPMENT IN 1986

Development drilling activity was considerably below the level achieved in the last five years - 35 development wells were drilled, 20 offshore and 15 onshore. Development and production expenditure in 1986 is estimated to have been about $1100 million.

The total of 35 development wells drilled during the year was 63 percent less than in 1985 (94 wells) and at its lowest level since 1980 - onshore development drilling (15 wells) was down 80 percent and offshore development drilling (20 wells) was marginally more than for 1985 (18 wells). Development wells were drilled offshore at Flounder (7), Snapper (5), Fortescue (3), and at North Rankin (5), Platforms.

Queensland

Approval has been granted to link the natural gas fields of Southwest Queensland to Moomba in South Australia to augment the supply of natural gas to the Adelaide and Sydney markets.

A pipeline is proposed to supply gas from the Gilmore gas field for an ammonium nitrate plant to be built at Blackall in central Queensland.

Licences have been granted for the construction of a $120 million, 600 km pipeline linking the Denison Trough natural gas fields and Gladstone. The Queensland Alumina Ltd refinery would be the main user and proposes to replace fuel oil with natural gas in its kilns.

Victoria

Production of natural gas from the North Paaratte field, located in the onshore, Otway Basin commenced in April. The supply agreement requires the operator to provide 396.6 x $10^6 m^3$ of natural gas over a 20 year period. The nearby Wallaby Creek natural gas field will be developed at a later stage.

The Bream platform, which will be located between the existing West Kingfish and Barracouta platforms in the Gippsland Basin is currently nearing completion and is planned to be offloaded by the end of March 1987. Bream will ultimately have 27 wells and is planned to produce oil at about 2,400 m^3/d via a 400mm pipeline linked to the West Kingfish platform, 30 km distant.

South Australia

Initial contracts have been let totalling $10 million towards an enhanced oil recovery project which is expected to double the oil produced from the Tirrawarra and Moorari fields. The project involves the injection of ethane gas into the reservoirs and the whole program will be of 20 years duration and cost an estimated $100 million.

Western Australia

The Harriet-Lenita field, located 18 km northeast of Barrow Island, commenced oil production in January 1986 at a rate of about 1.6×10^3 m^3/d. The project involved the construction of a main production platform and two smaller satellite platforms linked via a 6.5km submarine pipeline to the terminal on Varanus Island. The tanker loading facility is separated from the terminal by a 3.5km submarine pipeline.

The second phase of the North West Shelf gas project which includes the construction of the on-shore LNG plant, storage and loading facilities, began in August 1985. By the end of 1986, the foundations for two of the three processing trains had been laid, two of the four liquid gas storage tanks were nearing completion, most of the crucial construction work has been finished and work on the 800m loading jetty for bulk gas carriers has begun. Apart from the construction onshore, three production tests were completed in the little known northern extension of the Goodwyn field. These tests indicated a potential condensate reserve of about $31.7 \times 10^6 m^3$ which combined with known North Rankin condensate reserves could increase the projects condensate reserves to about $55.5 \times 10^6 m^3$ - a fifth of the size of the Gippsland Basin reserves and the biggest single discovery since the Fortescue field in 1978.

In January 1987, the operators for the project announced plans to double the production of condensate from the North Rankin A platform. A new production well and five re-injector wells are planned to be drilled from the platform to complement the seven wells drilled for the domestic gas phase of the project. The condensate will be separated from the gas which will then be compressed on the platform and pumped back into the gas reservoir through the injector wells.

A feasibility study is underway for a low cost project to bring the South Pepper and North Herald oil fields south of Barrow Island into production possibly by the end of 1987.

Northern Territory

The main trunk line and delivery systems for the 1500 km Palm Valley to Darwin natural gas pipeline were commissioned in early January 1987 following the completion of performance testing. The gas is being used initially to fuel turbines at Darwin's new combined-cycle power station on Channel Island. A proposal to establish a gas liquefaction plant in Darwin to produce LPG, natural gas and Australia's only commercial production of helium is currently under consideration. Plans were also announced for a possible $6 million LNG conversion plant to be built at Alice Springs to supply fuel to the Yulara Power Station and markets in the Alice Springs area.

Negotiations are continuing with overseas clients for the delivery of LNG gas from the Petrel and Tern gas fields located in the Bonaparte Gulf. Should negotiations be successful, first deliveries of the gas could be expected in the early-to-mid-1990s.

The offshore Jabiru oil field located in the western part of the Bonaparte Basin (Timor Sea) commenced production in August 1986. This is the first sustained oil production in the Timor Sea area and features a unique floating production facility (FPF) using a converted 140 000 dwt oil tanker (Jabiru Venture) that can be readily detached from its mooring in bad weather. Crude oil is produced from the Jabiru 1-A well via a subsea completion installation through flowlines and a mooring riser on to the FPF where modules are installed to process the crude oil prior to storage. Production from the field is about 2000 m^3 per day and the first shuttle tanker lifted a cargo of 61600 m^3 in late September 1986.

DETAILS OF MAJOR ACTIVITIES IN 1986

Onshore Basins

Amadeus Basin (NT)

Drilling was confined to the early part of 1986 when four development wells were drilled in the East Mereenie oil field and one appraisal well was successfully completed in the Palm Valley gas field. Palm Valley No. 6B flowed an estimated 3.88 x $10^6 m^3/d$ of gas from the Pacoota P1 Sandstone on a 3 inch choke. This is the largest flow recorded in the Palm Valley field.

Gas is now flowing in the 1500 km natural gas, Palm Valley-to-Darwin pipeline construction of which was completed this year. The Palm Valley field will supply about 4.98 x $10^9 m^3$ of gas over the next 25 years to the Channel Island power station in Darwin, which will provide power for Darwin, Katherine, and Tennant Creek. The Mereenie field will supply 1.64 x $10^9 m^3$ of gas.

Consideration is being given to the construction of a gas liquefaction plant in Darwin to supply LPG and LNG for local and other markets. This plant would be the only plant in Australia to produce helium.

Arafura/Money Shoal Basins (NT)

Goulburn No. 1 was plugged and abandoned without significant hydrocarbon shows; minor dead oil, bitumen, and weak gas shows were recorded.

All permits within the offshore part of the basin have been surrendered or applications to surrender have been made.

Arckaringa/Eromanga Basins (SA)

The end of the year has seen a revival of interest in the Arckaringa Basin where a two well program is planned. Main exploration targets are in the Palaeozoic Arckaringa Basin sequence with additional targets in the overlying Eromanga Basin. Birribiana No. 1 and Arkeeta No. 1 were plugged and abandoned without shows, and Hanns Knob No. 1 was still drilling at the end of the year.

Bowen/Surat Basins (Qld)

Wildcat drilling predominated in the Bowen and Surat Basins during the year, comprising 15 of the 19 wells drilled in the basins. The three discoveries made were all in the Showgrounds Sandstone of the Bowen Basin. Taylor No. 1 flowed 0.61 x $10^6 m^3/d$ of gas plus condensate on a drill stem test. This is the largest flow recorded in the Bowen and Surat Basins. Narrows No. 1 flowed only 0.39 x $10^3 m^3$ of gas from the Showgrounds Sandstone and 1325 m of 59.7 degree API oil were also recovered. Oil was also recovered from McGregor No. 1, but production from the Showgrounds Sandstone in this well was considered uneconomic and the well was converted to a water well.

In Taylor No. 1 the Permian Kutting Formation flowed oil at a maximum rate of 15.9 m^3/d on a drill stem test; the well was completed only as a gas/condensate producer from the Showgrounds Sandstone.

Browse Basin (WA)

Browse Island No. 1, was drilled as a stratigraphic well to test a seismic anomaly. No hydrocarbons were recorded during drilling and the well was plugged and abandoned at a total depth of 405.5 m.

Canning Basin (WA)

Patience No. 1 encountered no hydrocarbons and the well was plugged and abandoned at a total depth of 1868.5 m.

Carnarvon Basin (WA)

Midway Hill No. 1, Lefroy Hill No. 1 and Roberts Hills No. 1, were drilled in the Northwest Cape area, close to Rough Range No. 1, which was completed as a shut-in oil well in 1954 after recovering oil from the Birdrong Sandstone. Minor hydrocarbon shows were recorded in the Birdrong Sandstone from the Midway Hill No. 1 and Lefroy Hill No. 1 wells which were plugged and abandoned. Roberts Hill No. 1 recovered formation water with an oil scum from a drill stem test of the Birdrong Sandstone and was plugged and abandoned.

Cooper/Eromanga Basins (Qld, SA)

These basins were the main onshore exploration targets and 73 wells were drilled within or near the Cooper Basin. There were 33 discovery wells, nine of which were not completed for production, and a wildcat discovery rate of around 50 percent or better. All gas and gas/condensate discoveries were in the Cooper Basin, and all major oil discoveries were in the Eromanga Basin. Several small oil discoveries were made in the Cooper Basin sequence but none of the discovery wells were completed for production from the Cooper Basin Sequence. The only new pool discovery was a gas/condensate pool in the Patchawarra Formation of the Kidman field.

Several wells have multiple pools; Dirkala 1, an oil and gas discovery well, has 4 pools.

Drilling was largely concentrated near previous discoveries or producing fields in the Cooper Basin. However, the discovery of Permian oil in Byrock No. 1 indicates potential for further discoveries in the eastern end of the Cooper Basin.

The discovery of a possible oil leg in the Patchawarra Formation of the Daralingie field and the success of Kidman No. 5, which increased the gas reserves by $1.02 \times 10^9 m^3$, may lead to further exploration of established fields. Kidman No. 5 also confirmed a connection between the Kidman and Bagundi-Aroona fields.

Plans are being considered for production from gas fields in the Queensland part of the Cooper/Eromanga Basins. This gas could be used to supplement the South Australian Cooper Basin gas supply to Adelaide and Sydney.

Eromanga Basin (Qld, SA, NT, NSW)

The drilling results have been less encouraging outside the Cooper/Eromanga area. Seven wells were drilled north, west, and south of the Cooper Basin; two were stratigraphic holes drilled by the Geological Survey of Queensland. All 7 wells were plugged and abandoned without encountering significant hydrocarbons.

Eromanga/Galilee/Adavale Basins (Qld)

Two stratigraphic and two exploration wells were drilled within the areal limits of the Galilee Basin, mainly to test the Eromanga Basin sequence. Neither exploration well recovered hydrocarbons; however Phfarlet No. 1, which was drilled near the Gilmore gas field, may be deepened later to test the Adavale Basin sequence.

Gunnedah/Surat Basins (NSW)

The NSW Department of Mineral Resources drilled a stratigraphic well to provide further information on the Gunnedah Basin sequence for which core descriptions are available.

Murray/Darling Basins (NSW, Vic)

Three wells drilled to test the Permian and Carboniferous sequence were plugged and abandoned without finding hydrocarbons.

Otway Basin (Vic/SA)

Four wildcat wells were drilled in the Victorian part of the basin. Najaba No. 1A in the Gambier Embayment and Greenslopes No. 1 in the Tyrendarra Embayment failed to encounter any significant indications of hydrocarbons and were plugged and abandoned. Princes No. 1 and Westgate No. 1 were located in the Port Campbell Embayment to the north and northwest respectively of the North Paaratte gas field. Princes No. 1 was a dry hole however Westgate No. 1 produced a minor gas flow on testing a low permeability sandstone. These wells were also plugged and abandoned.

Sydney Basin (NSW)

Cut Hill No 3A recorded gas flows from the Narrabeen Group up to a maximum of $14.4 \times 10^3 m^3/d$. The flow rate declined with testing and the well was plugged and abandoned.

TABLE 5. DISCOVERIES OF PETROLEUM IN 1986 (a)

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
				ONSHORE			
Bowen/Surat							
	McGregor No 1	Bridge	Qld	Oil	Showgrounds Ss	NFD	Recovered 260 m of oil; flowed gas at very small rate. P&A.
	Narrows No 1	Bridge	Qld	Oil Gas	Showgrounds Ss Showgrounds Ss	NFD	Small gas flow ($0.39 \times 10^3 m^3/d$), was also recorded from Showgrounds Ss. Completed only for oil.
	Taylor No 1	Bridge	Qld	Gas/Cond	Showgrounds Ss	NFD	Largest gas flow ($169 \times 10^3 m^3/d$), in the Bowen/ Surat Basins.
				Oil	Kuttung Fm		Non-commercial oil discovery in pre-Triassic Kuttung Fm, flowed maximum of $16 m^3/d$ with a rapidly declining rate. Completed as gas/condensate producer.
Cooper/Eromanga							
	Alkoomi No 1	Crusader	SA	Oil	Namur Mbr	NFD	Recovered 4.88 m of oil. P&A.

(a) Preliminary, subject to revision

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
Cooper/Eromanga (Cont)							
	Bagundi No 2	Delhi	SA	Oil Gas/Cond	Patchawarra Fm Patchawarra Fm	NPD	Flowed oil at 25 m^3/d in addition to producing gas/condensate. Completed as a gas/condensate producer.
	Bimbaya No 1	Santos	SA	Gas Gas	Toolachee Fm Tirrawarra SS	NFD	
	Black Stump No 1	Lasmo	Qld	Oil	"Basal Jurassic"	NFD	
	Byrock No 1	Lasmo	Qld	Oil	Permian undiff.	NFD	DST recovered 2.2 m^3 of oil from Permian. First significant oil discovery in the eastern end of the Cooper Basin. Lack of porosity and permeability. P&A.
	Calamia West No 1	Delhi	SA	Oil Oil	Murta Mbr Hutton Ss	NFD	
	Cooroo No 1	Delhi	Qld	Oil Oil	Hutton Ss "Basal Jurassic"	NFD	
	Cooroo North No. 1	Delhi	Qld	Oil	Westbourne Fm	(b)	
	Cowralli No 1	Santos	SA	Gas	Patchawarra Fm	NFD	

28

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
Cooper/Eromanga (Cont)							
	Daralingie No 17	Delhi	SA	Oil	Patchawarra Fm	(b)	Recovered 347 m of oil - possible oil leg to gas field. P&A.
	Dilkera No 1	Pancontinental	Qld	Oil	Murta Mbr	NFD	Recovered 0.72 m^3 of oil. P&A.
	Dirkala No 1	Delhi	SA	Oil Oil Gas Gas	Namur Mbr Birkhead Fm Epsilon Fm Patchawarra Fm	NFD	Completed as an oil and gas well.
	Garanjanie No 1	Delhi	SA	Gas/Cond Gas/Cond	Epsilon Fm Patchawarra Fm	NFD	
	Goyder No 1	Delhi	SA	Gas/Cond Gas	Epsilon Fm Patchawarra Fm.	NFD	Flowed 21 x $10^3 m^3$/d gas, and recovered 28 m condensate from Epsilon Fm; flowed gas at 481 m^3/d from Patchawarra Fm. P&A.
	Ipundu No 1	Hartogen	Qld	Oil Oil	Wyandra SS Murta Mbr	NFD	Completed in Wyandra Ss. Recovered 7.2 m^3 oil from Murta Mbr.
	Kidman No 5	Delhi	SA	Gas/Cond	Patchawarra Fm	NPD	
	Kidman North No 1	Delhi	SA	Gas/Cond Gas/Cond Gas	Toolachee Fm Epsilon Fm Patchawarra Fm	NFD	Completed in Toolachee and Patachawarra Fms.

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
Cooper/Eromanga (Cont)							
	Kihee No 2	Pancontinental	Qld	Oil	Murta Mbr	NFD	
	Macadama No 1	Delhi	Qld	Gas	Patchawarra Fm	NFD	Flowed gas at 14 x $10^3 m^3$/d. P&A.
	Merupa No 1	Santos	SA	Oil Gas	Murta Mbr Tirrawarra Ss	NFD	Completed as gas producer from Tirrawarra Ss. Recovered 50 m oil from Murta Mbr.
	Mundi No 1	Delhi	SA	Gas/Cond Gas/Cond	Epsilon Fm Patchawarra Fm	NFD	
	Nanima No 1	Delhi	SA	Gas	Nappamerri Fm	NFD	
	Nungeroo No 1	Crusader	SA	Oil	Namur Mbr	NFD	
	Okotoko No 1	Delhi	Qld	Gas	Patchawarra Fm	NFD	
	Pira No 1	Delhi	SA	Gas/Cond Gas/Cond	Toolachee Fm Patchawarra Fm	NFD	Completed as a gas/condensate producer from Toolachee & Patchawarra Fms.
	Spectre No 1	Delhi	SA	Gas	Patchawarra Fm	NFD	Flowed 4 x $10^3 m^3$/d gas. P&A.
	Spencer No 3	Delhi	SA	Oil	Birkhead Fm	NFD	
	Swan Lake No 1	Santos	SA	Gas Gas	Patchawarra Fm Tirrawarra Ss	NFD	
	Tarwonga No 1	Delhi	SA	Gas	Epsilon Fm	NFD	

30

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
Cooper/Eromanga (Cont)							
	Tennaperra No 1	Delhi	Qld	Oil	Hutton Ss	NFD	
	Thungo No 1	Pancontinental	Qld	Oil Oil	Murta Mbr Westbourne Fm	NFD	
	Thurakinna No 1	Delhi	SA	Gas/Cond	Patchawarra Fm	NFD	
	Toobunyah South No 1	Hartogen	Qld	Oil	Hutton Ss	(b)	Recovered 278 m oil. P&A.
Otway							
	Westgate No 1	Beach	Vic	Gas	Waare Fm	NFD	Minor gas flow.
Sydney							
	Cut Hill No 3A	AGL	NSW	Gas	Narrabeen Gp	NFD	Flowed gas up to 14.4 x 10^3 m^3/d. Significant decline in flow rate on further testing.

BASIN	WELL NAME	OPERATOR	STATE	NATURE OF DISCOVERY	PRODUCING FORMATION	CLASSI-FICATION	REMARKS
			OFFSHORE				
Bonaparte							
	Avocet No 1A	Bond	WA	Gas/Cond	Petrel Fm	NFD	Minor gas recovery on RFT.
	Skua No 2	BHP	NT	Oil	Petrel Fm	NFD	Flowed oil at 71.5 m^3/d. P&A. TD reached Dec 1985, tested Jan 1986.
Carnarvon							
	Campbell No 2	Bond	WA	Gas/Cond	Barrow Group	NFD	Flowed gas at 280 x 10^3 m^3/d and condensate at 22.2 m^3/d. Suspended for possible future re-entry.
	Orpheus No 1	Bond	WA	Gas	Barrow Group	NFD	Minor gas recovery on RFT. P&A.
Gippsland							
	Kipper No 1	Esso	Vic	Gas/Cond	Latrobe Group	NFD	Major gas discovery
	Snapper No 6	Esso	Vic	Oil Gas	Latrobe Group Latrobe Group	NFD	
	Leatherjacket No 1	BHP	Vic	Oil/Gas	Latrobe Group	NFD	Minor oil and gas. P&A.

(a) Preliminary, subject to revision.

(b) To be determined.

Note: A discovery is defined here as a well from which any discrete amount of oil or gas has been recovered; no consideration of commerciality is implied. In previous years some discoveries which recovered only small amounts of hydrocarbons were not included in this table.

Offshore Basins

Bass Basin (Tas/Vic)

Three wells were drilled in Tasmanian waters. Exploration wells, Seal No 1 and Chat No 1 had minor indications of hydrocarbons and were plugged and abandoned at 1670 m and 3104 m respectively.

Pelican No 5, an appraisal well in the Pelican gas/condensate field, was drilled to 4267 m. A gas flow of 99000 m^3/d, accompanied by a condensate flow of 72 m^3/d, over the interval 2786 to 3699 m, was the only significant recovery obtained from six production tests.

Bonaparte Basin (WA/NT)

Eight new field wildcats were drilled; all were plugged and abandoned. The only hydrocarbon discoveries were in Avocet No 1A, in the WA part of the basin, which recovered minor gas on repeat formation tests, and in Skua No 2, in the NT part of the basin, which flowed oil at 71.5 m^3/d. In addition four extension/appraisal wells, one of which was a redrill, were completed in the Challis oil field.

Carnarvon Basin (WA)

Five new field wildcats were drilled; all except Campbell No 2 were plugged and abandoned. Hydrocarbons were recovered from Campbell No 2, which was suspended for possible future re-entry after flowing gas at the rate of 280 x $10^3 m^3$/d, and from Orpheus No 1 which recovered minor gas on repeat formation tests.

Three extension/appraisal wells were also drilled. Saladin No 2, drilled in the central part of the Saladin field, recovered an oil flow of about 1740 m^3/d. Goodwyn No 8 and No 9 confirmed the northern extension of the Goodwyn gas field and indicated substantial additions to the condensate reserves in this field.

Gippsland Basin (Vic/Tas)

Exploration wells, Kipper No 1 and Leatherjacket No 1, were drilled in the eastern part of the basin. Kipper No 1 discovered a major gas accumulation, the first large discovery of hydrocarbons in the Gippsland Basin since that of the Fortescue oil discovery in 1978. The gross gas

column encountered by Kipper No 1 was 287 m thick. A production test in the upper part of the column (2005-2013 m) achieved a gas flow of 0.7 x $10^6 m^3/d$, accompanied by 54.6° API condensate at a rate of 85 m^3/d. In Leatherjacket No 1, oil and gas were recovered from wireline tests at 765.0 m, 788.5 m and 812.8 m. The well was plugged and abandoned at 951 m.

Snapper No 6 was a successful appraisal well and possible new pool discovery in the Snapper field.

Great Australian Bight Basin (SA/WA)

Duntroon No 1 was drilled in South Australian waters as a test of the Upper Cretaceous section in the Duntroon Embayment and was plugged and abandoned as a dry hole.

Otway Basin (Vic/SA)

Normanby No 1 was drilled in Victorian waters in the Voluta Trough. The well was plugged and abandoned as a dry hole in Cretaceous sediments.

APPENDIX I

WELLS AND METRES DRILLED - AUSTRALIA 1970-86

WELLS DRILLED

Year	Exploration			Development			Totals	
	Onshore	Offshore	Sub-total	Onshore	Offshore	Sub-total	for year	Cumulative
To 1970	1 396	87	1 483	768	59	827	-	2 310
1971	54	18	72	4	18	22	94	2 404
1972	62	38	100	21	12	33	133	2 537
1973	29	31	60	5	6	11	71	2 608
1974	20	31	51	8	-	8	59	2 667
1975	6	19	25	4	-	4	29	2 696
1976	16	3	19	13	-	13	32	2 728
1977	8	13	21	18	2	20	41	2 769
1978	33	22	55	24	13	37	92	2 861
1979	31	21	52	48	9	57	109	2 970
1980	77	17	94	26	7	33	127	3 097
1981	142	16	158	41	14	55	213	3 310
1982	177	44	221	95	13	108	329	3 639
1983	160	49	209	40	26	66	275	3 914
1984	221	43	264	71	38	109	373	4 287
1985	227	43	270	76	18	94	364	4 651
1986*	112	28	140	15	20	35	175	4 826

* Preliminary figures subject to revision

METRES DRILLED

Year	Exploration		Development		Totals	
	Onshore	Offshore	Onshore	Offshore	Yearly	Cumulative
To 1970	1 794 911	272 994	776 656	148 654	-	2 993 215
1971	108 683	59 860	9 359	46 453	224 355	3 217 570
1972	107 002	117 429	47 365	23 643	295 439	3 513 009
1973	50 301	80 616	11 347	9 644	151 908	3 664 917
1974	37 206	84 078	15 531	-	136 815	3 801 732
1975	12 579	35 658	10 351	-	58 588	3 860 320
1976	32 393	15 119	24 863	-	72 375	3 932 695
1977	23 675	36 827	44 508	6 419	111 429	4 044 124
1978	52 709	56 900	56 332	42 493	208 434	4 252 558
1979	59 635	76 424	44 110	36 612	216 781	4 469 339
1980	137 296	62 012	41 337	27 142	267 787	4 737 126
1981	277 258	45 126	77 602	34 473	434 459	5 171 585
1982	324 288	128 213	154 030	28 379	634 910	5 806 495
1983	273 571	137 472	82 019	86 425	579 487	6 385 982
1984	403 329	113 486	147 294	137 645	801 754	7 187 736
1985	406 967	105 145	125 190	59 816	697 118	7 884 854
1986*	208 012	60 983	24 059	72 364	365 418	8 250 272

* Preliminary figures subject to revision

APPENDIX 2

EVENTS IN PETROLEUM EXPLORATION, DEVELOPMENT AND PRODUCTION IN AUSTRALIA

1839 Commander Stokes discovers "bitumen", Victoria River NT.

1885 Gas discovered in Narrabeen Nos 1 and 2 during search for coal in Sydney Basin NSW.

1892 First exploration drilling for petroleum: Alfred Flat, Coorong area, SA.

1900 Roma (Qld) No 2 town water bore encounters natural gas.

1907 First gas appraisal well: Roma, Qld, caught fire in 1908 and extinguished with difficulty.

1908 Roma streets lit by gas for 10 days.

1924 Lakes Entrance oil field discovered (Vic).

1930 Shafts sunk at Lakes Entrance (Vic) to mine heavy oil.

1953 Rough Range No 1 (WA) flows oil 550 barrels per day.

1954 AAO finds gas in the Hospital Hill field, Roma, Qld.

1956 BMR aeromagnetic program in Bass Strait indicates existence of sedimentary basin offshore Gippsland (Vic).

1957 Commonwealth Government introduces Petroleum Search Subsidy scheme.

1958 BMR seismic survey indicates possible drilling targets at Cabawin and Moonie.

1959 Frome-Broken-Hill's Port Campbell No 1 (Vic) produces strong gas flow on test.

1960 Associated Group discover Timbury Hills and Pickanjinnie gas fields near Roma.

36

1961 Cabawin No 1 (Qld) drilled by Union-AOG, discovers significant gas and condensate. Moonie No 1 (Qld) discovers oil. First sustained commercial use of natural gas in Australia at Roma from Hospital Hill and Timbury Hills gas fields.

1963 Associated Group discovers the Richmond oil and gas field near Roma.

1964 First offshore well in Australia, Esso Gippsland Shelf No 1 (later renamed Barracouta No 1) discovers gas in 46 m of water offshore Victoria (Bass Strait). Santos's Gidgealpa No 2 discovers gas in the Cooper Basin, SA. Wapet's Barrow Island No 1 (WA) and Yardarino No 1 (Perth Basin, WA) discover oil. Mereenie No 1 (NT) discovers oil and gas. Moonie oilfield starts commercial production.

1965 Palm Valley No 1 (NT) discovers gas. Gingin No 1 (WA) discovers gas.

1966 Delhi-Santos discover the Moomba gas field in Cooper Basin (SA) and Esso/BHP discover the Marlin gas field offshore Victoria. Dongara No 1 (WA) discovers gas in the Perth Basin.

1967 Esso/BHP discover major oilfields at Halibut and Kingfish in Bass Strait.

1968 Esso/BHP discover the Tuna oil and gas field in Bass Strait. Mondarra No 1 (WA) discovers gas. Commonwealth (Submerged Lands) Acts come into force on 1 April.

1969 Roma-Brisbane gas pipeline operational March 1969. Melbourne supplied with natural gas from Bass Strait fields in April 1969. Adelaide supplied with natural gas from Gidgealpa/Moomba in November 1969. Crude oil production commenced in Bass Strait fields. Esso/BHP discover Mackerel oil field in Bass Strait.

1970 Bridge Oil discovers the Tirrawarra oil and gas field in the Cooper Basin SA, and the Boxleigh gas field in the Bowen Basin Qld.

37

1971 The North Rankin and Scott Reef gas fields and the Rankin and Goodwin oil and gas fields on the Northwest Shelf discovered. Natural gas production from the Dongara field for Perth, Kwinana, and Pinjarra commenced in October 1971. Walyering No 1 (WA) discovers gas.

1972 Esso/BHP discover the Cobia oil field NW of the Mackerel oil field in Bass Strait. Delhi/Santos discover the Dullingari and Della gas fields in the Cooper Basin. Mondara, Gingin, and Walyering gas fields began producing into Perth-Kwinana-Pinjarra pipeline.

1974 Operations under the terms of the Petroleum Search Subsidy Act terminated with effect from 30 June 1974.

1975 Commonwealth Government's "new oil" pricing policy announced on 14 September 1975.

1977 Esso/BHP drill Cobia No 2 in Bass Strait and prepare the well for completion as Australia's first sub-sea completion.

1978 Wapet announces further Barrow Island drilling spurred on by "new oil" policy. Delhi-Santos discover oil in Strzelecki No 3 (SA) in the Eromanga Basin. In Bass Strait Esso Fortescue Nos 2 and 3 confirm Fortescue field discovery and Seahorse No 1 discovers oil.

1979 Beach Petroleum discovers gas at North Paaratte No 1 onshore in the Otway Basin. Exploration in the deep water on the Exmouth Plateau starts and Esso makes a major gas discovery there in Scarborough No 1 in 912 m of water. Oil production begins from Cobia No 2 subsea completion.

1980 Beach Petroleum finds gas in Grumby No 1 and Wallaby Creek No 1 in the Otway Basin (Vic). Gas discovered at Woodada No 1 in the Perth Basin (WA).

1981 Hudbay Oil discovers oil in West Seahorse No 1 in Bass Strait. Esso discovers oil in Yellowtail No 1 and Tarwhine No 1 in Bass Strait. Delhi finds oil in Jackson No 1 in Eromanga Basin in Qld. Home Oil discovers oil in Blina No 1 in the Canning Basin (WA), and Wapet makes a major offshore gas discovery at Gorgon No 1 in the offshore Carnarvon Basin (WA). In all there are 8 oil and 20 gas discoveries in 1981.

1982 North West Shelf gas project construction phase commences. Major gas discovery in deep water at North Scott Reef. Production commenced from Woodada gas field in Perth Basin. Home Energy discovers oil in Sundown-1 in Canning Basin.

1983 BHP discovers Jabiru oil field in the Bonaparte Basin. Palm Valley (NT) gas supply to Alice Springs commences. First Commercial oil production from Blina field (WA). Significant oil discoveries in Harriet No 1 (Occidental) and South Pepper No 1, North Herald No 1, Chervil No 1 and South Chervil No 1 (Mesa-Wesminco), near Barrow Island (WA). First shipment of liquids from Cooper/Eromanga Basin to Port Bonython facility in SA. First production of Fortescue oil (Vic). Further oil discoveries in Jackson area (Qld).

1984 Record year for total wells drilled - 373. Significant offshore discoveries in Challis (BHP), Talisman (Marathon) and Lenita (Occidental) wells. Numerous small oil and gas discoveries in Cooper/Eromanga Basins (Delhi/Santos et al) - record flows from Wancoocha No 2. Oil and gas discoveries in Gippsland Basin at Tuna, Grunter, Manta, Chimaera, West Fortescue and Veilfin. First phase North West Shelf gas completed - Perth market supplied. Oil production commenced from Jackson to Moonie and Mereenie to Alice Springs. Cooper Basin Liquids Scheme completed (oil, LPG, condensate).

1985 Record year for exploration drilling - 270 wells. Cooper/Eromanga Basins record 29 discoveries of oil and gas or both. Significant offshore gas discoveries at Saladin and Montague in the Carnarvon Basin. Oil and gas at Angelfish, Snapper, Whiptail and Whiting in

the Gippsland Basin and at Yolla in the Bass Basin. Construction of LNG phase on North West Shelf commenced. New development plans for Bass Strait fields announced - construction of Bream platform underway.

1986 Major fall in price of crude oil early in year to half 1985 levels resulted in reduction in exploration and development activities and expenditure. Construction of Palm Valley to Darwin natural gas pipeline completed. Warrnambool supplied by natural gas from nearby North Paaratte gas field in onshore Otway Basin, Vic. Work commenced on Australia's first enhanced oil recovery project at Tirrawarra, S.A.