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Australian Government
Geoscience Australia

Big New Oil —a progress report

Australia's gas reserves are at an all-time high and continuing to climb steeply, but oil reserves are in decline (figure 1).

The continent and its marine jurisdiction are vastly underexplored; only 8000 wells have been drilled and many offshore basins have never been tested (figure 2). The big fields in any new petroleum province are usually found first, so Australia's best chance of adding major new oil reserves is to find new petroleum provinces.

The Australian Government has made several key policy decisions with the aim of encouraging exploration investment in Australia. These include the decision in 2001 to provide access to government spatial data at the cost of transfer, enabling it to be available free online.

Geoscience Australia's online geological provinces database describes a multitude of offshore basins and sub-basins (144 at last count) and is also linked to detailed well and other data (see related website).

In 2003, the government announced the injection of an additional $61 million, over four years, into Geoscience Australia's petroleum program, to provide pre-competitive data in support of acreage release, and for the search for a new oil province, with new data acquisition and, data preservation and archiving. This boost was followed by the introduction in the 2004 Federal Budget of tax incentives for exploration in frontier areas.

Geoscience Australia developed a portfolio of potential projects based on integrated programs of seismic acquisition, geological sampling and oil seep detection. Deepwater frontier basins are among the most promising candidates (figure 3). Some of the most prospective petroleum-bearing frontier provinces considered for new data acquisition are as follows:

- The Bremer Sub-basin, in deep water off the southwest margin between Albany and Esperance at the western end of the Great Australian Bight where reprocessed reconnaissance seismic data shows a thick and well-structured Mesozoic section.
- The Mentelle Basin is another significant Mesozoic depocentre, or area of very thick sediment deposition. The basin extends along the edge of the continental shelf from Perth to the southern tip of the continent and in deep water west to the Naturaliste Plateau.
- The Lord Howe Rise is a submerged ribbon continent in the Tasman Sea between Australia, New Zealand and New Caledonia. Before seafloor spreading in the Late Cretaceous, this continental sliver sat between Australia's first major offshore petroleum province of Bass Strait and New Zealand's petroleum-producing Taranaki Basin. There are more than a dozen depocentres on the Lord Howe Rise and some are thick enough to have generated hydrocarbons if organic-rich source rocks are present.

Following a round of industry consultation, the immediate priority areas selected for new data acquisition were the shallow-water Arafura Basin in northern Australia, and the deepwater frontier basins of the southwest margin. Validation of remote sensing as a reconnaissance technique for detecting hydrocarbon seepage in the vast offshore areas was also seen as an important part of the new program.

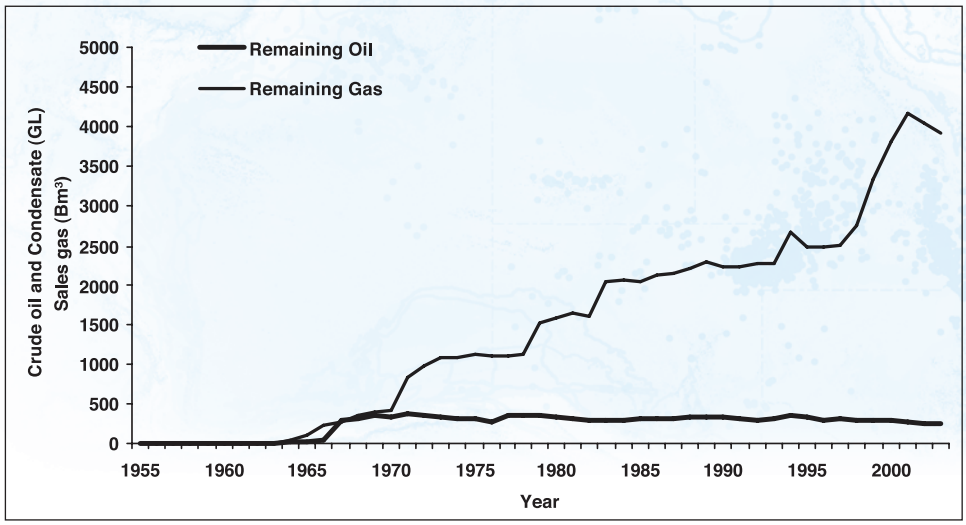
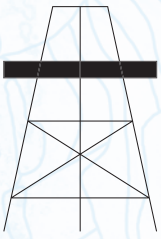


Figure 1. Graph showing Australia's gas and oil reserves through time.



In March 2004, a survey was undertaken in the natural laboratory of the Yampi Shelf on the North West Shelf, an area of known hydrocarbon seepage that is well covered by multiple datasets, including synthetic aperture radar, airborne laser fluorescence, Landsat, 'sniffer' water column geochemistry and 3D seismic. Active gas seepage was found, imaged, and tied back to its expression on seismic and bathymetric records.

In April 2005, the tools and techniques developed on the Yampi Shelf will be applied at a number of sites in the Arafura Basin, where remote sensing and seismic data indicate possible natural hydrocarbon seepage.

Geoscience Australia's program of data acquisition in the deepwater frontier basins of the southwest margin began in February 2004 with a marine sampling survey aboard the national research ship, RV Southern Surveyor. Dredging of submarine canyons recovered tonnes of rocks from the previously unknown sedimentary section of the Denmark and Bremer sub-basins. Analysis of the samples identified reservoir-quality sandstones and potential oil-prone Jurassic and Early Cretaceous source rocks.

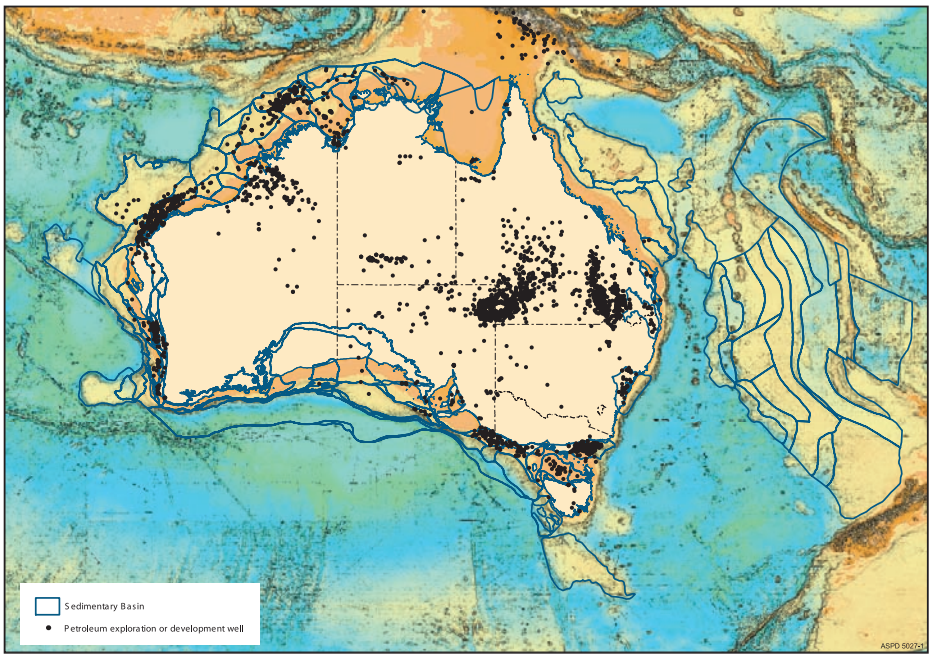


Figure 2. Map of Australia's offshore sedimentary basins draped over the bathymetry and showing the location of petroleum wells.

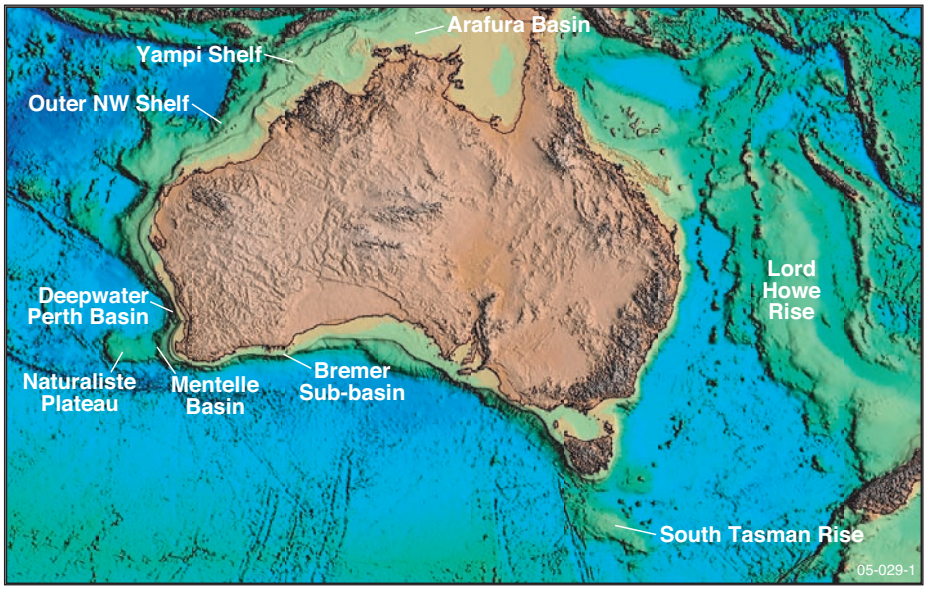


Figure 3. Map showing the location of the portfolio of potential and active Big New Oil projects

The most recent seismic coverage of the Bremer Sub-basin is a 1974 survey shot by ESSO. The age and limited extent of this data allow glimpses into the subsurface geology, but not a full understanding of the area's hydrocarbon potential.

The new seismic data, acquired in late 2004 by Veritas's MV Pacific Sword, better defines the extent, thickness and stratigraphy of the basin fill, and has identified potentially prospective structures. The Bremer is, however, only one of several potentially prospective basins along the southwest margin—the seismic survey has also collected data in the Mentelle and deepwater Perth basins (see the article on Geoscience Australia's Southwest Frontiers Geophysical Survey in this issue).

These first surveys in the Arafura Sea and the frontier basins of the southwest margin are the beginning of a four-year program to develop many new investment opportunities and present them to explorers in the annual release of offshore petroleum acreage (see the article 'Petroleum exploration opportunities in this issue). Other areas planned for data acquisition include the outer margins of the North West Shelf and the Lord Howe Rise.

The historical trend for offshore oil production shows a shift from the Gippsland Basin to the North West Shelf, and from sustained production over decades from a few giant oil fields to many smaller fields of much shorter life. Future trends may be shaped by the results of Geoscience Australia's new seismic data acquisition program.

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Online Geological Provinces:
www.ga.gov.au/oracle/provinces