



Offshore energy program underway

New programs to improve resource estimate



Peter Southgate

Geoscience Australia's Offshore Energy Security Program, which commenced in 2006 and extends to 2011, will provide high-quality pre-competitive data and information to help stimulate petroleum exploration in Australia. The forward program, developed in consultation with industry will focus on three offshore frontier regions:

- Remote eastern frontiers, offshore eastern Australia
- Southwest margin
- Southern margin.

Petroleum systems modelling in the current producing regions will form part of Geoscience Australia's ongoing core petroleum program. These studies are aimed at improving resource estimates and stimulating further exploration. Negotiations are currently underway with a number of organisations to partner with Geoscience Australia to deliver these models.

“Geoscience Australia's Offshore Energy Security Program, will provide high-quality pre-competitive data and information to help stimulate petroleum exploration in Australia.”

Remote eastern frontiers

New geophysical and geological datasets have been acquired from the Capel and Faust basins some 800 kilometres east of Brisbane in water depths between 1300 and 2500 metres (figure 1). Between December 2006 and January 2007, Geoscience Australia acquired about 6000 kilometres of industry standard 2D seismic data using an eight kilometre solid streamer.

The survey identified numerous depocentres (or areas of maximum deposition), some up to 150 kilometres long and 40 kilometres wide with up to seven kilometres of sediment fill. Initial interpretation has identified a potential pre-rift succession, three syn-rift phases

(clastic/volcanic), and two post-rift carbonate packages. Episodes of post-rift igneous activity are apparent, and possible correlations with the Capricorn, Great South and/or deepwater Taranaki basins are suggested.

In late 2007, the research vessel *Tangaroa* completed a marine reconnaissance survey of the Capel and Faust basins. Geophysical datasets acquired on that survey included gravity, magnetics, multibeam sonar and sub-bottom profiler data. An accompanying seafloor sampling program acquired geological and biological samples from potential seepage sites and representative areas of the sea floor.

The dual aim was to search for indications of active petroleum systems and document marine biodiversity and habitats. These datasets are designed to better define the region's petroleum prospectivity and inform marine and environmental planning decisions.

The multibeam sonar revealed seafloor features that appear to reflect the underlying basin structure, such as fault-related slumps. The gravity and magnetic coverages are expected to significantly improve the delineation of

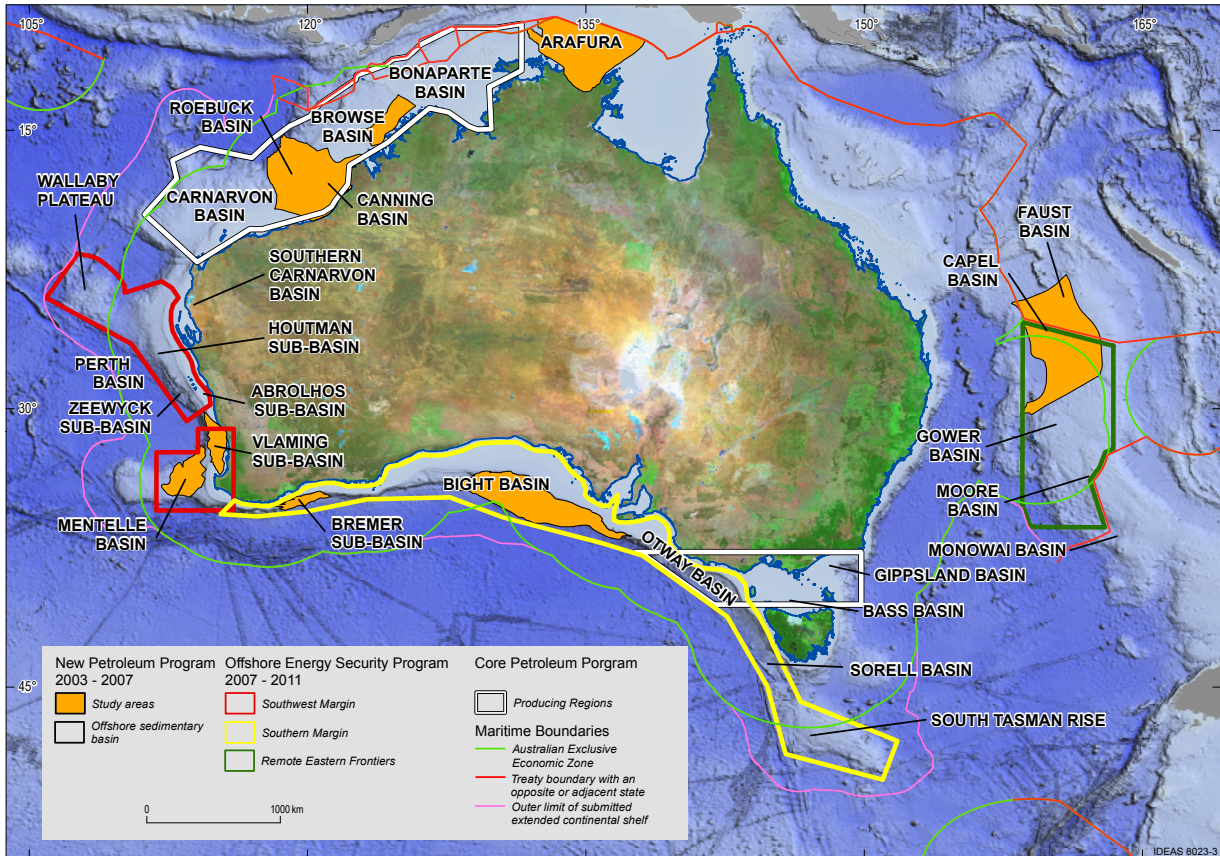


Figure 1. Frontier basins targeted for geophysical and geological datasets acquisition under the Offshore Energy Security Program. Studies in the producing regions of the North West Shelf and Bass Strait region will involve synthesis studies.

deponent boundaries. Seafloor sampling and camera footage provided information on the substrate composition and potential fluid escape sites. Current work involves the initial interpretation of these datasets and their integration to define the rift basin architecture and tectonostratigraphic history to better understand the region's petroleum prospectivity.

Southwest margin

During the New Petroleum Program (2003 to 2007), Geoscience Australia collected 2D seismic data in the Bremer, Perth and Mentelle basins off southwestern Australia. Acreage in the Bremer Basin was released to industry in 2005, and a 50-kilometre seismic grid has been interpreted for the Mentelle Basin.

Between November 2008 and March 2009, Geoscience Australia will undertake two major surveys to investigate the Mentelle Basin and the Abrolhos, Houtman and Zeewyck sub-basins of the North Perth Basin and the southern Carnarvon Basin (figure 1).

Seismic acquisition in the Mentelle Basin will infill the current 50-kilometre grid to provide a dataset with a line spacing of 20 to 30 kilometres. The improved seismic grid will provide critical data on basin shape and sediment architecture, permitting petroleum systems

models to be developed at the regional scale. The schedule for seismic acquisition, processing and interpretation suggests a 2010 date for release of acreage in the Mentelle Basin.

The deep water Houtman and Zeewyck sub-basins and the north Perth and south Carnarvon basins will be the focus for new acquisition of 2D seismic data and the reprocessing of open-file industry seismic data. Open-file seismic data from the shallow water Abrolhos Sub-basin will be used to constrain the deeper water stratigraphies of the Houtman and Zeewyck sub-basins where petroleum exploration well information is limited.



A marine reconnaissance survey to this region will assist in the resolution of basin depocentres and provide the opportunity to dredge outcropping strata in submarine canyons so that ages, lithologies and source potential can be determined and the seismic data constrained.

The Wallaby Plateau is a poorly understood fragment of continental crust in the southern parts of the Carnarvon Basin. It has been suggested that a reconnaissance seismic acquisition grid and geological sampling program would provide insights into the location of potential depocentres and, secondly, into whether or not gas-producing stratigraphies of the Exmouth Plateau may extend to the southwest.

Southern margin

Over the past 10 years, Geoscience Australia, in partnership with the Victorian, Tasmanian, South Australian and Western Australian geological surveys, has undertaken studies in the Bass, Otway, Sorell, Duntroon, Bight and Bremer basins that define the continent's southern margin (figure 1). The southern margin synthesis study aims to integrate the results of this earlier work to better understand the break-up history between Australia and Antarctica, resolve outstanding stratigraphic correlation problems and permit improved resource prediction.

A cooperative National Geoscience Agreement project between Geoscience Australia and the Tasmanian Geological Survey is funding the acquisition of about 104 000 line-kilometres of airborne magnetics data at a line spacing of 800 metres in the Bass and Sorell basins off Tasmania. Acquisition was completed in March and, at the time of writing, was scheduled for release in late May.

The new data will allow improved resolution of offshore structure and the distribution of volcanic rocks and intrusive bodies. The program also includes acquisition of 2D seismic data from the Sorell Basin and possibly over the South Tasman Rise in subsequent years.

In February–March 2007, a prospectivity validation survey to the Bight Basin recovered source rocks of Cenomanian–Turonian age, with total organic carbon (TOC) values between 2% and 6.2% and hydrogen indices (HI) values between 274 and 479.

These data clearly demonstrate the existence of a good-quality source rock in the Bight Basin, and studies are underway to establish whether correlations exist between these rocks and the asphaltite strandings common on the southern margin. There are also 2D petroleum systems modelling studies underway for the Bight Basin to further support upcoming acreage releases in 2009 and 2010.

Producing regions

Most of the exploration areas offered to market via the acreage release program are in producing regions of the North West Shelf, Otway and Gippsland basins (areas shown within the white polygons in figure 1). As those areas continue to mature and areas are returned to market

after industry relinquishment, it is essential that new information be provided to support their re-release.

Future work by Geoscience Australia in these areas will be at the regional, basin and sub-basin scales, with stratigraphic and structural syntheses leading to the development of petroleum systems models. The success of this program will depend on the development of partnerships between Geoscience Australia and external organisations able to provide access to 3D seismic datasets, petroleum systems modelling skills, basin analysis skills, and analytical skills to constrain elements of the petroleum systems.

For more information

phone Peter Southgate on
+61 2 6249 9206

email peter.southgate@ga.gov.au

Related websites/articles

AusGeo News 89: Survey of remote eastern frontier basins completed

www.ga.gov.au/ausgeonews/ausgeonews200803/survey.jsp

AusGeo News 87: Promising results from the Bight Basin survey

www.ga.gov.au/ausgeonews/ausgeonews200709/bight.jsp

AusGeo News 86: Promising results from Capel and Faust basins seismic survey

www.ga.gov.au/ausgeonews/ausgeonews200706/seismic.jsp