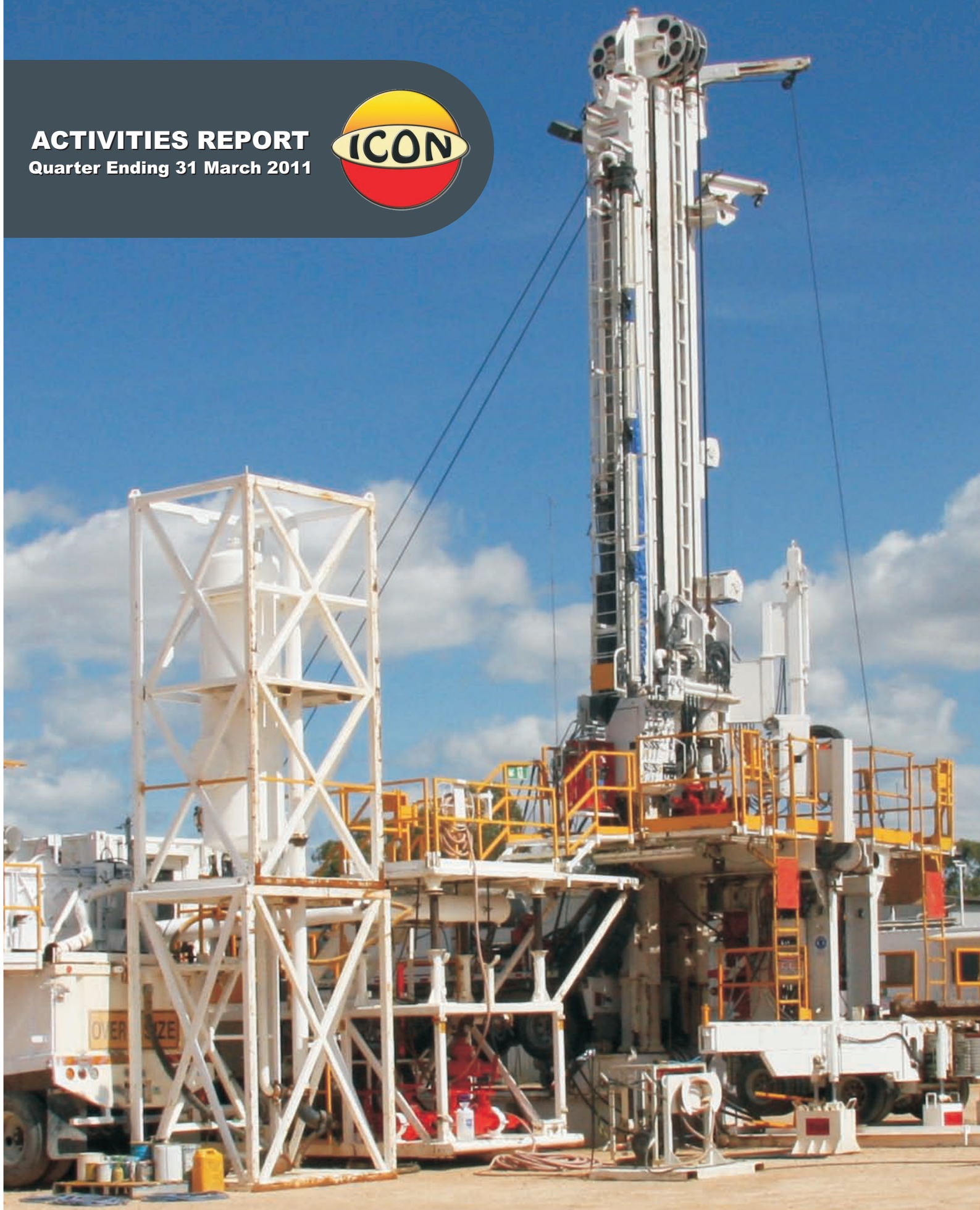


# ICON ENERGY LIMITED

ABN 61 058 454 569

**ACTIVITIES REPORT**  
Quarter Ending 31 March 2011



# Quarterly Activities Report

REPORT FOR THE QUARTER ENDING 31 MARCH 2011

## HIGHLIGHTS OF THE QUARTER

- Icon Energy Limited (**Icon Energy** or the **Company**) signed an LNG Sales Agreement with China's Shantou Sino Energy Co. Ltd (**Shantou Sino Energy**) on 29 March 2011 for the Company to supply a minimum of 2 trillion cubic feet (40 million tonnes) of liquefied natural gas (**LNG**) over a 20 year term.
- Icon Energy denies and defends Beach Energy Limited's (**Beach**) claim that Beach has a right to farmin up to a 40% interest in the prospective ATP855P Nappamerri Trough permit, located in the Cooper-Eromanga Basin in Queensland (**Beach Claim**). If successful, the Company will retain its full 80% interest in the highly prospective permit.
- Icon Energy successfully applied to the Australian Government for an innovation patent in relation to a new geothermal energy process well design, which was granted to the Company on 10 February 2011.
- On 7 January 2011, Mr. Howard Lu was appointed as a Director of the Company.

## EVENTS SUBSEQUENT TO 31 MARCH 2011

- Icon Energy commenced a new drilling programme in ATP626P in the Surat Basin. The programme forms part of Stanwell Corporation Limited's (**Stanwell**) Stage 2 investment in ATP626P to earn a 50% interest in four graticular blocks located in the north-eastern corner of the ATP626P tenement, which (together) are known as the Lydia Block. The programme consists of 3 exploratory wells; Lydia 10, Lydia 11 and Lydia 12. The Lydia 10 well was spudded on 17 April 2011. The Lydia 11 and Lydia 12 wells will then be spudded, using the Atlas Drilling Rig #2, after the completion of operations at the Lydia 10 well.
- Icon Energy continues to deny and defend the Beach Claim and continues to assert the Company's rights in relation to ATP855P in court proceedings against Beach, which proceedings have been listed for trial on 18 July 2011.
- Icon Energy's Managing Director, Mr. Ray James, was appointed to the Advisory Board of the Energy & Geoscience Institute at the University of Utah on 8 April 2011.
- The (independent) US Energy Information Administration's (**EIA's**) World Shale Gas Resources Report (**EIA Report**) published on 5 April 2011 significantly raises the potential gas in place in the ATP855P tenement. The EIA Report's "Initial Assessment of 14 Regions Outside the United States" has placed the Shale Gas resource potential in the Cooper Basin as a whole at 342TCF (trillion cubic feet) of gas (**Risked GIP**), with the recoverable equivalent at some 85TCF.

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# QUARTERLY ACTIVITIES REPORT

REPORT FOR THE QUARTER ENDING 31 MARCH 2011

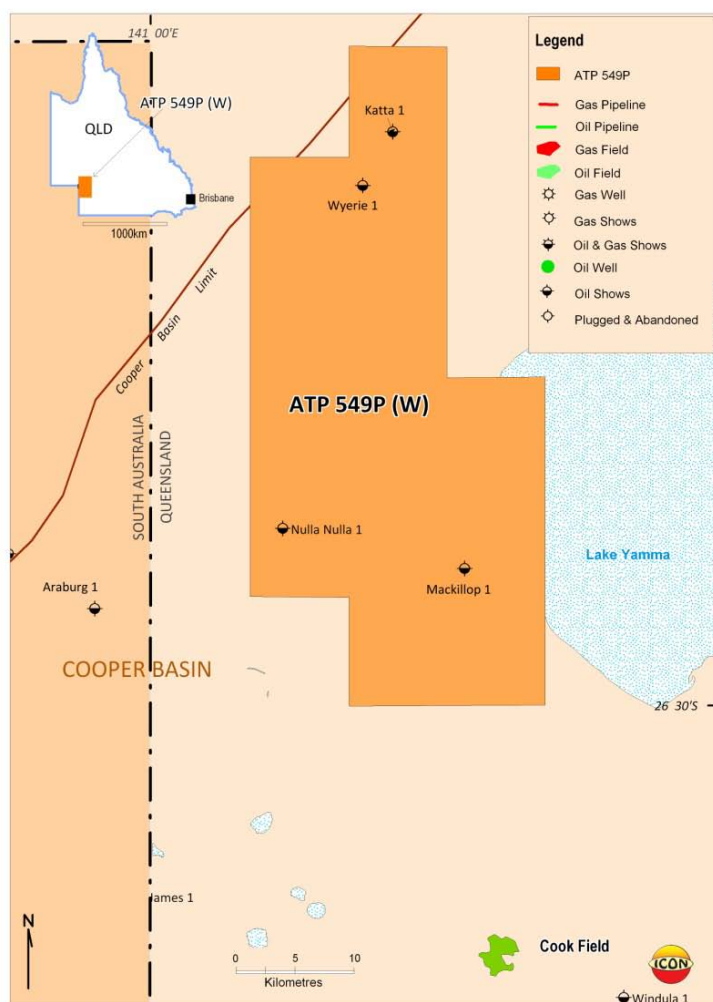
## Tenements

### Queensland – Petroleum Exploration – ATP549P (West)

ATP549P (West) is located just inside the boundaries of the Cooper Basin in Queensland, near the Queensland and South Australian border. Icon Energy holds a 33.33% working interest in the West block of the tenement.

No further work has been undertaken on this tenement since the Company's activities report for the quarter ending 31 December 2010.

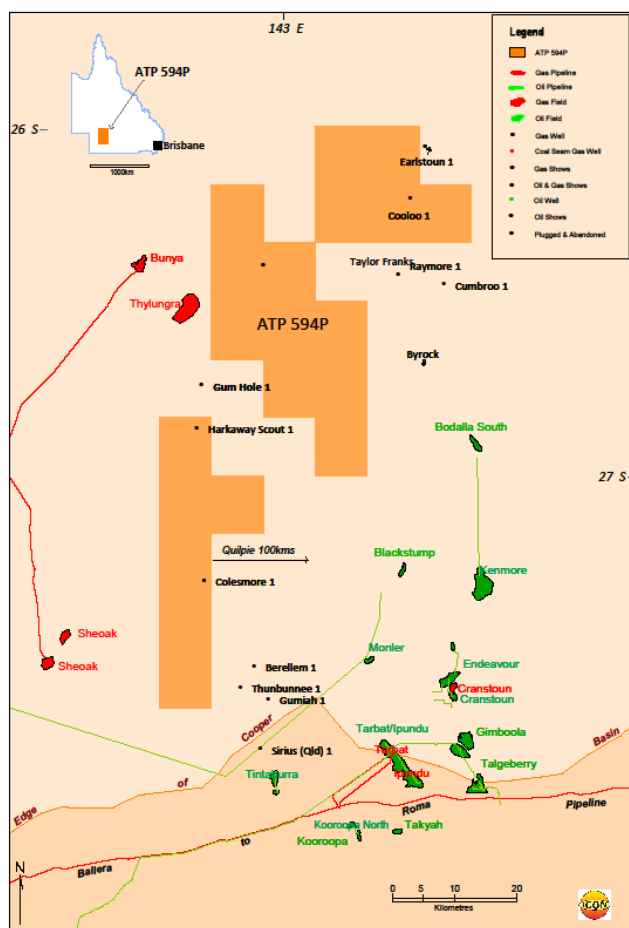
The following map delineates the location of the permit.



## Queensland – Petroleum Exploration – ATP594P

No further work has been undertaken on this tenement since the Company's activities report for the quarter ending 31 December 2010.

The following map delineates the location of the permit.

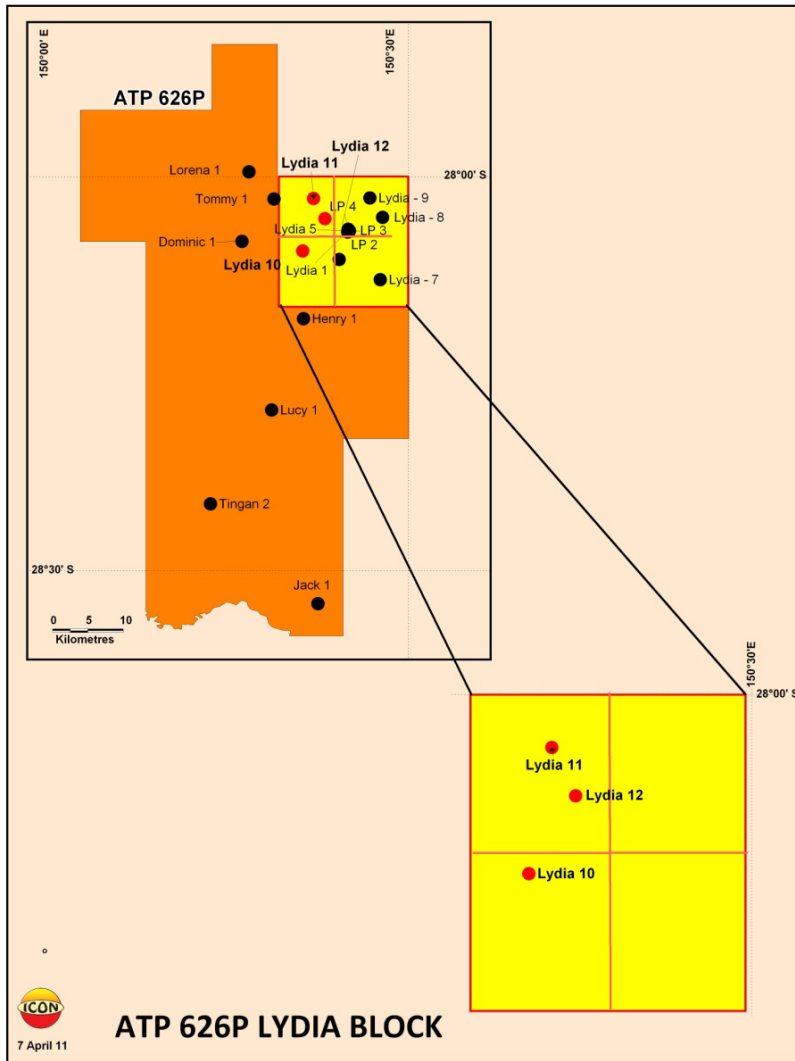


## Queensland – Petroleum Exploration – ATP626P

Icon Energy – through its wholly owned subsidiary, Icon Gas Productions Pty Limited, as Operator - commenced drilling three exploratory wells in ATP626P (**Drilling Programme**), where Stanwell has farmed into, with the spudding of the Lydia 10 well on 17 April 2011.

The Drilling Programme forms part of Stanwell's Stage 2 investment (through Goondi Energy Pty Ltd) in ATP626P, located in the Surat Basin, to earn a 50% interest in the four graticular blocks which make up what is known as the Lydia Block.

The figure on page 5 indicates the well positions for the Lydia 10, 11, and 12 exploration wells.



The 3 exploratory wells are targeting the Walloon Coal Measures, where gas saturation in the permit remains to be fully tested.

Following the drilling of Lydia 10, the Atlas Drilling Rig #2 will move 5.4 kilometers to the north north-east in the Permit to drill the Lydia-12 well and then 3.2 kilometers to the north north-west to drill Lydia-11.

These three wells will be drilled with a new coring system which will allow the Walloon Coal Measures to be cored with an 8½ inch diameter hole. The benefit of a hole of this size is that any, or potentially all, of these wells can easily be converted into production wells.

The Company has executed conduct and compensation agreements with landholders in the Lydia Block area, and continues to regularly engage with landholders while conducting the Drilling Programme.

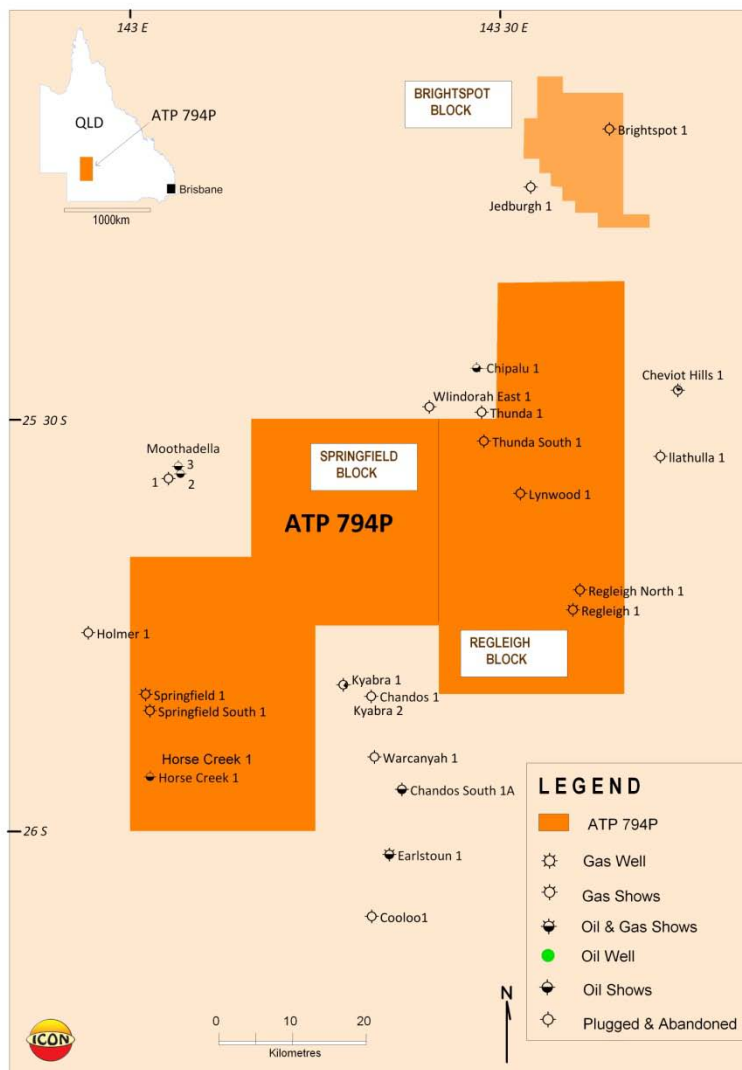
Upon completion of the data obtained from the drilling of these three exploration wells, the joint venture will consider whether or not a second pilot area has been sufficiently defined for development.

## Queensland – Petroleum Exploration – ATP794P

ATP794P is located north west of the town of Quilpie and lies directly north of ATP594P.

Icon Energy holds interests in the Brightspot, Springfield and Regleigh blocks in this tenement. However, Icon Energy is not engaged in a program for this block at present.

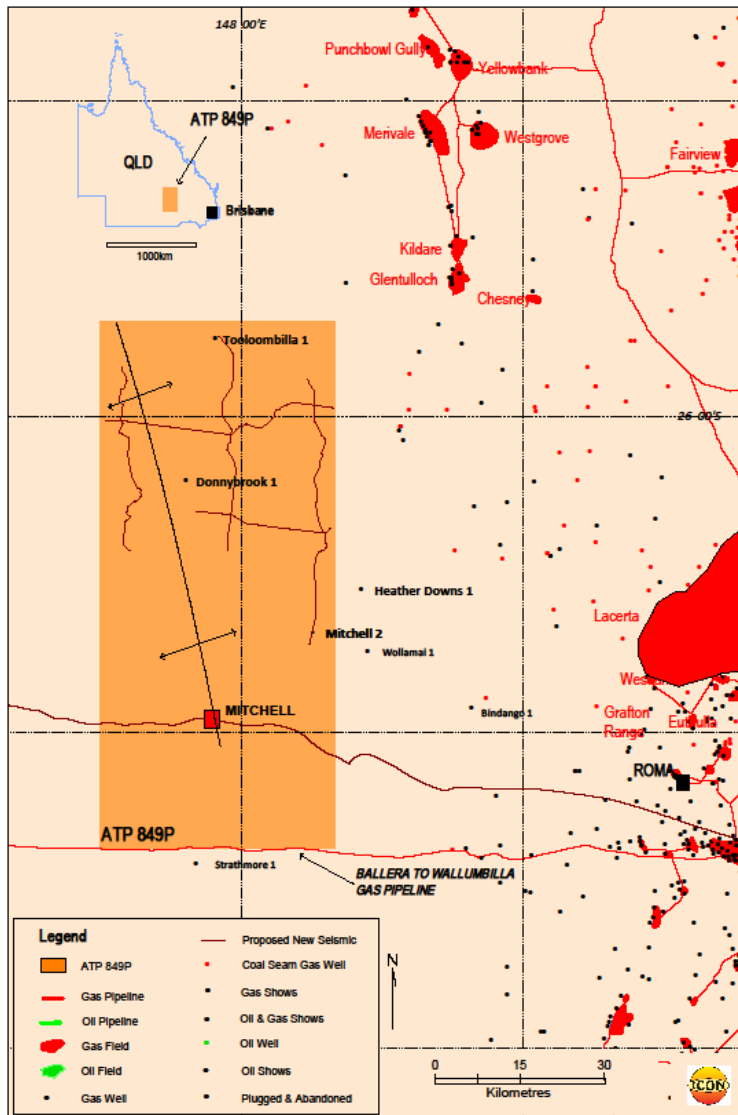
The following map delineates the location of the permit.



## Queensland – Petroleum Exploration – ATP849P

No further work has been undertaken on this tenement since the Company's activities report for the quarter ending 31 December 2010.

The map on page 7 delineates the location of the permit.



## Queensland – Petroleum Exploration – ATP855P

No activity has been undertaken in relation to this tenement during this quarter.

The (independent) US Energy Information Administration’s (*EIA’s*) World Shale Gas Resources report (*EIA Report*) published on 5 April 2011 has significantly raised the potential gas in place in the ATP855P tenement.

The EIA Report’s “Initial Assessment of 14 Regions Outside the United States” places the Shale Gas resource potential in the Cooper Basin as a whole at 342TCF (trillion cubic feet) of gas (*Risked GIP*), with the recoverable equivalent at some 85TCF. Using the EIA’s assessment, Icon Energy’s internal estimates conservatively place the potential recoverable amount from ATP855P at some 20TCF.

A copy of the relevant section of the EIA Report is attached to this Quarterly Activities Report from page 14.

Assuming the EIA Report is corroborated through drilling operations (expected to commence in the second half of 2011), it is anticipated that the potential of ATP855P alone will be significantly more than sufficient to underpin the necessary feedstock for the production of LNG contracted for supply

to Shantou SinoEnergy under the terms of the LNG Sales Agreement (executed with Shantou SinoEnergy on 29 March 2011).

Otherwise, Icon Energy continues to be in dispute with Beach over, and denies, Beach's Claim that Beach has a right to farm up to a 40% interest in ATP855P.

The dispute has been set down for trial commencing on 18 July 2011.

So as to ensure that Icon Energy was able to sign the LNG Sales Agreement with Shantou SinoEnergy, on 29 March 2011 the Company voluntarily offered undertakings to not deal with the tenement in a manner that would adversely affect Beach's claimed interest. The Company is, however, at liberty, to apply to the Federal Court to be relieved from such undertakings at any time. In any event, the undertakings were not considered by Icon Energy to be material in the context of not being able to access the tenement due to flood waters until mid to late July.

By way of background, in 2009, Beach approached Icon Energy, seeking to farm up to ATP855P. On or around October 2009, the companies signed a brief letter agreement for Beach to farm up to a 40% interest in the tenement, subject to undertaking various seismic and drilling operations and subject to the companies negotiating a formal Farming Agreement, Joint Venture Operating Agreement and Share Subscription Agreement (through which Beach proposed to acquire \$3.5 million shares in Icon Energy).

The proposed deal was pending the award of the tenement being subject to the negotiation of a native title agreement and the issue of an environmental authority.

Icon Energy negotiated the native title agreement over a period of 3 years with the Wongkumara People. These negotiations were successfully concluded at a cost of over \$500,000 to Icon Energy, and culminated in the execution of a right to negotiate agreement in May 2010. The environmental authority was secured in July 2010.

After 17 months, Icon Energy and Beach have still not been able to reach agreement on the final documents or the conduct of the work required in ATP855P.

On 29 March 2011, Beach filed proceedings against Icon Energy in the Federal Court of South Australia. Through these proceedings, Beach is attempting to secure its claim that it has farmed up to ATP855P under a 2 page letter agreement.

Icon Energy's position is that it does not do business in that way and that the so-called letter agreement is nothing more than an agreement to agree (with a requirement that Beach and Icon Energy negotiate and agree the terms of a formal Farming Agreement, Joint Venture Operating Agreement and Share Subscription Agreement).

Icon Energy has objected to the position taken by Beach, denies each and every one of Beach's claims and maintains that the companies have not finalised negotiations or completed what is required to be agreed for the necessary approval to be gained.

The dispute with Beach has been set down for trial in the week commencing on 18 July 2011 in Adelaide. This means that while the Company is waiting for the flood waters to subside and for access to the ATP855P tenement to be restored, Icon Energy can seek to dispose of Beach's claim. In the interim, the Company can get on with planning the next stage of drilling operations in the Nappamerri Trough, following the completion of drilling operations in the Surat Basin. Therefore, whatever the outcome, Icon Energy's exploration is to continue as required by the terms of the obligation under the ATP.

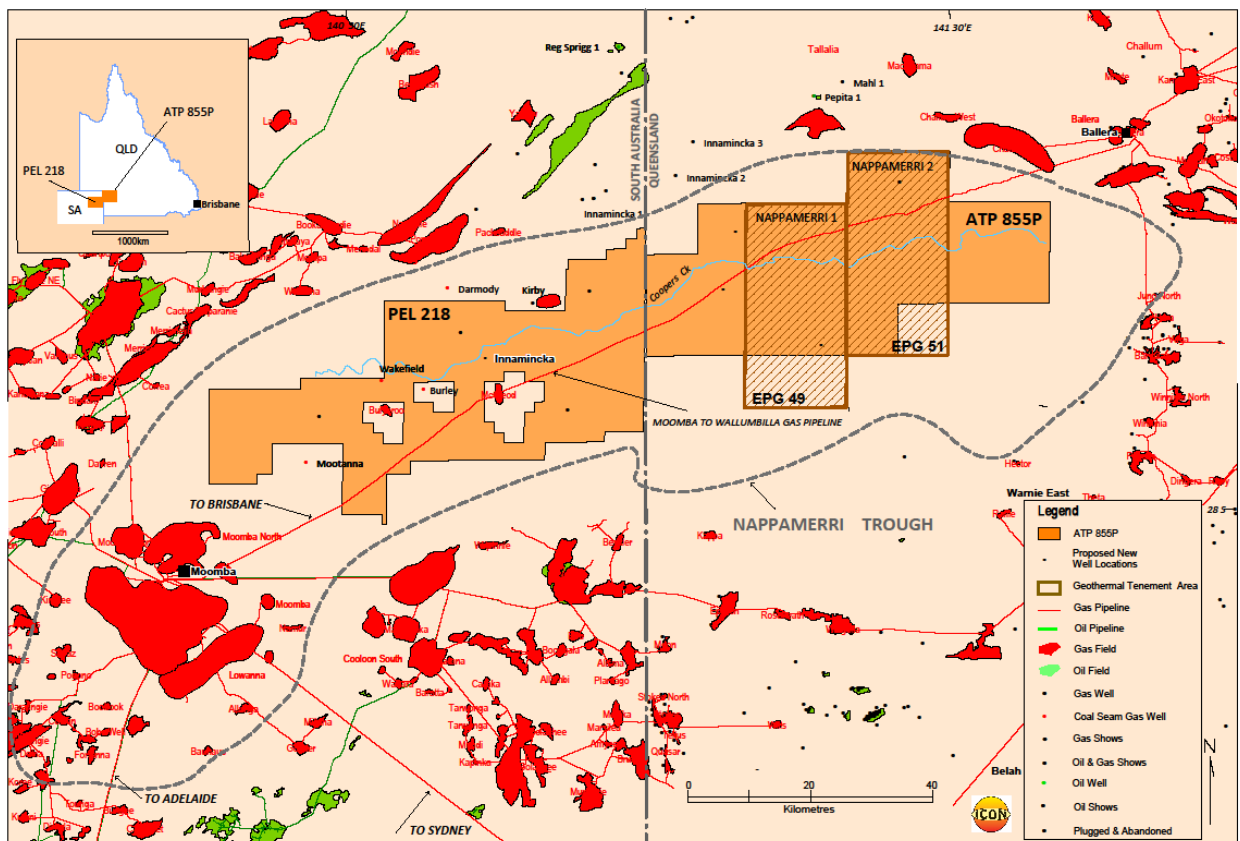
Various undertakings were voluntarily given by both Beach and Icon Energy in order to ensure that the matter is heard in an expedient manner.

There is no material downside for Icon Energy in its dispute with Beach, particularly in the context of the industry assessments of the shale gas potential of the Nappamerri Trough and the prospect of the Company retaining its full 80% interest in ATP855P.

The Company is steadfast in its position that negotiations had not been concluded and that Beach has not farmed in to ATP855P (as Beach claims).

The Company has consistently informed the market that it is well placed if it were to hold a 40% interest but that it is not concerned about being unable to reach agreement with Beach.

The following map delineates the location and extent of the ATP855P tenement and its proximity to PEL218, in which Beach has drilled the Encounter-1 and Holdfast-1 wells.



## Queensland – Geothermal Exploration – EPG49 and EPG51

In January of this year, Icon Energy applied to the Australian Government for an innovation patent in relation to a new geothermal process well design. On 10 February 2011, the innovation patent was granted in respect of the application, and will continue for a term of 8 years.

The newly patented process is designed to increase the efficiency of geothermal system, consequently decreasing the costs associated with drilling geothermal wells.

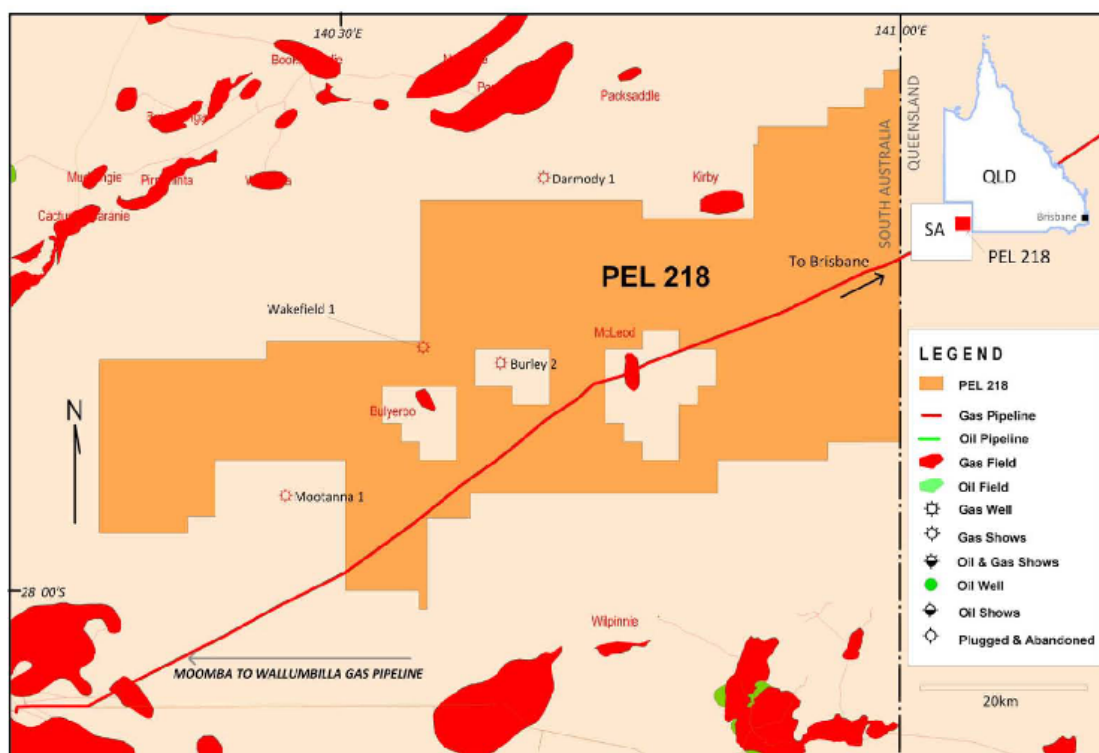
While the Company will be seeking to establish the geothermal potential of the EPG 49 and EPG 51 tenements (both of which overlie the central portion of the prized ATP855P tenement), geothermal operations are not a core focus for the Company.

The map on page 9 delineates the location of EPG49 and EPG51.

## South Australia – Petroleum Exploration – PEL218

No further work has been undertaken on this tenement since the Company’s activities report for the quarter ending 31 December 2010.

The following map delineates the location of the Post Permian Section of PEL218.



## Victoria – Petroleum Exploration – PEP170

Based on its geological and geophysical desktop studies, as well as existing seismic and well data, Icon Energy has now identified two target well locations in PEP170, and intends to drill at least one of those wells during this year.

Icon Energy is in the final stages of preparing its operating management plan (**OMP**) as required by the *Petroleum Act 1998 (Vic)*, and intends to submit the operating plan to the Victorian Department of Primary Industries (**DPI**) during the second quarter of 2011.

Subject to approval of the operating plan by the DPI, Icon Energy plans to drill this well in the second or third quarter of 2011 (subject to rig availability).

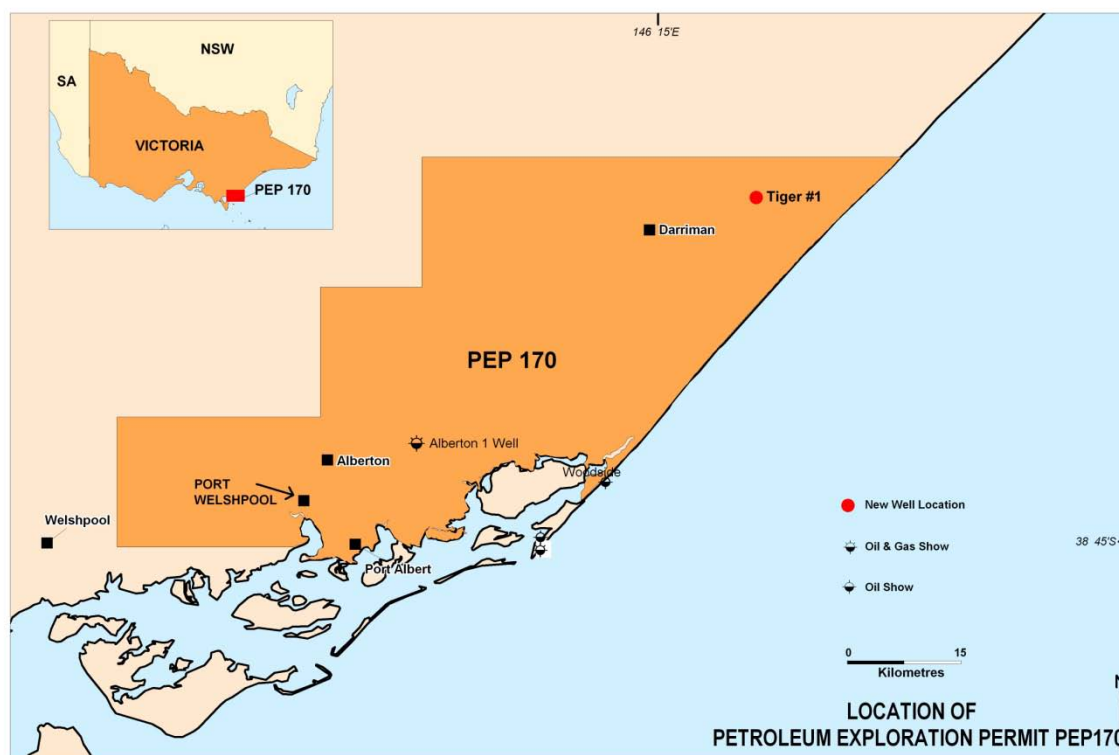
The objectives of the initial exploration well programme will be to:

1. determine presence of net thickness of sand packages and the presence of hydrocarbons in the Strzelecki and Latrobe formations;
2. obtain modern open hole logs to determine net thickness of sand packages;
3. obtain permeability information from Drill Stem Testing (*DST*);
4. obtain core samples from the Strzelecki formation to enable optimised fracture stimulation design;
5. obtain downhole fluid samples of any hydrocarbons encountered; and
6. suspend or plug and abandon the well subject to the evaluation of the data received during the drilling of the well.

A subsequent completion will follow pending the open-hole evaluation of logs and engineering data obtained during the drilling of the well.

Icon Energy has engaged Coffey International Limited (a leading global professional services consultancy to the oil and gas industry) to assist in the preparation of the OMP which must address environmental, anthropological and safety issues along with details of the wells proposed and compensation agreements required. A drilling rig has been identified but is awaiting OMP approval before going to contract.

The following map delineates the proposed first well location, Tiger#1, in PEP170.



## Corporate & commercialisation projects

### China LNG Project

On 29 March 2011 the Company signed a landmark LNG Sales Agreement with Chinese company Shantou SinoEnergy for the sale of 40 million tonnes of liquefied natural gas (**LNG**) over a 20 year period (**LNG Sales Agreement**).

The LNG Sales Agreement builds upon the Memorandum of Understanding (**MOU**) executed by Shantou SinoEnergy and the Company in April 2010 and provides for the commencement of the delivery of LNG to Shantou SinoEnergy by 30 June 2016.

Under the terms of the LNG Sales Agreement, Icon Energy is at liberty to source feedstock gas from its own tenements or other sources and to effect the delivery of LNG out of any port (on an FOB basis).

Icon Energy is in the process of discussing commercial arrangements and opportunities with third parties with regard to the supply of start-up feedstock gas and the development of that feedstock gas for supply as LNG (including through tolling arrangements). Both of these initiatives are being pursued with the aim of supplementing Icon Energy's own operations to secure the necessary 2TCF certified reserves required for supply under the contract.

Shantou SinoEnergy is joined by China's state-owned China Guodian Corporation in a joint venture for the receiving and distribution of the LNG (as gas).

China Guodian Corporation is one of China's largest State-owned power generation groups, whose core business includes the development, investment, construction, operation and management of power generation, as well as the sale of power and heat. In July 2010, China Guodian Corporation was listed in the Fortune Global 500, and by the end of June 2010 its total assets reached US\$68.5 billion. China Guodian Corporation currently owns 45 secondary branches and sub-companies and over 300 subsidiaries as well as 5 Chinese A-share listed companies and one listed company in Hong Kong. China Guodian Corporation covers 31 provinces and has over 120,000 employees.

The Company's principal plan remains to source the necessary feedstock gas via its current tenements in South Australia, Victoria and Queensland, gas swaps, arrangements with existing joint venturers, new farmin agreements and the securing of additional tenements.

### Domestic / Micro LNG Project

While LNG export remains the primary LNG focus for the Company, the Board continues to consider the potential for smaller domestic LNG sales for the early commercialisation of the Company's operations.

Preparatory groundwork has been laid and the indicative feasibility data modeled to date, in conjunction with strategic partners, points to considerable potential. Further details remain commercial-in-confidence and are the subject of ongoing negotiations, but (as reported last quarter) the project substantially consists of standalone plants producing up to 50 tonnes of LNG each per day for domestic consumption.

The Board will report to shareholders and the market any further developments as they transpire.

## Subsequent events

### Drilling commences in ATP626P

Icon Energy mobilised the Atlas Drilling Rig # 2 on 14 April 2011 to commence drilling three exploratory wells in the ATP626P Lydia Block, in which Stanwell has farmed into.

The drilling programme forms part of Stanwell's Stage 2 investment (through wholly owned subsidiary Goondi Energy Pty Ltd) in ATP626P, located in the Surat Basin, to earn a 50% interest in the four graticular blocks which make up what is known as the Lydia Block.

The figure below indicates the well positions for the Lydia 10, 11, and 12 exploration wells, the first of which (Lydia 10) was spudded on 17 April 2011.

## Funding

Icon Energy completed the first quarter of 2011 with a cash balance of \$17,938,000.

Yours faithfully,

Wesley Glanville  
Company Secretary  
Icon Energy Limited



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Or visit [www.iconenergy.com](http://www.iconenergy.com)

## **Annexure 1: EIA Report**

Annexure 1 comprises the relevant section of the Energy Information Administration's "*World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*", United States of America, 5 April 2011, relating to shale potential in the Cooper Basin in Australia.

## XIV. AUSTRALIA

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### INTRODUCTION

Australia has major gas shale potential in four main assessed basins. Additional potential may exist in other basins that were not assessed due to budget and data limitations. With geologic and industry conditions resembling those of the USA and Canada, the country appears poised to commercialize its gas shale resources on a large scale. The Cooper Basin, Australia's main onshore gas-producing basin, could be the first to develop, although its Permian-age shales have a non-marine (lacustrine) depositional origin and the gas has elevated CO<sub>2</sub> concentrations. Santos and Beach Energy testing the shale reservoirs in this basin, with reservoir core wells being drilled and initial frac production test wells planned for later in 2011.

Other prospective shale basins in Australia include the small, scarcely explored Maryborough Basin in coastal Queensland, which contains prospective Cretaceous-age marine shales that are over-pressured and appear gas saturated. The Perth Basin in Western Australia, undergoing initial testing by AWE and Norwest Energy, has prospective marine shale targets of Triassic and Permian age. Finally, the large Canning Basin in Western Australia has deep, Ordovician-age marine shale that is roughly correlative with the Bakken, Michigan, and Baltic basins. **Figure XIV-1** shows the main prospective gas shale basins of Australia. These basins hold an estimated total 396 Tcf of technically recoverable shale gas resources, **Table XIV-1**.

Figure XIV-1. Australia's Prospective Gas Shale Basins, Gas Pipelines, and LNG Infrastructure

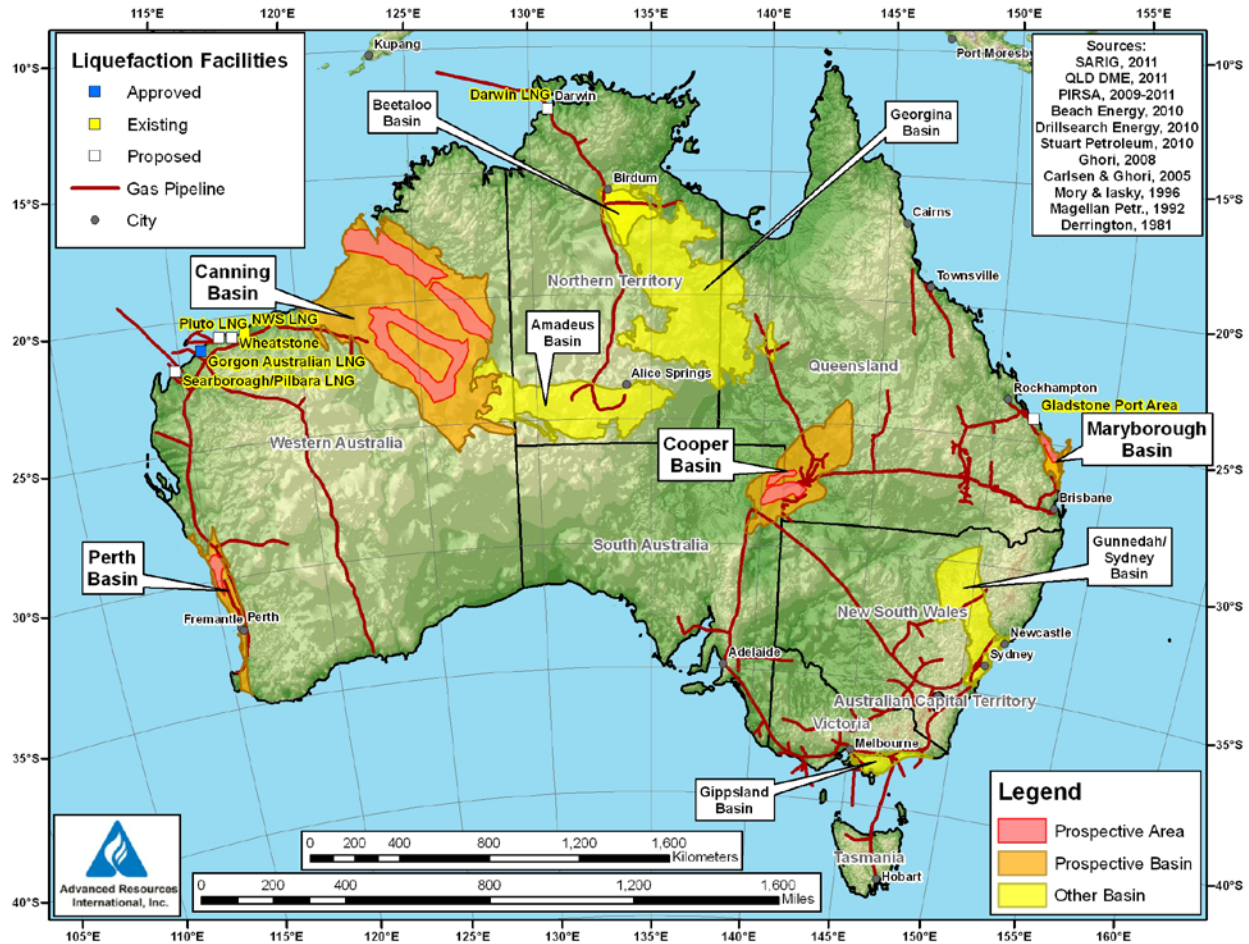


Table XIV-1. Shale Gas Reservoir Properties and Resources of Australia

Basic Data	Basin/Gross Area		Cooper Basin (46,900 mi <sup>2</sup> )	Maryborough Basin (4,290 mi <sup>2</sup> )	Perth Basin (12,560 mi <sup>2</sup> )		Canning Basin (181,000 mi <sup>2</sup> )
	Shale Formation		Roseneath-Epsilon-Murteree	Goodwood/Cherwell Mudstone	Carynginia Shale	Kockatea Fm	Goldwyer Fm
	Geologic Age		Permian	Cretaceous	Upper Permian	Lower Triassic	M. Ordovician
Physical Extent	Prospective Area (mi <sup>2</sup> )		5,810	1,555	2,180	2,180	48,100
	Thickness (ft)	Interval	0 - 1,800	300 - 3,000	300 - 1,500	300 - 3,000	300 - 2,414
		Organically Rich	500	1,250	950	2,300	1,300
	Net	300	250	250	230	250	
Depth (ft)	Interval	6,000 - 13,000	5,000 - 16,500	4,000 - 16,500	3,300 - 16,500	3,300 - 16,500	
	Average	8,500	9,500	10,700	10,000	12,000	
Reservoir Properties	Reservoir Pressure		Moderately Overpressured	Slightly Overpressured	Normal	Normal	Normal
	Average TOC (wt. %)		2.5%	2.0%	4.0%	5.6%	3.0%
	Thermal Maturity (%Ro)		2.00%	1.50%	1.40%	1.30%	1.40%
	Clay Content		Low	Low	Low	Low	Low
Resource	GIP Concentration (Bcf/mi <sup>2</sup> )		105	110	107	110	106
	Risked GIP (Tcf)		342	77	98	100	764
	Risked Recoverable (Tcf)		85	23	29	30	229

Given budget limitations for this study, other less promising basins in Australia were rapidly screened out as non-prospective for gas shale development. These include the Sydney Basin (where Permian coal measures are mature but appear ductile); Lorne Basin (no apparent potential source rocks); the Clarence-Moreton, Ipswich, Surat, Eromanga basins (Jurassic Walloon Coal Measures are mature but appear ductile); Gippsland Basin (coaly shale appears ductile); and Amadeus Basin (thin shale in a mostly sandstone unit). However, these and other basins warrant further evaluation at a future time.

#### COOPER BASIN (SOUTH AUSTRALIA AND QUEENSLAND)

Straddling the South Australia and Queensland border, the Cooper Basin has been the Australia's main onshore gas supply region for the past several decades. Current production from the basin is about 0.5 Bcfd of natural gas from conventional and low-permeability reservoirs. Within the basin, the Nappamerri Trough contains thick, overpressured and organic-rich shales at prospective depth, as well as extensive deep coal deposits. Gas pipelines connect the basin to Sydney and other urban markets in eastern Australia. With extensive tight sandstone gas production, the basin has service industry capability for advanced hydraulic fracturing that could be adapted for developing gas shale reservoirs.

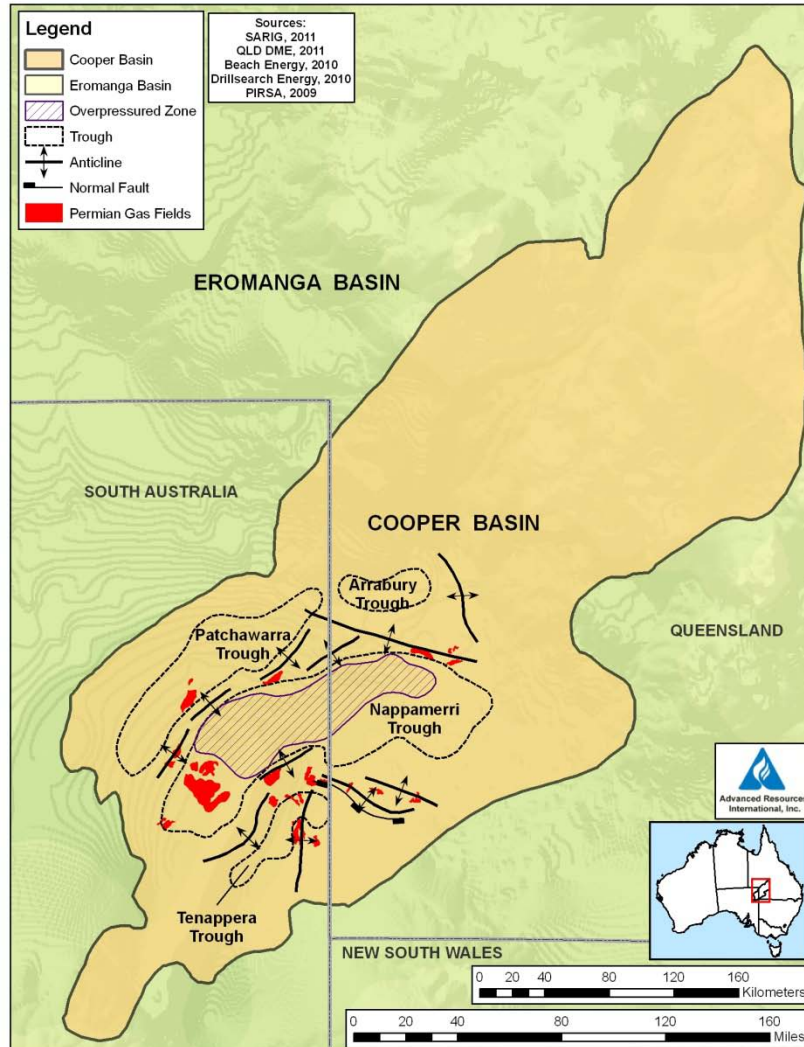
However, while overall the Cooper Basin appears favorable for shale gas development, a key risk remains that the shales were deposited in a lacustrine (not marine) environment. In addition, high CO<sub>2</sub> occurs in the deeper more mature troughs, though concentrations may be lower in shallower settings.

**Geologic Characterization.** The Cooper Basin is a Gondwana intracratonic basin containing about 2.5 km of entirely non-marine Late Carboniferous to Middle Triassic strata, which include prospective Permian-age shales. Following an episode of regional uplift and erosion during the late Triassic, the Cooper Basin continued to gently subside and the Paleozoic sequence was unconformably overlain by up to 1.3 km of Jurassic to Tertiary deltaic deposits of the Eromanga Basin, which contain the basin's conventional sandstone reservoirs.<sup>1</sup>

Extending over a total area of about 130,000 km<sup>2</sup>, the Cooper Basin contains four major deep troughs with shale gas potential (Nappamerri, Patchawarra, Tenappera, and Arrabury; **Figure XIV-2**). These troughs are separated by faulted anticlinal structural highs, from which the Permian shale-bearing strata largely have been eroded.<sup>2</sup> Conventional oil and gas

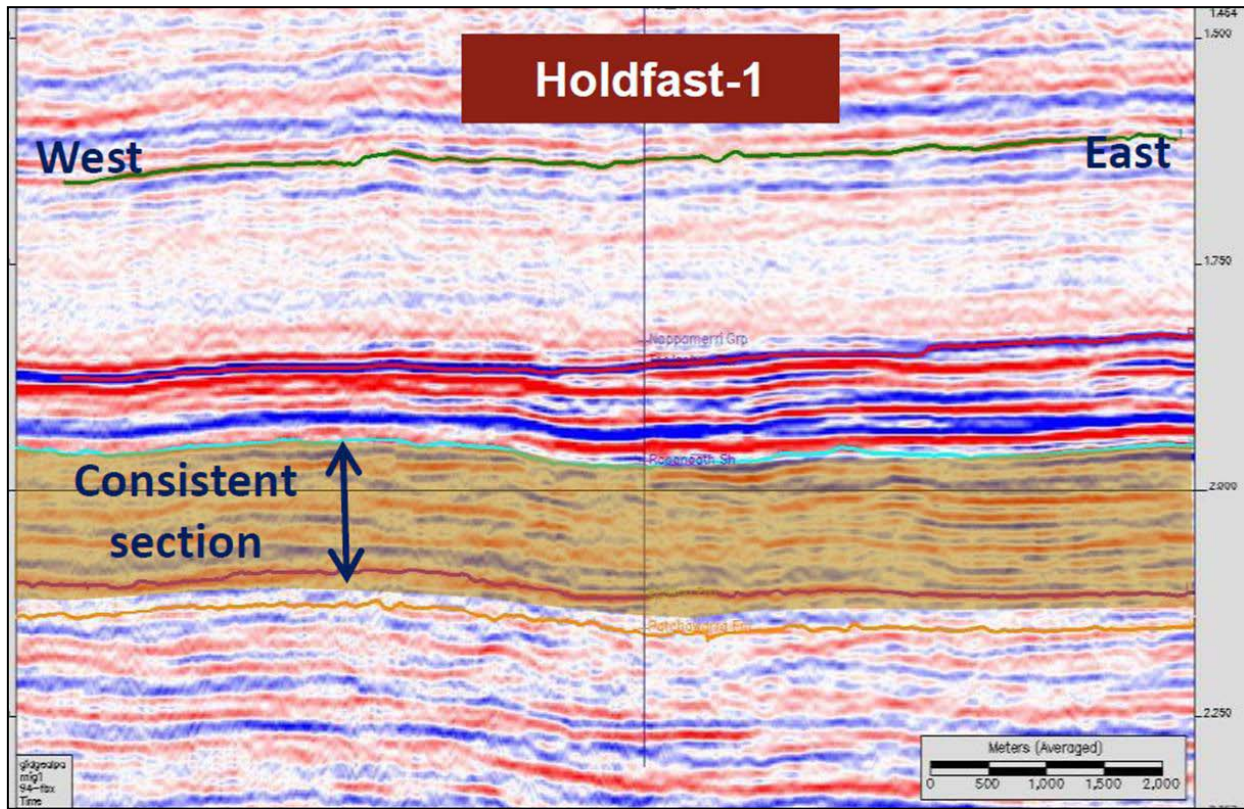
generated by the organic-rich shales and coals within the Nappamerri, Tenappera and other deep hydrocarbon kitchens accumulated along the Murteree and other uplifted ridges.

Figure XIV-2. Major Structural Elements of the Cooper Basin.



The Nappamerri Trough is particularly large (15,000 km<sup>2</sup>), deep (>10,000 feet), thermally mature, and overpressured, and thus appears to be the most prospective portion of the Cooper basin for gas shale development. The top Permian horizon reaches maximum depths of over 9,000 feet in the center of the Nappamerri Trough and over 10,000 feet in the Patchawarra Trough. Prospective Permian shales, approximately 2,000 feet below the top Permian, occur at depths of 10,000 to 14,000 feet. Nearly the entire extent of the two troughs appears to be depth-prospective for shale development. Furthermore, relatively little faulting occurs within these troughs, **Figure XIV-3**, as structural deformation is confined largely to the uplifted ridges.

Figure XIV-3. Seismic Reflection Line Showing Permian REM Sequence In The Cooper Basin And Location Of Beach Energy's Planned Holdfast-1 Test Well, Scheduled For January 2011.

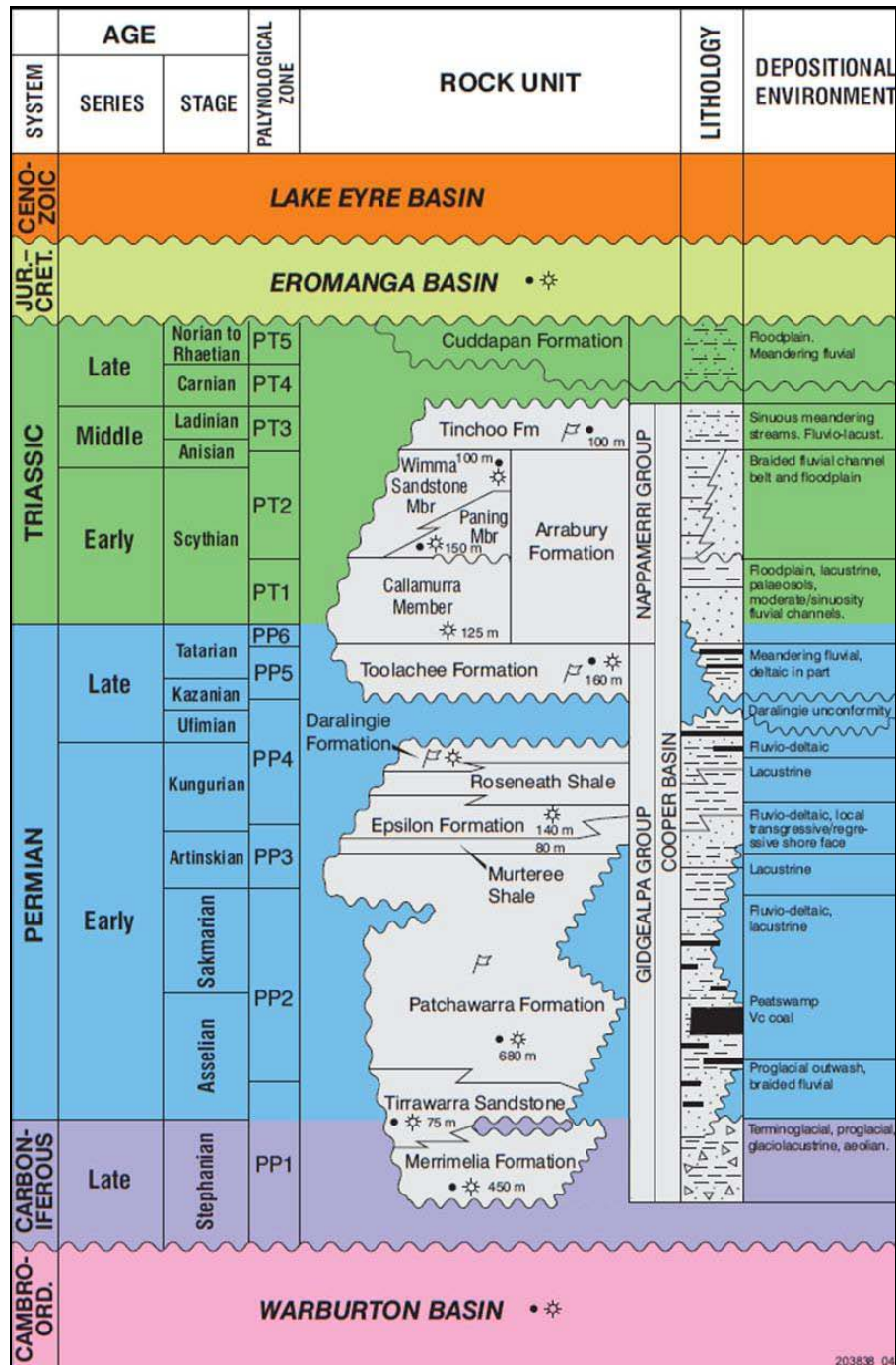


Source: Beach Energy, 2010

The stratigraphy of the Cooper Basin is shown in **Figure XIV-4**. Conventional and tight sandstone oil & gas reservoirs are found in the Patchawarra and Toolachee formations, interbedded with coal deposits. These were sourced by two organic-rich complexes: the Late Carboniferous to Late Permian Gidgealpa Group and the Late Permian to Middle Triassic Nappamerri Group, both of which were deposited in non-marine settings. Of the two source rock groups, the Gidgealpa Group appears the more prospective. Most of the gas generated by the Nappamerri Group likely came from its multiple, thin, discontinuous coal seams; shales in this unit are low in TOC, humic, and often oxidized.

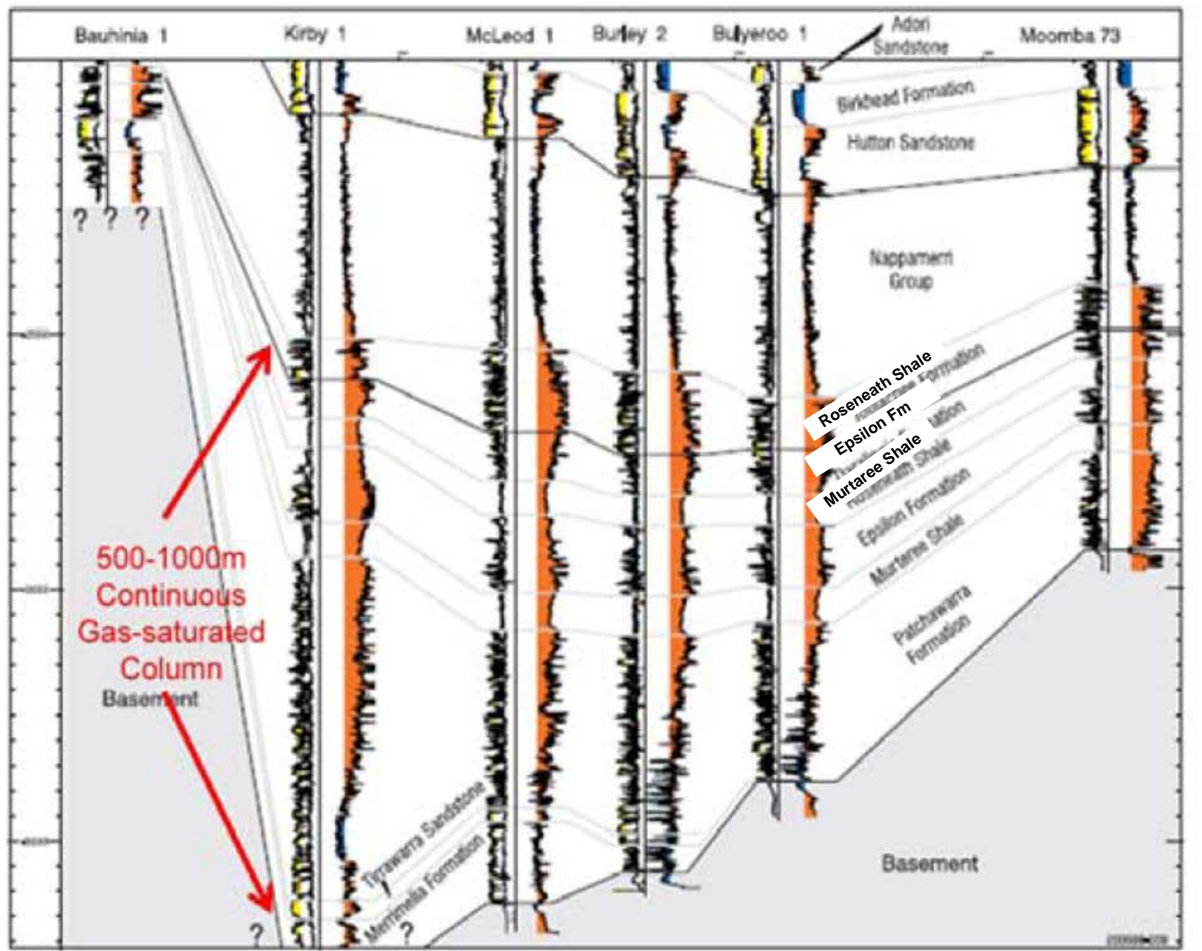
Although deposited in lacustrine environments, the best shale exploration targets within the Gidgealpa Group appear to be the Early Permian Roseneath and Murteree shales.<sup>3</sup> **Figure XIV-5** shows a stratigraphic cross-section of the Roseneath, Epsilon, and Murteree (collectively termed REM) sequence in the Nappamerri Trough.

Figure XIV-4. Stratigraphy of the Cooper Basin, Showing Permian-Age Shale Targets (Roseneath, Epsilon, Murteree)



Source: South Australia DMER, 2010

Figure XIV-5. Stratigraphic Cross-Section In The Cooper Basin Showing The Laterally Continuous REM Section.



Source: DrillSearch Energy, 2010

The Murteree Shale (Artinskian) is a widespread, primarily shaley formation typically 50 m thick across the Cooper Basin, becoming as thick as 80 m in the Nappamerri Trough. The Murteree consists of dark organic-rich shale, siltstone and fine-grained sandstone, becoming sandier to the south. TOC of the Murteree Shale averages approximately 2.5%, about 84% of which is inertinite, based on analyses from seven wells. The Roseneath Shale, less widespread than the Murteree due to erosion on uplifts, averages 37 m thick, reaching up to 100 m thick in the Nappamerri Trough. The Roseneath is somewhat leaner than the Murteree, with TOC averaging just over 1.0%. The intervening Epsilon Fm consists primarily of low-permeability (0.1 to 10 mD) quartzose sandstone with carbonaceous shale and coal. The Epsilon, averaging about 53 m thick in drill cores, was deposited in a fluvial-deltaic environment.<sup>4</sup>

The total thickness of the REM sequence in the western Nappamerri Trough averages about 1,000 feet.<sup>5</sup> The unit becomes generally thicker to the east and north, where it reaches a maximum of about 1,800 feet. The REM sequence appears to have prospective shale thickness across the entire western Nappamerri Trough.

The REM source rocks are dominated by Type III kerogens derived from plant assemblages. They have generated medium to light (30-60° API gravity) oil rich in paraffin. Initial mineralogical data indicate that these shales consist mainly of quartz and feldspar (50%) and carbonate (30%; mainly iron-rich siderite). Clay content is relatively low (20%; predominately illite).<sup>6</sup> In spite of the lacustrine depositional origin, this lithology appears brittle and could respond well to hydraulic fracturing.

Temperature gradients in the Cooper Basin are high, averaging 2.55°F/100 ft. Bottomhole temperature at depths of 9,000 feet average about 300°F. The Nappamerri Trough is even hotter, with a gradient of up to 3.42°F/100 ft, due to its radioactive granite basement. The Patchawarra Trough, which has a sedimentary-metamorphic basement, has a lower but still elevated 2.02°F/100 ft temperature gradient.

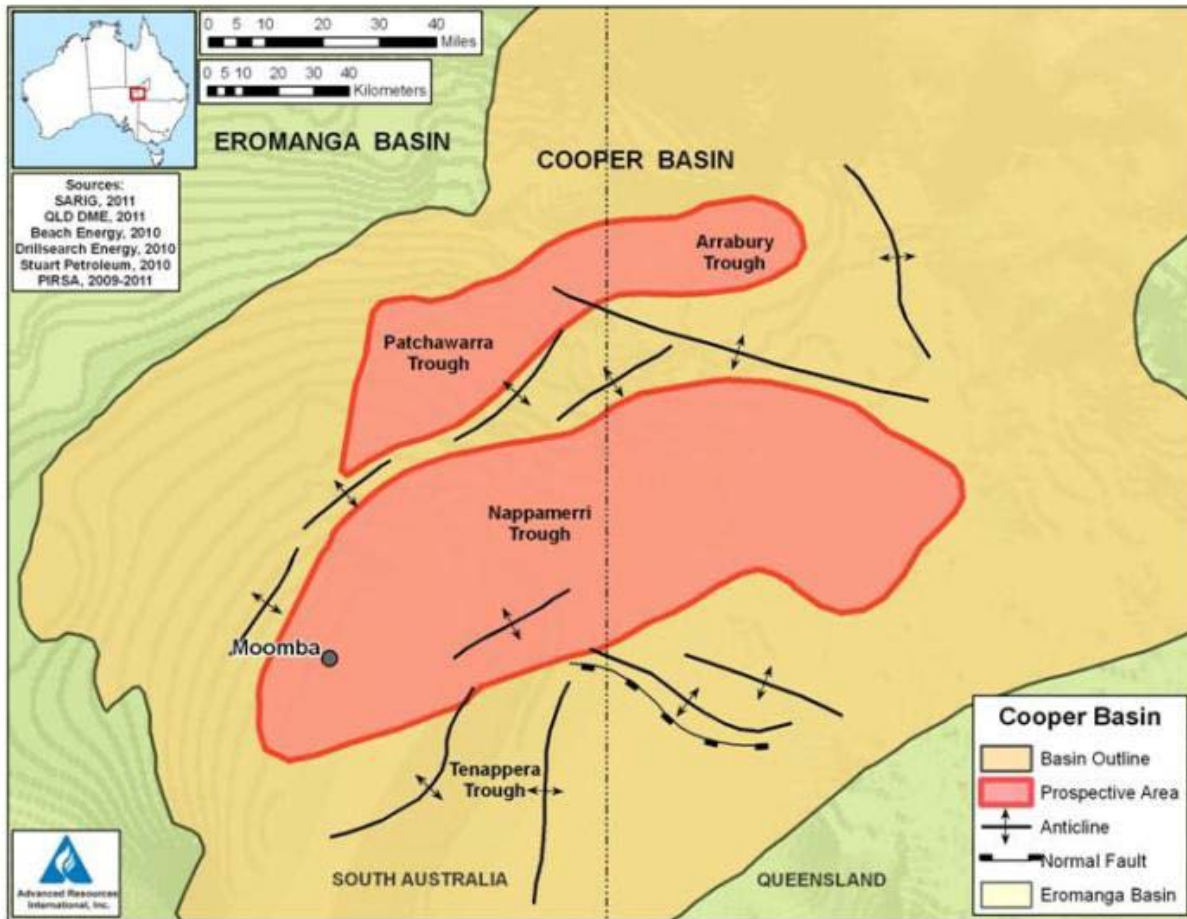
The thermal maturity of the Permian REM section in the Nappamerri Trough is gas prone ( $R_o = 3\%$  to  $4\%$ ), whereas the Patchawarra Trough has lower thermal maturity ( $R_o = 1\%$ ). Hydrostatic regional pressure gradients occur in most of the Cooper Basin, but locally in the Nappamerri Trough can become overpressured at depths of 2,800 to 3,700 m.<sup>7</sup> Pressure gradients of up to 0.7 psi/ft have been recorded in the deepest portions of the Nappamerri Trough.

High levels of carbon dioxide are common in the Cooper Basin. Gas produced from tight sandstones in the Epsilon Formation (central portion of the REM sequence) contains elevated  $CO_2$ , typically ranging from 8% to 24% (average 15%). Gas produced from the Patchawarra sandstone, which underlies the REM shale sequence, contains even higher levels of  $CO_2$  (8-40%).<sup>8</sup>

**Resources (REM Sequence).** ARI evaluated the area that could be prospective for shale gas development in the Cooper Basin, using standard minimum depth (6,000 feet) and vitrinite reflectance ( $R_o > 1.0\%$ ) cutoffs, **Figure XIV-6**. Completable shale intervals in the Rosemead, Epsilon, and Murteree (REM) formations have an estimated resource concentration of 105 Bcf/mi<sup>2</sup>, benefitting from favorable thickness, moderate TOC, high thermal maturity, and

overpressuring, but reduced for 15% average CO<sub>2</sub> content. The prospective area for this Permian shale-bearing sequence is estimated to be approximately 5,500 mi<sup>2</sup>, covering portions of the Nappamerri, Arrabury, and Tenappera troughs. Net of 15% CO<sub>2</sub> content, the estimated risked completable shale gas-in-place for the REM sequence is approximately 342 Tcf, while risked recoverable resources are approximately 85 Tcf, **Table XIV-1**.

Figure XIV-6. Western Portion Of The Cooper Basin Showing Approximate Prospective Shale Gas Area.



**Activity.** The Cooper Basin is Australia's largest onshore oil and gas production region. Oil and gas development began in the basin during the 1960's, while hydraulic fracturing of low-permeability formations began in 1968 and has been extensively used since. More than 400 wells have been hydraulically stimulated in the Cooper basin to date, though the jobs were much smaller (typically 50,000 lbs sand with 50,000 gal fluid) than used in modern horizontal shale wells. Nevertheless, the Cooper basin has Australia's best capabilities for fracking shale reservoirs. Current production from conventional and tight formations in the basin totals nearly 600 Mcfd from 700 gas wells and 2,500 bopd from 50 oil wells.

The Cooper Basin also has been Australia's most active area for gas shale leasing and testing. Santos, Beach Energy, and DrillSearch Energy have active shale evaluation programs, though only Beach is known to have drilled a test well. Starting in October 2010 Beach drilled and completed a vertical shale test well in the eastern Nappamerri Trough, thought to be Australia's first dedicated shale test well. Drilled to a total depth of 3,612 m, the well penetrated 393 m of REM shale formation with continuous gas shows. The company is analyzing five REM cores for gas content and mechanical properties. Beach plans to conduct an 8-stage frac of the Encounter-1 test well during 2Q-2011.