



3. Offshore oil and gas production

3.1 Background

Australian oil and gas resources include crude oil, condensate, liquefied petroleum gas and natural gas. Exploration and production can be an expensive process because petroleum resources are extremely difficult to find and are complicated to extract, process and distribute to the community, primarily because they are often located in inconvenient locations (Australian Institute of Petroleum, 2002a). Nonetheless, identification of these resources is essential to the growth of the industry (APPEA, 2007).

According to the Australian Petroleum Production and Exploration Association (APPEA, 2007) exploration in offshore waters has remained relatively constant over the past ten years in terms of the number of wells drilled. This exploration in offshore waters is very important considering offshore drilling contributes approximately 85% of Australia's petroleum production. The majority of Australian oil and gas production is sourced from Commonwealth waters adjacent to Western Australia (APPEA, 2007). Other significant production wells are located in the Bass Strait and Timor Sea (Australian State of the Environment Committee, 2001). Although offshore oil and gas exploration is particularly expensive and often futile, it is important to Australia's resource and economic future (Australian Institute of Petroleum, 2002b).

3.2 Regional activity

At the time this report was written, no major offshore oil and gas production occurred in the East Marine Planning Region. This may be associated with offshore areas within the Region being largely underexplored; however locations exist where potential petroleum reserves occur. **Table 3-1** lists the basins within the East Marine Planning Region where potential reserves exist. As minimal exploration of these offshore areas has occurred there is limited survey data available. Data is available for one well on an offshore island in the Nambour Basin and a petroleum well in the Sydney Basin. In the 10 years prior to 2003, no offshore drilling took place in Commonwealth waters off the New South Wales and Queensland coast (Quinn *et al*, 2005). In most cases, the prospect of gas and oil production is low, although some areas are highlighted for further investigation. In the 1960s wells were drilled off the Queensland coast, but subsequently abandoned due to producing no oil or gas shows.

The Lord Howe Rise, extending from southwest of New Caledonia to the west of New Zealand has the greatest potential for the discovery of reserves. Symonds and Wilcox (1989) estimated that the Lord Howe Rise has potential petroleum reserves of 4.5 million barrels.

■ **Table 3-1 Basins, plateaus and rises explored within the East Marine Planning Region**

Basin	Offshore Area (km ²)	Details / Prospectivity
Capricorn Basin	45 000	Mostly within the Great Barrier Reef Marine Park where exploration is prohibited. This offshore basin is poorly explored with three wells having been drilled (all dry) and no exploration since 1968.
Clarence Moreton Basin	1 000+	A possible offshore extension of the onshore basin. The Solitary Islands Marine National Park and Reserve near. Offshore basin lies under a whale migration path. One offshore survey conducted, 2 of 30 onshore wells flowed sub-economic gas, basin has abundant oil-prone organic matter. No onshore wells.
Eastern Plateau	31 000	Plateau comprising offshore and onshore. Little known about eastern area but offshore area thought to be 1000 km ² , 19 onshore wells have been dug with many unconfirmed oil and gas shows but no commercial discoveries. No offshore exploration.
Lord Howe Rise	1 500 000	Knowledge is sparse, but has been recognised as having long term hydrocarbon potential. Potentially prospective sedimentary basins underlie much of western half and eastern flank. Fairway Basin considered a frontier hydrocarbon province.
Lorne Basin	-	Unknown if extends offshore and if so, based on onshore information, prospectivity is very low.
Maryborough Basin	15 500	Limited information. Basin offshore and onshore. Five onshore wells (all dry except for gas shows in one), none offshore. The offshore Maryborough Basin underlies whale migration paths for several months of the year.
Nambour Basin	2 500	Offshore and onshore. The offshore basin lies under a whale migration path for several months of the year. One petroleum well on an offshore island. Minor gas shows onshore but unlikely to contain commercial quantities of hydrocarbons.
Sydney Basin	28 000	Offshore and onshore. The offshore basin lies under a while migration path for several months of the year. 115 onshore wells and 0 offshore. Onshore contains rich coal deposits and natural gas and minor oil shows.
Townsville Basin	450 x 20-120 km	The western part of the Townsville Basin lies within the Great Barrier Reef Marine Park, in which petroleum exploration activity is prohibited. The rest of the basin is also in a sensitive area due to its proximity to the Park. No wells have been drilled.

Source: Geoscience Australia (2007).



Lord Howe Rise – Capel and Faust Basins

The northern area of the Fairway Basin on the Lord Howe Rise in the Tasman Sea is a known region of petroleum potential and therefore interest lies in the potential of petroleum in the neighbouring areas within Australian waters.

A survey carried out in 2001 on the vessel RV *Franklin* supported earlier beliefs that the region shows oil and gas potential. Evidence of gas hydrates in the northern region of the Fairway Basin had been detected within New Caledonian jurisdiction but further seismic profiling suggested petroleum potential also existed in the southern region of the basin in Australian jurisdiction (Exon, 2002).

Recent investigations into other features in the region provided promising results. The Capel and Faust Basins are deepwater basins located approximately 800km east of Brisbane, Queensland the Lord Howe Rise. Between November 2006 and January 2007, a seismic survey of the basins was undertaken by Geoscience Australia as part of the Big New Oil initiative aimed at opening offshore frontier areas for exploration.

The survey gathered 5920 km of two dimensional data with line spacing of 30 km. The data is currently being processed but the size and shape of some of the basin structures appear favourable for hydrocarbons (Kroh, 2007).

As part of the Big New Oil program, investigations will continue within this region in the hope of discovering a new oil province.

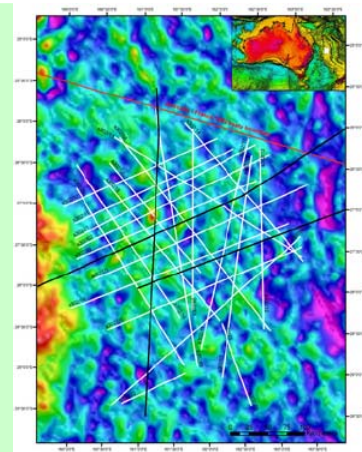


Image: Geoscience Australia

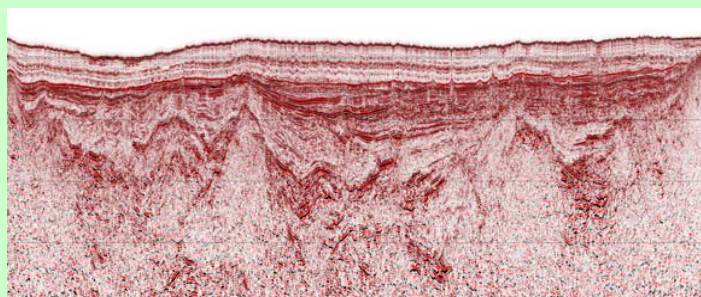


Image: Geoscience Australia (2007)

Despite the offshore area of Sydney Basin not having been tested for reserves in the past, it is regarded as a potential source of gas and petroleum. This is due to the number of wells drilled in the adjacent onshore Sydney Basin from which gas and oil shows have been encountered. The company, Bounty Oil and Gas NL, has been given approval for offshore drilling within the Basin; however, drilling has not commenced to date (Hutt, 2007).

3.3 Economic context

Australian oil and gas production is valued at approximately \$15 billion per year (Eard and Butler, 2006). As outlined in **Section 3.2**, no production occurs in the East Marine Planning Region, therefore the Region does not contribute to the value of Australia's oil and gas production.

National expenditure on oil and gas exploration is shown in **Table 3-2**. Expenditure on offshore oil and gas exploration between 2001 and 2006 rose by 26.2%, or \$188 million, to \$906.1 million (Australian Bureau of Statistics, 2007). As a proportion of total expenditure for offshore and onshore exploration over this time period, offshore expenditure was down 9.6%. However, for the



period 2005-06 there was significantly more investment in exploration with offshore exploration expenditure increasing 17% from the previous year (and onshore expenditure increasing 32%).

■ **Table 3-2 National expenditure on oil and gas exploration between 2001 and 2006**

Year	Onshore exploration (\$m)	Offshore exploration (\$m)	Total	Offshore as proportion of total (\$m)
2001-02	164.5	718.1	882.6	81.4
2002-03	191.3	803.7	995	80.1
2003-04	230.5	713.5	944	75.6
2004-05	270.1	774.6	1044.7	74.1
2005-06	355.8	906.1	1262	71.8
% change since 2001-02	116.3	26.2	43	-9.6

Source: Adapted from Australian Bureau of Statistics (2007)

With respect to the East Marine Planning Region, the most recent records indicate that in 2004, there was no expenditure on oil and gas exploration offshore of Queensland, whilst \$1.95 million was spent on two dimensional surveying offshore of New South Wales (Geoscience Australia, 2006).

The economic contribution of oil and gas within the Region will depend largely on the future exploration and success of the Lord Howe Rise and the success of the Bounty Oil and Gas NL's drilling of the Sydney Basin (PEP 11). Seismic investigations from one prospect in the northern region of the permit area, named *Biggus*, indicate that there are potential recoverable reserves in excess of 1.2 trillion cubic feet (MEC, 2006). If successful, this well is expected to provide enough gas to meet Sydney's needs for the next decade, which is estimated to generate in excess of US\$450 million (MEC, 2006).

3.4 Impacts on the environment

Oil and gas production and exploration can significantly impact the surrounding environment if it is not carefully managed. The main concerns (Australian Institute of Petroleum, 2002a) are associated with:

- Ship movements;
- Seismic surveys;
- Drilling rig placement;
- Drilling;
- Anchoring;
- Platform placement;
- Emissions and discharges;



- Sewage; and
- Oil spills.

More information on potential environmental impacts is provided in **Table 3-3**.

- **Table 3-3 Potential impacts of offshore oil and gas exploration and production on the marine environment**

Issue	Potential impacts
Ship movements	Possible hazards include sedimentation at coastal facilities from propeller disturbance, introduction of invasive species from ballast water release, disposal of produced and process waters that may have raised salinity and hydrocarbons, collisions at sea (Black <i>et al</i> , 1994), potential to alter animal movements and oil spills.
Seismic surveys	Concerns that sound waves causing mortality, sublethal injuries or modify feeding or mating activity of marine mammals, fish and other organisms. Evidence suggests the seismic sound waves do alter the behaviour of some species and may cause damage to the hearing organs. Whales have also been known to avoid noise associated with surveys even at a distance of 7-12 km (Australian State of the Environment Committee, 2001, McCauley <i>et al</i> , 2000).
Drilling rig placement	Possible localised damage from the placement of rig.
Drilling	Modifications to the benthic faunal communities, even up to 11 months after drilling (Currie & Isaacs, 2005), drill cuttings discharged overboard, increased suspended sediments in water column, drilling fluids containing harmful constituents potentially released into environment.
Anchoring	Localised physical damage.
Platform placement	Habitat disturbance, however platforms may act as artificial reef attracting marine and bird life. The decommissioning of the equipment may involve only the partial removal of platform, although they may be left to act as an artificial reef.
Emissions and discharges	Produced formation water with hydrocarbon traces and at an elevated temperature released into the environment, cumulative effects on organisms from long exposure to low levels of particular hydrocarbons. Greenhouse gas emissions (mostly carbon dioxide and methane) are released but exploration and production combined contribute only 3% to Australia's total emissions.
Sewage	Elevated water column nutrients may increase the numbers of some organisms
Oil spills	Smothering and toxic effects for organisms and cascading impacts along the food chain.

Source: Australian Institute of Petroleum (2007a)

Over the past 25 years four billion barrels have been produced, 900 of which were spilt. This represents a 0.00002% rate of spillage over the past 25 years (Australian Institute of Petroleum, 2002a). Although historically there is a low incidence of spillage occurring, there are risks of a major incident occurring in the future (Australian State of the Environment Committee, 2001).

With respect to the East Marine Planning Region, risk of environmental impacts from production and exploration is low due to the lack of production and minimal exploration activities taking place in the Region. While few surveys and little exploration drilling has been carried out within the Region, future production activities do have the potential to cause adverse environmental impacts if not properly managed.



3.5 Future uses

Australia has accessed approximately half of its oil resource potential but less than 10% of its gas reserves with limited exploitation to date, despite comparable resources to oil (Ronalds, 2006).

Offshore production may be classified into two water depth categories: moderate which is less than 500m and deepwater which is greater than 500m (Ronalds, 2006). Deepwater production in Australian waters is limited as most discoveries have been gas fields, but as gas is of lesser value than oil and not always cost-effective due to complex processing issues, these resources have not been utilised (Ronalds, 2006).

Australian scientists, research institutions, the industry, companies and international partners are collaborating towards the *National Research Flagship Program*, designed to help Australia develop six key national objectives to further economic growth and sustainability. As part of the *Wealth from Oceans Flagship*, investigations into new platform-free technologies for offshore oil and gas extraction are being undertaken. This will allow access to deposits that currently cannot be economically recovered. These technologies have the potential to hasten opportunities for industries and possibly lower the cost of resources for the consumer, thus reducing initial capital investment and operational costs by 75%. If successful, large gas reserves may be accessed in remote offshore locations while reducing the environmental and safety issues associated with platform operations (CSIRO, 2005).

Production in the future is expected to reduce as current reserves of oil and gas are insufficient to sustain present levels of production (Powell, 2001). However, Geoscience Australia's *Big New Oil Program* is a major four year data acquisition program (2003-2007) designed to assist the petroleum exploration industry in the search for a new oil province. It was recently extended to 2011, with an additional \$75 million contribution (Foster, 2006) by the Australian Government. This program directly affects the East Marine Planning Region because the northern Lord Howe Rise has been identified as a Big New Oil study area. A report will be released on the petroleum potential of the basins in the region following a reconnaissance mission.

3.6 Information gaps

There is limited information on offshore oil and gas exploration and production within the East Marine Planning Region. This is largely due to the undeveloped nature of the industry along the east coast, with the area minimally explored. Few seismic surveys and no drilling have occurred so the extent of potential petroleum reserves is not well understood. It is therefore also difficult to determine potential economic benefit from the industry in the Region.

It is anticipated that information gaps will be filled as research is carried out into Australian offshore exploration and production and as additional seismic data is gathered along the eastern Commonwealth waters.



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