Northern Territory
Oil and Gas
2006
DPIFM
Dedicated professionalism, Passion with purpose, Individual accountability, Fun and celebrating success and Motivation to lead
2006 HIGHLIGHTS

1. Every well drilled in 2006 encountered hydrocarbons at one or more levels. This is the highest number of discoveries in a given year in the Northern Territory.

2. The Darwin Liquefied Natural Gas (LNG) plant started its commissioning phase in late 2005 and exported its first shipment in mid February 2006.

3. In December 2006, the Darwin LNG plant announced its intention to increase production to full capacity (3.24 Mtpa) from the current level of production (3 Mtpa), which is at the level of the originally contracted sales. Approvals currently in place for the Wickham Point site are for 10 Mtpa of LNG production in two trains.

4. Approximately 2.46 MMT of LNG have been exported through 39 cargo shipments since the plant commenced production in January 2006.

5. Extensive exploration and drilling programs were undertaken:
   - Six offshore exploration wells were drilled at a total cost of A$214.9 million. The drilling of another two wells had commenced at years end and was continuing at the time of writing of this report. For comparison, in 2005, eight exploration wells were drilled, at a total cost of over A$137 million.
   - Twelve geophysical surveys were conducted in 2006, compared to only two 3D seismic surveys in 2005.

6. There was significant progress in the development of moderately sized resources, with one new production licence awarded.

7. A fourth Floating Production Storage and Offloading Facility (FPSO) is expected over the Puffin oil discovery in June 2007. A fifth FPSO is under consideration to develop the Swift/Swallow/Skua and Montara projects.

8. Two Field Development Plans with applications for new Production Licences are being assessed by the Authorisations and Evaluations Division of the Northern Territory Department of Primary Industry, Fisheries and Mines (DPIFM).

9. Coogee Resources has committed to a multi-million dollar Front End Engineering and Design (FEED) study for a Methanol Floating Production, Storage and Offloading Facility (MFPSO), which is planned over discovered, but stranded gas resources such as Cash Maple.

10. A condensate stripping project is planned by Nexus over the Crux gas discovery. Drilling of Crux-2 commenced on 30 December 2006 to appraise and certify reserves in the Crux field. Drilling is still underway at time of writing.

11. The Northern Territory Government attended several national and international petroleum conferences. The Territory maintained a high profile at the Australia Petroleum Production and Exploration Association (APPEA) meeting and the South East Asia and Australian Offshore Conference (SEAAOC). Highlights included the following:
   - Territory opportunities were heavily promoted at the APPEA Conference on the Gold Coast (7–10 May 2006). The Northern Territory Chief Minister, Hon Clare Martin, presented a keynote address on the importance of placing downstream gas industry development on the national agenda.
   - In a joint venture with the International Institute of Research for Executive Development (IIR Executive Development), the NT Government organised the 12th SEAAOC Conference, held on 18–21 June 2006 at SKYCITY Casino, Darwin.
   - The NT Chief Minister and the PNG Energy Minister, Sir Moi Avei, presented keynote addresses at SEAAOC.
   - Other high-level speakers included Laura Sugg, the Australian President of ConocoPhillips; Belinda Robinson, the Chief Executive of APPEA; John Hartwell, the Head of Resources Division, Department of Industry, Tourism and Resources; James Slutz, Deputy Assistant Secretary, Oil and Natural Gas, US Department of Energy; and Joe Desmond, the Undersecretary for Energy Affairs, California Resources Agency.
The following petroleum areas are administered by the Northern Territory Government (Figure 1).

The level of activity planned to be undertaken in the next five years ranks the Northern Territory as a world-class petroleum province.

These activities include the following:

**Onshore area**
A minimum nominated expenditure of A$44.49 million has been committed up to year 2011.

**Northern Territory Adjacent Area**
A minimum nominated expenditure of A$205 million has been committed up to year 2011. This includes the drilling of 11 wells and the acquisition of 2850 line km of 2D and 300 km² of 3D seismic data.

Figure 1. Petroleum areas in the Northern Territory.
The Territory of Ashmore and Cartier Islands

Adjacent Area

A minimum nominated expenditure of A$220 million has been committed up to year 2011. This includes the drilling of 17 wells and the acquisition of 200 line km of 2D and 1189 km² of 3D seismic data.

Objectives

The objectives of the Resource Management section of DPIFM is to provide oil companies with a framework for the exploitation of hydrocarbons in a manner that maximises return to the NT community. This is achieved by: advising on matters related to granting and maintaining petroleum titles in the Territory onshore areas and Commonwealth offshore waters; by monitoring oil and gas production; and by ensuring that operators are following the appropriate legislation and guidelines and good oil field practice.

PETROLEUM ACTIVITIES IN THE JOINT PETROLEUM DEVELOPMENT AREA (JPDA)

Exploration, development and production activities in 2006

- Kuda-Tasi-3 drilled by Woodside in JPDA 06-105
- Acreage release:
  - JPDA 06 101A awarded to Minza Oil and Gas Ltd
  - JPDA 06-102 awarded to Petronas Consortium
  - JPDA 06-103 awarded to Oilex Consortium

Figure 2 shows titles awarded in the JPDA in 2006.

- First LNG shipment from Darwin LNG plant: February 2006
- 145.6 BSCF gas exported from JPDA to Darwin LNG plant in 2006

Petroleum production in 2006

Hydrocarbon production from the Joint Petroleum Development Area is summarised in Tables 1 and 2.

PETROLEUM PRODUCTION FROM NORTHERN TERRITORY ADMINISTERED AREAS

The offshore fields, Laminaria, Corallina, Jabiru and Challis, continue to produce oil. Over the course of 2006, a decline in oil production and a rise in water cut were the dominating features from these producing fields. Onshore, Mereenie continues to produce oil. Mereenie and Palm Valley continue to supply the Northern Territory with gas for electricity generation.

Table 3 shows hydrocarbon production from Northern Territory and NT-administered waters from 1983 to 2006.

Oil

The Northern Territory’s offshore oil is produced from four different fields: Laminaria, Corallina, Jabiru and Challis. Corallina, Jabiru and Challis (see Figure 3), continue to produce oil at an expected declining rate, due to natural depletion of the resource and a steadily increasing water cut. Laminaria was also expected to follow this decreasing trend, but after certain mechanical problems were rectified, oil production increased from 1.685 million barrels (MMbbl) in 2005 to 2.320 MMbbl. A total of 9.09 MMbbl of oil was produced from offshore resources in 2006 (see Table 3).

The Northern Territory’s total onshore oil production is shown in Table 4. A total of 0.336 MMbbl were produced from Mereenie in 2006 (Table 3).
Table 1. Summary of hydrocarbon production from the Bayu Undan field.

<table>
<thead>
<tr>
<th>Month</th>
<th>Propane (mm³)</th>
<th>Butane (mm³)</th>
<th>Condensate (mm³)</th>
<th>Raw gas (km³)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>99 461</td>
<td>82 754</td>
<td>355 180</td>
<td>950 427</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>85 377</td>
<td>70 079</td>
<td>314 164</td>
<td>838 009</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>99 081</td>
<td>79 975</td>
<td>350 942</td>
<td>944 735</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>96 008</td>
<td>78 244</td>
<td>339 868</td>
<td>949 606</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>99 711</td>
<td>81 957</td>
<td>348 222</td>
<td>990 665</td>
<td></td>
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<tr>
<td>June</td>
<td>89 107</td>
<td>72 788</td>
<td>311 223</td>
<td>881 220</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>101 734</td>
<td>81 911</td>
<td>349 778</td>
<td>975 742</td>
<td></td>
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<tr>
<td>August</td>
<td>96 320</td>
<td>80 865</td>
<td>349 994</td>
<td>960 370</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>92 336</td>
<td>77 728</td>
<td>335 988</td>
<td>914 521</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>101 365</td>
<td>84 938</td>
<td>364 614</td>
<td>975 355</td>
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<td>November</td>
<td>93 298</td>
<td>79 556</td>
<td>345 095</td>
<td>928 586</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>95 189</td>
<td>80 982</td>
<td>350 386</td>
<td>943 693</td>
<td>Estimate only</td>
</tr>
</tbody>
</table>

Total 2006: 1 148 987 951 767 4 115 454 11 252 929 Estimate only

Table 2. Summary of hydrocarbon production from the Elang Kakatua/Kakatua North fields.

<table>
<thead>
<tr>
<th>Year</th>
<th>Gas (km³)</th>
<th>Oil (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>16,885,994</td>
<td>132,460</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Year</th>
<th>Oil (m³)</th>
<th>Gas (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>16,885,994</td>
<td>132,460</td>
</tr>
<tr>
<td>1991</td>
<td>16,885,994</td>
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<td>132,460</td>
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<td>132,460</td>
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</tr>
<tr>
<td>2006</td>
<td>16,885,994</td>
<td>132,460</td>
</tr>
</tbody>
</table>

Northern Territory Oil and Gas 2006
Department of Primary Industry, Fisheries and Mines
Gas

All of the Northern Territory’s onshore gas production is from the Amadeus Basin, southwest of Alice Springs. There are two producing fields in the basin, Mereenie and Palm Valley. Virtually all of the gas produced is sold under long-term contracts to the NT Power and Water Corporation (PowerWater) through Gasco for power generation. Palm Valley is operated by Magellan Petroleum and the Mereenie oil and gas field is operated by SANTOS.

In 2006, 19,657 billion standard cubic feet (BSCF) of gas were produced (Figure 5), as the two fields continued to supply the Territory’s power generation needs:

- Palm Valley produced 4.448 BSCF in 2006 compared to 5.220 BSCF in 2005.

In June 2006, Eni Australia and PowerWater signed a Sales and Purchase Agreement to supply gas from the Blaktip gas field, starting from the beginning of 2009. The agreement is to supply up to 850 PJ of gas over a period of 25 years.

![Figure 4. Yearly onshore production of oil from the Mereenie field (1990–2006).](image)

![Figure 5. Yearly onshore production of gas (1983–2006).](image)

**EXPLORATION**

Extensive exploration activity occurred within the Territory in 2006. The most significant activities are listed below:

- Nexus Energy acquired a voluntary 285 km² 3D seismic survey over the Crux gas discovery within AC/P23. The cost of the Crucis 3D seismic survey was A$5.07 million.
- Santos acquired a voluntary 3D seismic survey over and around NT/P48 and the Evans Shoal gas structure, in two phases:
  - Phase One – “Fast-track”. This survey commenced on 17 June 2006 and was completed on 11 July. It covered 960 km² and cost about A$28.0 million.
  - Phase Two – “Racetrack”. This survey acquired 2086 km² between 12 November 2006 and 7 December 2007.
- Methanol Australia conducted two seismic surveys:
  - 600 km line of 2D seismic survey was acquired over NT/P68 from 2 to 10 November 2006.
  - 500 km² of 3D seismic survey was acquired over NT/P68 from 9 September to 31 October 2006.
- National Oil and Gas Pty Ltd acquired several 2D seismic surveys over NT/P62, 63, 64, 65, 70, 71 and 72:
  - Crocodile Marine Seismic Survey, 796 km over NT/P70 was acquired from 8–16 October 2006.
  - Kurrajong 2D Marine Seismic Survey, 3291.6 line km over NT/P62, 63, 64, 71 and 72 was acquired from 17 October to 16 November 2006.
  - Sunshine 2D Marine Seismic Survey, 887.7 line km over NT/P65 was acquired from 21 November to 01 December 2006.
- Karoon Gas Australia acquired an airborne magnetic survey over its West Australian title, which also extended over AC/P30.
- Sweetpea Petroleum Pty Ltd (Sweetpea) acquired several 2D seismic surveys over onshore permits EP76, 98 and 117 in the Beetaloo Sub-basin. A total of 689 line km was acquired.
- The Caldita 3D seismic survey over NT/P61 and 69 was commenced by ConocoPhillips on 10 December 2006. A total of 4826 km² is planned. The survey was still ongoing at the time of writing of this report.
- The Oliver 3D seismic survey over AC/P33 was commenced by Auralandia NL on 28 December 2006. A total of 128 km² was acquired. Schwarzer 3D seismic survey commenced on 3 March 2007 over AC/P4, 17, 24 and AC/RL5 and 6. The survey was still ongoing at the time of writing of this report.
ENVIRONMENT

In August 2006, a minor leak was identified on the Jabiru-1A subsea tree. The Department was advised that this leak had a uniform flow rate and consisted predominantly of produced water with random amounts of gas and oil bubbles. Attempts to seal the leak were unsuccessful. Based on water surface observations, calculations estimated the discharge of oil to be a maximum rate of 3 litres per day. As a result, the leak was considered to be minor and judged as extremely unlikely to have a serious or long-term environmental impact. The Jabiru-1A wellhead was monitored on a daily basis without an observed increase in leakage rate.

The operator, Coogee Resources (Ashmore Cartier) Pty Ltd (Coogee Resources) submitted a Jabiru-1A contingency plan to the Department. This plan was implemented to monitor the flow rate of the leak and to introduce steps to assist in managing the loss of wellhead integrity.

On 6 December 2006, measurements confirmed that the oil discharge rate had increased and the well was shut down. Coogee Resources is currently assessing its options, but it is likely that the well will remain shut down for several months.

PIPELINE ACTIVITIES

Bonaparte Gas Pipeline design review

A review of the preliminary design for the Bonaparte Gas Pipeline, which will supply gas from the Blacktip field to Darwin, was held in Brisbane in December. Representatives of the owner (Power and Water Corporation), design consultants, the project manager, the nominated pipeline operator, DPIFM Energy Team and various other experts received an overview and key milestone dates of the project and discussed a number of issues, such as stress corrosion cracking, pipeline isolation and venting philosophy, tie-ins, gas quality, pipeline coating selection, and process flow diagrams.

The DPIFM Energy Compliance group undertook extensive training in the areas of cathodic protection systems, pipeline defect detection, Australian Standard 2885 and emergency responses.

DRILLING

An extensive drilling campaign was undertaken in 2006. Despite limited rig availability, operators drilled eight wells in NT administered offshore areas (see Table 4). Drilling operations at two of these wells were continuing at the time of writing of this report.

Wells drilled in Offshore areas in 2006

<table>
<thead>
<tr>
<th>Well</th>
<th>Permit</th>
<th>Operator</th>
<th>Date</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swift North-1</td>
<td>AC/P34</td>
<td>Coogee</td>
<td>Jan-Feb 06</td>
<td>Discovered oil</td>
</tr>
<tr>
<td>Swallow-1</td>
<td>AC/P34</td>
<td>Coogee</td>
<td>Mar-Apr 06</td>
<td>Discovered oil in two zones</td>
</tr>
<tr>
<td>Puffin-9</td>
<td>AC/P22</td>
<td>AED</td>
<td>Mar-Apr 06</td>
<td>Discovered oil in two zones</td>
</tr>
<tr>
<td>Puffin-7</td>
<td>AC/L6</td>
<td>AED</td>
<td>Apr-May 06</td>
<td>Intersected oil column</td>
</tr>
<tr>
<td>Evans Shoal South-1</td>
<td>NT/P48</td>
<td>Santos</td>
<td>May-Jul 06</td>
<td>Discovered gas in two zones</td>
</tr>
<tr>
<td>Barossa-1</td>
<td>NT/P69</td>
<td>ConocoPhillips</td>
<td>Jul-Dec 06</td>
<td>Discovered gas in two zones</td>
</tr>
<tr>
<td>Caldis-2</td>
<td>NT/P61</td>
<td>ConocoPhillips</td>
<td>4 Dec 06 – Feb 07</td>
<td>Encountered gas column</td>
</tr>
<tr>
<td>Crux-2</td>
<td>AC/P23</td>
<td>Nexus</td>
<td>30 Dec 06</td>
<td>Encountered gas at two levels</td>
</tr>
</tbody>
</table>

Table 4. Summary of drilling activity in 2006.
The well discovered a new oil accumulation in a separate fault compartment in the Puffin geological structure. Oil was encountered in two different zones:
- 6 m in the UK1a member.
- 3.8 m in the LK1a member.

**Puffin-7**

Puffin-7 was a development well that was drilled by AED in AC/L6. It was spudded on 02 April 2006 and reached a vertical depth of 2500 m. The well was deviated and drilled horizontally through 650 m of the reservoir sandstone, which is 10 m thick. The well was tested and flowed oil at a stabilised rate of 9700 bbl/day.

**Evans Shoal South-1**

Evans Shoal South-1 was drilled by Santos in NT/P48. It was spudded on 27 May 2006 and discovered gas at two levels:
- in the Elang/Plover Formation, the primary objective of the well.
- in the Flamingo Formation, the secondary objective of the well.

Wells planned to be drilled in 2007

- Caldita-2, in the northern Bonaparte Basin, drilled by ConocoPhillips in NT/P61, was completed on 8 Feb 2007.
- Crux-2, in the Vulcan Sub-basin, was being drilling by Nexus Energy in AC/P23, at the time of writing of this report.
- Puffin-8, in AC/L6, was being drilled at the time of writing of this report.
- Sweetpea is planning to drill 8 to 12 wells in the onshore Beetaloo Sub-basin.

**PETROLEUM DEVELOPMENT, MAJOR PLAYERS AND PROJECTS**

The Petroleum Development unit in the Trade and Major Projects Division (formerly the Office of Territory Development) of the Department of the Chief Minister is responsible for the facilitation of major gas resource projects in the Northern Territory and the Timor Sea area, such as:
- expansion of LNG production
- the establishment of gas-based manufacturing, such as petrochemicals, fertilisers and gas-to-liquids
- potential gas supply to markets in southeastern Australia.

**Eni Australia (Eni)**

Since the discovery of the Vesta oil field, Eni has become one of the major players in the Northern Territory. The Vesta discovery was followed by the acquisition of the Pantheon HD3D Seismic Survey, the acquisition of Woodside’s equity in the Blacktip gas field, and more recently, by the signing of a Sales and Purchase Agreement with the PowerWater to supply the Northern Territory’s gas needs for 25 years.

**Blacktip gas field**

The Blacktip gas field is located in the southeastern Bonaparte Basin in exploration permit WA-279-P. 300 km southwest of Darwin and 100 km west of Wadeye. Currently, Eni Australia has 100% equity in Blacktip. In June 2006, Eni Australia and the PowerWater signed a Sales and Purchase Agreement to meet the Territory’s long-term gas requirements from 2009.

**Australian Energy Developments (AED Oil Limited)**

**Puffin oil field development**

AED Oil Limited applied for a Production Licence to produce oil in two phases from the Puffin structure. The production licence (AC/L6) was awarded and the company is modifying a tanker (the Gerrita) to become the fourth FPSO operating in Northern Territory-administered waters.

Since its formation, the Company has experienced considerable growth, as illustrated by the following 2006 highlights of the Puffin project:
- Puffin’s published P50 reserves were upgraded from 11.6 MMmbbl to 14.7 MMmbbl.
- A multiple-level oil discovery in the Puffin-9 exploration well was announced, with 6 m and 3.8 m oil columns in the UK1a and LK1a sandstones, respectively.
- Puffin-7 intersected hydrocarbons.
- Oil Initially In Place (OIIP) of 90 MMmbbl for the Puffin North region was announced. Reserves were estimated to be in the order of 40 MMmbbl from the Reservoir simulation. Puffin South West region also shows considerable potential, subject to final reserve calculations.
- Puffin-8 was spudded on 17 February 2007.
- Shortly after the completion of Puffin-8, the installation of a flowline support base, subsea trees, flowlines and a riser is expected to commence.
- In June 2007, the FPSO is scheduled to be connected, tested and commissioned (first oil).

**OMV Australia**

The OMV Australia group of companies has interests in the following offshore Exploration Permits and Retention Leases administered by DPIFM (Table 5):
- OMV Timor Sea Pty Ltd holds a 100% interest in the Tenacious oil pool in Retention Lease AC/RL4 and a 50% interest in the Tenacious oil pool in the adjacent AC/RL5 Retention Lease. Cosmo Oil Ashmore Ltd holds the remaining 50% interest in AC/RL5.
- Cosmo Oil Ashmore Ltd, Cosmo Oil Co, Ltd and OMV Timor Sea Pty Ltd hold 35%, 15% and 50% interests, respectively, in the Audacious oil pool within Retention Lease AC/RL6.

During 2006, Retention Lease AC/RL6 was granted for a five-year term, effective from 21 July 2006. AC/RL6 was previously part of the Audacious Location in Exploration Permit AC/P17 and contains the Audacious-1 oil discovery.
Technical work aimed at commercialising the Tenacious and Audacious-1 oil pools (in AC/RL4 and 5, and the oil pool discovered by Audacious-1 in AC/RL6) was conducted during the year. No field development activities were carried out during 2006.

**AC/P4, AC/P17, AC/P24 and AC/RL6**

The AC/P4, AC/P17, AC/P24 and AC/RL6 Joint Venture partners have agreed to acquire the Schwarzer 3D survey over these permits. The new survey will be acquired in the dip direction, with sail lines trending northwest to southeast, and will cover an area of some 680 km². The survey was underway at the time of writing. It will overshoot a portion of the Onnia regional speculative 3D dataset, acquired by PGS in 1999–2000.

**AC/RL4, AC/RL5 and AC/RL6**

In addition to the new 3D seismic data to be acquired by the Schwarzer survey over AC/RL6, anticipated activities for 2007 will be to continue technical and commercial studies aimed at commercialising the Tenacious and Audacious oil pools.

<table>
<thead>
<tr>
<th>Title</th>
<th>Company</th>
<th>Interest</th>
<th>Operated</th>
<th>Joint Venture partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/P4</td>
<td>OMV Timor Sea</td>
<td>35%</td>
<td>Yes</td>
<td>Cosmo Oil Co, Nippon Oil Exploration (Australia)</td>
</tr>
<tr>
<td>AC/P17</td>
<td>OMV Timor Sea</td>
<td>35%</td>
<td>Yes</td>
<td>Cosmo Oil Ashmore, Nippon Oil Exploration (Australia)</td>
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<tr>
<td>AC/P24</td>
<td>OMV Timor Sea</td>
<td>60%</td>
<td>Yes</td>
<td>Avery Resources, Nippon Oil Exploration (Australia)</td>
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<tr>
<td>AC/RL4</td>
<td>OMV Timor Sea</td>
<td>35%</td>
<td>Yes</td>
<td>Cosmo Oil Co, Nippon Oil Exploration (Australia)</td>
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<tr>
<td>AC/RL5</td>
<td>OMV Timor Sea</td>
<td>35%</td>
<td>Yes</td>
<td>Cosmo Oil Ashmore, Nippon Oil Exploration (Australia)</td>
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<tr>
<td>AC/RL6</td>
<td>OMV Timor Sea</td>
<td>35%</td>
<td>Yes</td>
<td>Cosmo Oil Ashmore, Nippon Oil Exploration (Australia)</td>
</tr>
</tbody>
</table>

Table 5. OMV Australia’s interests and joint-venture partners in NT offshore tenements.

**Nexus Energy**

**AC/P23**

The AC/P23 permit includes the Crux gas/condensate field, discovered in 2000 (Figure 6). This field is estimated to contain mean recoverable gas reserves of 1.3 TCF with a Gas Condensate Content (GCC) of approximately 30 bbl/mmscf, giving recoverable condensate reserves of 48 mmstb.

The Crux 3D Survey was acquired between 15 December 2005 and 9 March 2006, covering 285 km² (134 km² within AC/P23).

Seismic data processing commenced on 11 January 2006 and was completed on 9 June 2006. FEED studies are currently active, with first production scheduled for 2009.

The Crux field will be developed initially as a gas recycling project, using an FPSO, with two producing wells and three gas injection wells. Plateau production rate is anticipated to be 16 000 stb/d.

**Woodside**

Woodside is one of the major players in the Territory. Woodside’s activities cover both exploration and production. It operates the Northern Endeavour FPSO in AC/L5 over the Laminaria/Corallina oil structures. These fields are experiencing declining oil production associated with a high water cut (now averaging around 80%). This has been expected, due to excessive production in the last few years leading, to oil production peaking at over 180 000 barrels per day at times. Activities over the area are summarised below:

- A seismic study was conducted to investigate the technical feasibility of a seismic survey over Laminaria/Corallina, as part of a possible multi-azimuth acquisition program. A seismic fluid effect is expected, but the magnitude, compared to the expected noise level, may make this difficult to

![Figure 6. Schematic diagram showing details of proposed production wells in the Crux field](image-url)
interpret. Ongoing work aims to reduce the uncertainties in interpretation.

- **Subsurface studies to understand oil accumulation in the Laminaria South area were continued.** A potential undeveloped accumulation was inferred from the Laminaria-3 and LPS1 appraisal well results.
- **The Laminaria 3D seismic dataset was re-processed and the new dataset shows improved overburden and velocity structure.** The need for possible additional PreSDM processing is currently being evaluated.

The following annotated charts provide details of the production performance of the Northern Endeavour from inception to date (Figure 7), and details for 2006 (Figure 8).

**Kuda Tasi**
Operations in the Kuda Tasi/Jahal oil field included the following:
- **Kuda Tasi-3 was drilled to a depth of 3513 mRT.** Significant losses were encountered at TD (total depth). The FMI image log showed drilling-induced-tensile-fractures in the top of the Laminaria Formation.

The Kuda Tasi-3 appraisal well was designed to differentiate between the sub-economic/marginal base case (7 m oil column or less) and the high case economic up-side (18+ m oil column). The well intersected the predicted stratigraphy, close to the prognosed top reservoir depth and was interpreted to contain a possibly oil-bearing sandstone at 3443 mMD (3420 mSS LAT). Pressures of 6 Modular Dynamic Tool (MDT) pressure points were obtained. A lower permeability was interpreted, compared to other Kuda Tasi appraisal and exploration wells.
- **Well results and their impact on potential future development are currently being evaluated.**

**Coogee Resources**
Coogee Resources is one of the major players in the Northern Territory, undertaking a range of petroleum activities that includes production, exploration, drilling and development. Coogee Resources are the holders of AC/P32, AC/P34, AC/P20, AC/RL3, and AC/L1, 2, and 3. The following activities were completed during the 2006 Calendar Year.
Drilling
Two exploration wells were completed within AC/P34 during the year, Swift North-1 and Swallow-1. Both wells have been suspended as possible oil producers, pending production licences.

Exploration Activity
- AC/P32. Interpretation of the reprocessed (PSDM) Onnia 3D seismic survey and a detailed geological study, including stratigraphic correlations and petrophysical analysis, is ongoing.
- AC/P34. Interpretation of the reprocessed (PSDM) Skua 3D seismic survey is ongoing and is targeting the Spruce Prospect.
- AC/P20. A preliminary petrophysical review of Cash-1 and Maple-1 was completed.

Development Activity
- AC/P34. The Swift-Swallow-Skua Preliminary Development Plan was submitted to Government for approval in October 2006. Detailed work is continuing on both the Swift-Swallow and Skua fields. The Department is assessing the Preliminary Field Development Plan and the first draft of the Joint Technical Paper was forwarded to the Commonwealth for comments and input.
- AC/RL3. The Montara Final Development Plan was submitted to Government for Approval in October 2006, along with an application for a production Licence. Detailed work is continuing. The Department is assessing the Final Field Development Plan and the first draft of the Joint Technical Report was forwarded to the Commonwealth for comments and input. The new Production Licence, AC/L7, was awarded on 20 March 2007.

Production
Figure 9 shows oil and water production from Jabiru and Challis from 1986 to 2006. Figures 10 and 11 show metered oil production from Jabiru and Challis, respectively, for 2006.
- AC/L1. Jabiru field continued to produce oil and water. Cumulative oil produced until the end of 2006 totalled 109 452 MMbbl.
- AC/L3. Challis field continued to produce oil and water. Cumulative oil produced until the end of 2006 totalled 58 174 MMbbl.

PETROLEUM TITLES
The Department administers petroleum titles in four different areas, three of which are offshore. The offshore areas include (a) Territorial waters, (b) Northern Territory Adjacent Area, and (c) Territory of Ashmore Cartier Island and Adjacent Area.

Onshore
The NT onshore area covers over 1.35 million square kilometres of land (Figures 12, 13), embracing several prospective sedimentary basins; these include the Amadeus, Pedirka, Simpson, Eromanga, Georgina and McArthur basins and the Beetaloo Sub-basin. Twelve exploration permits over the Amadeus, Simpson, Eromanga and Georgina basins and Beetaloo Sub-basin have been awarded to local and international companies, including Sweetpea, Texalta and Central Petroleum. The first of a number of seismic surveys has been conducted and a very ambitious drilling program is planned by different operators in 2007. Two retention leases (gas discoveries) and three oil and gas production licences are currently in place.

The production licences are in the Amadeus Basin. OL3 acts over the Palm Valley gas field, OL 4 and 5 act
over the Mereenie gas and oil fields. For actual production rates, refer to Figures 4 and 5, and Table 3.

Thirty-five applications are currently being assessed prior to awarding exploration permits in onshore areas of the Northern Territory.

**RL1 (Weaber gas field)**
DPIFM is undertaking pre-renewal negotiations with the operator, Advent Petroleum.

**RL2 (Dingo gas field)**
The Dingo field is a moderately sized gas discovery, with four wells in the structure. Geological and stratigraphic work is being undertaken by Santos as a part of licence commitments.

**Offshore**

**Territorial Waters** includes an area stretching three nautical miles from the Northern Territory coastline. Despite an increase in interest from several players, no titles are currently awarded in this area.

The **Northern Territory Adjacent Area** covers over 500,000 km² between Territorial Waters and the International borders of Australia. This area is administered by the Department on behalf of the Commonwealth of

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**Figure 10.** Metered oil production from the Jabiru field for 2006.

**Figure 11.** Metered oil production from the Challis field for 2006.
Australia. Fourteen exploration permits and three retention leases are currently granted and are operated by various national and international operators. The area contains world-class gas discoveries, such as the Sunrise, Evans Shoal, Caldita and Barossa fields (Figure 14).

**NT/RL1 (Petrel gas field)**
The Petrel retention lease was renewed for another term on 10 July 2006. Conditions of the renewal include a commitment to undertake a 3D seismic survey in the third year of the term.
**NT/RL2 (Sunrise / Troubadour gas fields)**
The Sunrise/Troubadour retention lease is due for renewal. DPFIM is currently assessing the application and is conducting negotiations with the operator (Woodside).

**NT/RL3 (Barnett Oil discovery)**
DPFIM is currently negotiating with the operator, DrillSearch, regarding future drilling.

The **Territory of Ashmore Cartier Island and Adjacent Area** is a well known petroleum province in WA adjacent waters (Figure 15). It is administered by DPIFM on behalf of the Commonwealth of Australia.

All of the Northern Territory’s offshore petroleum is produced from this area and is delivered to three operating FPSO facilities.

The following extensive exploration and drilling activities occurred in 2006:

- Activities ranging from drilling, geological and geophysical studies, seismic acquisition, interpretation and commercial evaluations occurred on fifteen exploration permits.
- Work programs aiming to progress resource activities closer to the development phase occurred on six retention leases over hydrocarbon discoveries.
- Oil is currently produced through three FPSOs on four Production Licences:
  - Northern Endeavour, producing from the Laminaria and Corallina oil fields.
  - Jabiru Venture, producing from the Jabiru field
  - Challis Venture, producing from the Challis and Cassini fields.

A fourth FPSO is expected over the AC/L6 Puffin oil field by June 2007.

**Major projects in Territory of Ashmore Cartier Island and Adjacent Area**

The following new applications for retention leases are currently being assessed and negotiated with the Commonwealth Department of Industry, Tourism and Resources (DITR).

**Argus (AC/RL8)**
A gas discovery in AC/P30 was made by BHP Billiton in September 2000. The resource is estimated at 1.5 TCF and possibly up to 6 TCF of dry gas. AC/RL8 was awarded over 10 blocks on 9 Jan 2007, with an appraisal well to be drilled in year 3 of the term.
**Crux (AC/P23)**
Crux is a gas discovery made by Nippon Oil in May 2000. The resource is estimated to be in the order of 1.5 TCF of gas within a 180 m-thick gas column. Initially, the field will be developed as a gas recycling project utilizing an FPSO to extract condensate from the gas and reinjecting dry gas back into the reservoir. Phase two is expected to be an LNG development. Nexus Energy is the current operator of the field.

**Cash-Maple (AC/RL7)**
The current operator, Coogee Resources, made an application for a retention lease over 5 blocks in the declared location. This lease was awarded on 27 November 2006. Coogee has committed to a Front End Engineering and Design (FEED) study for the development of Cash/Maple, using MFPSO technology.

**Audacious (AC/RL6)**
An application for a retention lease was made by the operator, OMV Australia. This application covered one block over the Audacious oil discovery. This lease was awarded on 21 July 2006.

**Talbot (AC/RL1)**
An application to renew AC/RL1 was made by the operator, Hardman Resources. The renewal was granted on 13 March 2006. Apache Oil Australia Pty Ltd farmed in and is the current operator of the lease.

**Puffin (AC/L6)**
Australian Energy Developers (AED) presented a final field development plan (FFDP) of the Puffin oil discovery, together with an application for a licence to produce oil in two phases. The company is modifying a tanker (the Gerilla) to be the fourth FPSO operating in NT-administered waters.

An extensive drilling program with multiple discoveries was undertaken in 2006. This consisted of drilling two development wells and an additional exploration well over the Puffin structure. Puffin-9 and -7 were drilled between March and May 2006. Puffin-9 discovered oil in both its primary and secondary objectives. Puffin-8 is currently being drilled.

**TERRITORY ACREAGE RELEASES IN 2006**

**North Eastern Bonaparte Basin**

**Area NT06-5**
Multiple bids for this area (Figure 16) were received from highly recognised explorers. The Department has assessed applications and the successful bidder will receive an offer. The acreage has the following features:
- It is an under-explored area (no exploration wells), 200 km from Darwin.
- It is 200 km northeast of the Bayu–Undan gas pipeline.
- It is in close proximity to the recent gas discovery of Caldita (tested 33 mmcf/d).
- There is potential for hydrocarbon charge from the Malita and Calder grabens.
- There are a range of Mesohydrate plays, associated with the Lynedoch Bank Fault System.

**Figure 16. Area NT06-5 2006 acreage release in the northeastern Bonaparte Basin.**

**Figure 17. Areas NT06-1, -2, -3 and -4 2006 acreage releases in the northern Arafura Basin.**
Northern Arafura Basin

Areas NT06-1, NT06-2, NT06-3 and NT06-4

The department did not receive any applications for these areas (Figure 17). Offers are still open until 10 May 2007. The acreage has the following features:

- Designated Frontier Tax Concession applies.
- It is in a large frontier Palaeozoic basin.
- Water depths are shallow (70–220 m).
- There are several potential source rocks.
- There are large structural plays and numerous stratigraphic plays.
- Recent studies have reduced the charge risk factor.
- Hydrocarbon shows/indications occur in nearby wells.
- There are indications of shallow gas.
- Recent non-exclusive seismic data is available.

Vulcan Sub-basin, Bonaparte Basin (Territory of Ashmore and Cartier Islands)

Area AC06-1

An exploration permit (AC/P40) for this area (Figure 18) was awarded on 1 March 2007 to the successful applicant, Coogee Resources (Ashmore Cartier) Pty Ltd, based on a challenging exploration program. Two committed exploration wells in the primary period are to be followed by another two exploration wells in the secondary work program. Studies and seismic reprocessing are also committed.

The acreage has the following features:

- It is adjacent to hydrocarbon accumulations in proven shallower water.
- There is a Triassic–Jurassic horst block play, proven to the south at the Challis and Cassini oil fields.
- There is a continuation of the basin edge trend that hosts the Talbot oil field to the south.
- There is evidence of a localised hydrocarbon source kitchen within the graben, along the eastern flank of the Vulcan Sub-basin.
- Proprietary Vulcan Sub-basin Mega Survey seismic coverage is available.

Northern Browse Basin (Territory of Ashmore and Cartier Islands)

Area AC06-2

An exploration permit (AC/P41) for this area (Figure 19) was awarded on 1 March 2007 to Shell Development (Australia) Pty Ltd and Nexus Energy Limited. The proposed work program includes three committed exploration wells in the primary period along with seismic and other studies.

This acreage has the following features:

- It is a proven major hydrocarbon province and is adjacent to significant hydrocarbon discoveries.
- There is evidence of oil and gas migration and accumulation.
- It contains thick Jurassic–Lower Cretaceous mature source rocks.
- There are tilted Permo–Triassic to Jurassic fault block traps.
- It contains high-quality Mesozoic fluvio-deltaic to marine sandstone potential reservoirs with overlying Cretaceous shale seal.
- Water depths are less than 200 m.

TITLES GRANTED IN 2006

Northern Territory Adjacent Area

- On 8 August 2006, NT/P71 (99 blocks) was awarded to National Oil & Gas Pty Ltd, leading a joint venture with a minimum nominated expenditure of A$21.85 million.
- On 8 August 2006, NT/P72 (108 blocks) was awarded to National Oil & Gas Pty Ltd, leading a joint venture with a minimum nominated expenditure of A$21.6 million.

Ashmore Cartier area

- One Production Licence (ACL6), covering three blocks over the Puffin oil discovery, was awarded to AED Oil Limited on 12 April 2006.
Two retention leases were granted in the Ashmore Cartier Area:

- On 21 July 2006, AC/RL6 (1 block over the Audacious oil discovery) was awarded to a joint venture led by OMV Timor Sea Ltd.
- On 27 November 2006, AC/RL7 (5 blocks over the Cash-Maple gas discoveries) was granted to a joint venture led by Coogee Resources (Ashmore Cartier) Pty Ltd.

Onshore

- On 21 November 2006, EP103 (156 blocks) was awarded to a joint venture led by Texalta Petroleum Ltd, with a committed work program of A$2.1 million.
- On 21 November 2006, EP104 (126 blocks) was awarded to a joint venture led by Texalta Petroleum Ltd, with a committed work program of A$2.1 million.
- On 14 March 2006, EP117 (114 blocks) was awarded to Sweetpea Petroleum Pty Ltd, with a committed work program of A$4.05 million.

Conferences

In 2006, DPIFM participated in the following petroleum events:

**APPEA 2006**

At the APPEA Conference on the Gold Coast held on 7–10 May 2006, the Chief Minister, Hon Clare Martin MLA, presented a keynote address on the importance of placing downstream gas industry development on the national agenda. An exhibition stand was manned by NTG officers to promote Territory opportunities. Considerable interest was shown by the record number of delegates.

Over 1300 delegates attended the 2006 Conference on the Gold Coast, seeing first hand why APPEA hosts the most successful upstream oil and gas event in the Southern Hemisphere.

Memorable comments included Paris-based International Energy Agency's Claude Mandil’s pointers on energy efficiency and oil prices; Colin Beckett’s clear plans for Australia as one of Chevron’s prime exploration targets; ExxonMobil Australia’s Mark Nolan’s Gorgon update and plea for offshore gas to get the same beneficial treatment as coal; warnings on further skill shortages from Gerard Daniels; London-based Ben Mellon’s timely warnings on stamping out corruption in payments to governments in developing countries; and the NT Chief Minister, Clare Martin’s concern on adding value to northern Australia’s gas reserves and querying whether it was in the nation’s best interests to export virtually all of our gas as LNG.

Notable was APPEA Chief Executive, Belinda Robinson’s launch of a 60-page *Issues Paper*, as a first step in developing a joint industry–government initiative to underpin the industry’s future.

**SEAAOC 2006**

The NT Government in a Joint Venture with IIR, organised the 12th SEAAOC Conference on 18-21 June 2006 at the SKYCITY Casino. The Chief Minister and the PNG Energy Minister, Sir Moi Avei, both presented keynote addresses. Other keynote speakers included the Australian President of ConocoPhillips - Laura Sugg, the Chief Executive of APPEA- Belinda Robinson, the Head of Resources Division DITR – John Hartwell, Deputy Assistant Secretary, Oil and Natural Gas, US Department of Energy - James Slutz and the Undersecretary for Energy Affairs, California Resources Agency – Joe Desmond.

The Conference was very successful, attracting over 300 delegates and providing high quality speakers covering a broad geographical range and diversity of petroleum industry issues. SEAAOC 2007 will be held from 30 May to 1 June at the Holiday Inn Esplanade. Planning for SEAAOC 2007 is well underway and is being staged to coincide with

Figure 19. Area AC06-2 2006 acreage release in the northern Browse Basin.
the APEC energy ministers’ meeting to be held in Darwin on 27 – 29 May.

AAPG-2006

The American Association of Petroleum Geologists conference was held in Perth in 2006. Although held at various “remote” venues of Perth, the 2006 AAPG International Conference and Exhibition proved to be a record-setting meeting. The final official count was 2,626 registrations resulting in the largest international meeting in AAPG history. Geologists from 65 countries attended the meeting and with 907 registrations, Australians accounted for the largest numbers of participants. Other countries with large representations included the United States (283), the United Kingdom (100), Malaysia (90), Indonesia (76) and People’s Republic of China (67).

Promotions

In conjunction with the Chief Minister’s keynote addresses at APPEA and SEAAOC, the Northern Territory Government undertook a range of activities to promote the development of downstream gas processing industry in the Territory. These activities included:

• presentations to Australian Government ministers and senior officials
• a submission to the APPEA–Government Joint Leadership Group
• the establishment of a joint working group under the auspices of the Ministerial Councils for Energy and for Mineral and Petroleum Resources to examine gas supply for future domestic demand, including a gas processing industry
• the commissioning of two studies by the international consulting firm, Nexant, on gas processing industries such as petrochemicals, liquid fuels and fertilisers, to identify potential investment opportunities and issues.

Overview of Mining and Petroleum Support 2006

Mining and Petroleum Support is one of the principle activities of the Investment Services unit of the Department of Business, Economic and Regional Development (DBERD). The Mining and Petroleum Support group promotes growth in businesses supporting the mining, oil and gas, and manufacturing industries.

The Government’s two key initiatives for Territory industry development in relation to mining and petroleum support are:

1. Making It in the Territory
2. Building Northern Territory Industry Participation.

Activities and achievements by the Investment Services in 2006 included;

• participation in the exhibition “OSEA 2006” in Singapore (September 2006), leading a Ministerial delegation of local businesses and potentially gaining over $30M in orders/work as a result. This also included a briefing to the British delegation on “Opportunities in the Timor Sea and surrounding areas”.

• publication of a new corporate brochure: “Growing Mining & Petroleum Support in Australia’s Northern Territory”.

• organisation of the Alice Springs Petroleum & Mining Expo (March 2006), in conjunction with the Northern Territory Geological Survey’s Annual Geoscience Exploration Seminar (AGES), to support the use of local suppliers.

• the ongoing promotion of Darwin and Alice Springs as regional petroleum and mining supply and service centres.

• facilitation of several inward investment visits in the petroleum and mining supply and service industry, including the offshore sector.

• encouragement and support to assist Thiess Indonesia’s Kalimantan operations to use Darwin-based services for scheduled maintenance and breakdown repairs of heavy industry plant.

• continuing discussions with Inpex Holdings Inc on the service and support from Darwin of the exploration campaign over the Abadi gas discovery in Indonesian waters, along the border with Australia.

• the organisation of a seminar on oil and gas business opportunities in the Timor Sea. This was held in Jakarta (March 2006) for 60 business people, resulting in several investment visits to Darwin and follow-up visits to a number of Jakarta-based businesses.
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