Upcoming Exploration and Appraisal Activity in Africa

Investment Highlights

- **ASX exposure to highly prospective acreage in Africa.** There are a number of Aussie explorers with prospective oil and gas acreage in West and North Africa with significant exploration and appraisal programs planned over the coming 24-months. The activity will commence with COE’s and JKA’s upcoming Menzel Horr-1 exploration well in November, followed by the JV’s appraisal of the Hammamet West discovery in mid-2011 and also includes RIA’s appraisal of existing discoveries in its Cote d’Ivoire acreage planned for late 2011 and an exploration well for ADX/XST onshore Tunisia in December.

- **Africa is a highly prospective region with several countries providing stable environments and fiscal regimes.** These include Tunisia, Ghana, Cote d’Ivoire which provide highly prospective acreage, good fiscal terms and opportunity for small-cap oil and gas explorers.

- **Exploration Activity in West Africa heating up on the back of recent discoveries.** West Africa has had an interesting history of oil and gas production with International Oil Companies (IOC’s) pursuing attractive petroleum systems in challenging political and technical environments. Activity has heated up more recently in the Ivorian Basin and surrounding areas on the back of the 2007/2008 giant 1.8bnbbl Jubilee Oil Field discovery. Jubilee was not only significant for the size of the discovery but discovered a new stratigraphic channel sands play and has significantly enhanced the prospectivity and reserves potential of the Ivorian basin and other similar adjacent basins.

- **RIA has an exciting portfolio of appraisal opportunities in the Ivorian and adjacent Keta-Benin Basin in West Africa.** Its Block CI-202 is estimated to hold gross total mean contingent and prospective resources of 220mmbbls of oil and 893bcf gas which will be the subject of a reserves assessment in early 2011 followed by a substantial appraisal program planned for Q4 2011. In Ghana, together with TAP, RIA will be acquiring additional seismic in the deepwater area of the highly prospective Offshore Accra Contract Area and drilling planned for a shallow water target in late 2011/early 2012.

- **Drilling Menzel Horr in Tunisia in November.** COE and JKA will commence drilling of the Menzel Horr -1 exploration well onshore Tunisia this year, targeting 24mmbbls. The well provides significant potential for both parties with unrisked upside of +$0.70/sh for COE and +$0.99/sh for JKA. This will be followed by an offshore appraisal well at the Hammamet West discovery in mid-2012, targeting 67mmbbls. Hence, both parties have an active African program.

- **ADX/XST to drill an onshore exploration well and progress the potential development of the Dougga and Lambouka discoveries.** ADX will commence drilling of the Sidi Daher prospect in central Tunisia in December 2010, targeting an estimated 44mmbbls oil and 175bcf gas and is highly leverage to the potential commercialisation of the Lambouka and Dougga gas and condensate discoveries offshore Tunisia. Key catalysts include an updated resource assessment on the back of recent drilling - planned for early 2011, plus planned appraisal drilling at both fields in Q3 2011.

- **Africa non-core for ROC but drilling Aleta in 2011 subject to farmout.** ROC continues to highlight its intention reduce its exposure in Africa yet has plans to drill the deep water Aleta prospect in Equatorial Guinea in 2011, subject to a successful farmout. It is also currently appraising the Castanha discovery, although this is relatively immaterial to ROC and planning for acquisition of seismic in the Mozambique Channel.
Summary

A number of ASX listed oil and gas companies with prospective assets in Africa have significant exploration and appraisal activities planned for the coming 24-month period. This note provides a brief background on oil and gas exploration in West and North Africa and a focus on the upcoming activities of stocks under coverage including COE (BUY - price target of $0.67/sh), RIA (SPECULATIVE BUY - price target of $0.94/sh), TAP (BUY - price target of $1.37/sh (under review)) and ROC (BUY – price target of $0.63/sh) plus others including JKA (not-rated), ADX(not-rated) and XST(not-rated). Key events include the drilling of the Menzel Horr-1 exploration well in Tunisia (COE and JKA) planned for November and RIA’s appraisal of existing discoveries in its highly prospective CI-202 permit in the Ivorian Basin, planned for late 2011. In addition RIA and TAP will commence the acquisition of additional seismic in deeper water areas of the Offshore Accra block in Ghana with drilling targeted for late 2011/early 2012. ADX/XST have a busy 2010/2011 planned with further appraisal of the Lambouka and Dougga discoveries plus an exploration well in Q4 2010. We have also included information in ROC’s activities, although the company continues to highlight that this area is non-core and looking to reduce its exposure in Africa. It has plans to drill the deep water Aleta prospect in Equatorial Guinea in 2011, but only subject to a successful farmout and will continue to appraise the Castanha discovery, although this is relatively immaterial to ROC.

Africa is a significant producer of oil and gas, accounting for some 12% of world oil production in 2009 (from key countries including Nigeria, Angola, Libya and Algeria) and also a significant gas producer, accounting for ~23% of the worlds production in 2009. Several of Africa’s producing countries provide highly prospective and safe environments for exploration, including Tunisia, Ghana and Cote d’Ivoire. Of particular interest is the significant increase in exploration activity offshore West Africa in the Ivorian and adjacent basins following the 2007/2008 discovery of the giant Jubilee Oil Field. While the size of the 1.8bnbbl discovery was significant in its own right, the discovery also identified a new stratigraphic play type as a direct result of recent developments in 3D seismic processing, reprocessing and interpretation techniques. With several of our stocks participating in high impact exploration and appraisal activities over the coming 24-months we thought it useful to summarise the targets, schedule and potential upside. The following table provides a summary:

**Figure 1: Upcoming African Activity**

<table>
<thead>
<tr>
<th>Location</th>
<th>Permit</th>
<th>Participants</th>
<th>Interest</th>
<th>Key Prospect or Discovery</th>
<th>Description</th>
<th>Gross Estimate</th>
<th>Upcoming Activity</th>
<th>Well Timing</th>
<th>Unrisked Upside $/sh</th>
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<td>Bangou</td>
<td>COE</td>
<td>85%</td>
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<td>Stacked multiple carbonate formations</td>
<td>P$0 Prospective Resource of 24mmbbls</td>
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<td>JKA</td>
<td>15%</td>
<td>Hammamet West Discovery</td>
<td>Targets Abiod and Birsans structures</td>
<td>P$0 Contingent Resource of 61mmbbls</td>
<td>Hammamet West-3 horizontal appraisal</td>
<td>Q3 2011</td>
<td>$1.15</td>
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<td>Tunisia - Offshore</td>
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<td>15%</td>
<td>6 discoveries (4 appraisal wells and 1 exploration well planned)</td>
<td>Stratigraphic or stratigraphic/structural traps</td>
<td>Total Mean Contingent – Prospective resource of 223mmbbls oil and 899bcf gas</td>
<td>Firm prospects announced 1Q 2011, Resource upgrade 2Q 2011</td>
<td>Q4 2011</td>
<td>$3.82</td>
<td>$0.57</td>
<td>676%</td>
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<td>Ivory Coast</td>
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<td>$0.10</td>
<td>220%</td>
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<tr>
<td>Equatorial Guinea</td>
<td></td>
<td>JKA</td>
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<td>260%</td>
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</tr>
<tr>
<td>Angola - Offshore</td>
<td>Cabinda South</td>
<td>ROC</td>
<td>19%</td>
<td></td>
<td>2x 100mmbbl + size leads identified</td>
<td>Additional seismic in deepwater. Shallow water exploration well</td>
<td>Late 2011/2012</td>
<td>$0.26</td>
<td>$0.10</td>
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</table>

Notes:
1. Existing Interest 85% - Assume COE farms-out for a final 50% interest in Hammanet West
2. Existing Interest 37.5% - Assume ROC farms-out for a final 19% interest
3. COE will only drill subject to successful farmout
4. Assumes additional dilution for forward program
5. Assumes additional $150m dilution for funding of drilling campaign
6. Assumes additional dilution for forward program
7. Assumes additional dilution for forward program
8. RIA has right to up to 15% interest in Contract Area

Source: Various

All information and advice is confidential and for the private information of the persons to whom it is provided and is provided without any responsibility or liability on any account whatsoever on the part of this firm or any employee thereof.
Of the activities summarised above there are a number of key highlights which will likely provide significant catalysts:

- Drilling of Menzel Horr (COE/JKA) - November 2010. The onshore location makes this well a low cost/high upside event and a worthy drill target on this basis. Menzel Horr-1 will target 24mmbls of oil, providing unrisked upside of +$0.70/sh for COE and +$0.99/sh for JKA. JKA provides the larger upside leverage, while COE provides balanced exposure.

- Reserves certification for the existing discoveries at CI-202 (RIA) based on integration of latest technical work and development studies - Q2 2011. We anticipate maiden reserves in the order of 40-50mmbls which will provide a significant catalyst for RIA. This will be followed by appraisal drilling in CI-202 - Q4 2011.

- In the medium term, drilling of the Ghana Accra contract area will provide a key catalyst for TAP and RIA with +100mmbbl targets identified on 3D seismic and drilling planned for late 2011/2012. This is a highly prospective permit and should generate significant interest in the lead up to drilling as prospects are prioritised and details provided to the market. Early drilling will target the shallow water and proven Albian play while further seismic in the deeper water will be acquired to identify Jubilee-style turbite targets.

- ADX/XST will be drilling an exploration well on the Sidi Daher prospect in December 2010 and appraisal wells at both Lambouka and Dougga discoveries in 3Q 2011. Release of a pre-feasibility study for Dougga and an updated resource review will be important in outlining a commercial development strategy to the market and likely a key catalyst.

- Drilling of the Aleta prospect in Equatorial Guinea (ROC) - 2011 subject to farmout. This is a deep-water and high-cost/high-risk well so the farm-out could be challenging.
Background

Oil Outlook

The short-term outlook for oil demand is tied to the pace and strength of the recovery in global economic growth. The oil price has risen significantly in recent months driven by stronger financial markets, signs of strengthening demand and a weaker USD, however there are certainly mixed views on the recovery going forward. Regardless of debate on short term demand and its effect on oil prices, demand for oil is expected to increase year on year, driven by growth in non-OECD demand. In the recently released Oil Market Report (IEA October 2010), the IEA revised its global oil demand forecasts for 2010 and 2011 upwards by 0.3mbopd on average to 86.99mbopd and 88.2mbopd, respectively, on the basis of promising demand data and updated growth assumptions. In the longer term the IEA forecasts a significant increase in global energy demand with fossil fuels continuing to dominate the energy mix. The IEA’s longer term forecasts out to 2030 and change in energy mix over this period are summarised below.

![Figure 3: World Energy Demand Forecast to 2030](image1)

![Figure 4: Forecast Change in Energy Mix to 2030](image2)

Source: IEA World Energy Outlook – 2009

Note that the IEA intends to release its updated World Energy Outlook 2010 on the 9th of November 2010.

In the short term we highlight the potential for weakness in the oil price with lower than expected demand in non-OECD countries providing a key risk and excess OPEC supply acting as a buffer. However in the medium to longer term we remain bullish on the demand for oil, driven by strengthening demand in the non-OECD transport sectors against a tighter supply, with the impact of substitution a longer dated risk.

Deeper, Riskier & Further Afield

Regardless of short or medium term risks to the oil price, increasing demand requires any ever increasing replacement of reserves and the exploration and discovery of new supplies of oil and gas. One of the key challenges facing Western oil and gas companies is the tightening supply of access to prospective oil and gas acreage. Over the previous 20 years the proven reserves have been increased by over 30%, however only 2% of this growth has been achieved in OECD or non-OPEC countries, with 81% from OPEC and 17% from the Former Soviet Union. The discovery of oil in OECD regions (i.e. the USA and North Sea) has long been in decline and will continue to present an issue moving forward. Exploration globally by multinationals in pursuit a major commercial hydrocarbons is by no means a new development and have long pushed into politically and environmentally challenging areas to sure up large resources. However it is likely to be increasingly competitive and push exploration further afield and into riskier environments, aided by developments in technology.

The rapid emergence of shale gas in the USA somewhat contradicts the discussion above and highlights the key role that technology plays in defining new oil and gas supplies. This has seen many US firms return to onshore exploration and interest from other global players, including the recent entry of CNOOC into the Eagle Ford Shale.
Impact of Technological Development

Exploration, development and production technology has advanced substantially over the history of production, driven by many inter-related factors, which have resulted in the natural competitive evolution of products and services. The decline of 'easy' hydrocarbons and subsequent higher oil prices drives the need for better solutions, resulting in the exploitation of oil and gas resources that were previously technically and economically constrained. A very recent and important example of this has been the significant emergence of shale gas production onshore the USA and the implications for gas self-sufficiency and global ramifications. Another and more relevant example of the important role technology plays has been the evolution of 3D seismic acquisition, processing and interpretation techniques that has been advanced over the past decade. This has resulted in the discovery of a number of major oil and gas fields including the discovery of the 1.2 billion barrel (bnbbl) Jubilee Oil Field which opened the window for further discoveries in this and similar regional stratigraphic plays.

Oil and Gas Production in West Africa

A very oily region...

Oil was first discovered in West Africa in 1956 in Niger Delta Basin in Nigeria by Shell/BP. Nigeria remains to day the largest producer in Africa, accounting for ~25% of total production and 75% of West African production. Nigeria joined OPEC in 1971 but allowed for multinationals to continue operations in the country. Other major producers included the Cameroon which commenced production in 1977 but it was not until more recently that additional countries emerged which include Cote d'Ivoire (2002), Chad (2003), Mauritania (2006) and Ghana. Although gas was discovered along with oil it was historically flared and only commenced commercial production more recently. LNG production in Nigeria commenced in 1999 and now accounts for ~7% of global LNG output, behind Egypt and Algeria.

Recent excitement following some major discoveries...and a new play...

The Jubilee field was discovered in 2007 by Tullow Oil and Kosmos Energy with the drilling of the Mahogany-1 and Hyedua-1 exploration wells, some 5km apart - both intersecting a large continuous oil accumulation oil. Subsequent appraisal wells successfully defined a massive oil field with an estimated 1.8bnbbls of oil reserves. The Jubilee reservoir is described as a thick and extensive turbite fan system. This was followed by the subsequent Tweneboa (250bnboe) and Odum (120mbbbs) discoveries, also in the Ivorian basin. All three discoveries are stratigraphic or combined stratigraphic/structural traps that were defined using modern exploration techniques including 3D seismic, seismic inversion processing and detailed seismic interpretation and highlight the impact of technological development in identifying new oil reserves.

Due to the recent discoveries within the Ivorian Basin, the demand for oil and gas exploration permits has become increasingly competitive. The Jubilee discovery was significant not only for its size but for a new play type. Afren Energy, an independent oil and gas exploration and production company listed on the London Stock Exchange (LSE) with a market cap of ~A$1.5bn owns block CI-01 which is located near RIA’s CI-202 block. In the deeper waters of the Ivorian basin, Lukoil (one of Russia’s largest energy company’s) has entered block CI-401. Hess Petroleum has made a recent foray into offshore Ghana, by acquiring a 90% interest in Tano Cape Three Points which began exploration in 2008. Other notable competitors within the Ivorian Basin include the Jubilee field partners of Anadarko, Kosmos Energy and Tullow Oil while Canada Natural Resources owns a stake in the Espoir and Baobab fields.

The prospectivity of the Ivorian Basin has been re-confirmed recently with Tullow oil announcing on the 13th of September 2010 that the Owo-1 exploration sidetrack in the Deepwater Tano license offshore Ghana has significantly extended the column of high quality light oil discovered by the Owo-1 well. Results of drilling, wireline logs and samples of reservoir fluids confirm that Owo is a major new oil field. Future drilling in the Ivorian basin (nearby RIA’s acreage) by Tullow oil and Lukoil in mid 2011 could be potential catalysts for RIA if further discoveries are made.
Oil and Gas Production in North Africa

A major oil and gas production hub.

North African oil producers consist of Libya, Algeria, Egypt, Tunisia and Morocco. Libya is the largest producer in North Africa and the third in Africa, behind Nigeria and Angola. Oil was first discovered in Libya in 1956 and commenced first production 1961. Production commenced in Algeria in 1944 from the Ain Zeft field and in 1910 in Egypt. Algeria and Egypt are major gas producers, supplying 8.6% and 5.3% of the world’s LNG production in 2009, respectively and a similar volume of gas via pipeline into Europe and the Middle East. The world’s first LNG project was built in Arzew Algeria, achieving first sales in 1964.

However our focus is North Africa is Tunisia where COE (operator) and JKA will be drilling the Menzel Horr-1 exploration well in November this year followed by the appraisal of the Hammamet West discovery in 2011. In 1966 the first oil discovery, El Borma, was brought online and remained the country’s main oil producer until 2005. Two thirds of the Tunisia’s production comes from ENI’s Adams fields and BG’s Hasdrubal field. The country provides a stable platform for oil and gas exploration with a proven petroleum system, good PSC terms and a stable government and legal framework.

Figure 6: COE’s Risk Assessment of Tunisia

Source: COE
Fiscal Terms

With the exception of a few questionable countries, where safety and political instability are key concerns, several African countries provide politically stable and safe environments to operate. Fiscal regimes vary throughout the region and on an individual project basis. Below is a summary of the key fiscal regimes for the assets discussed in this note.

Figure 7: Key Fiscal Regimes

<table>
<thead>
<tr>
<th>Country</th>
<th>Fiscal Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>PSC, royalty (3% for gas, 5 to 10% for crude oil), and corporate tax (upstream 50%)</td>
</tr>
<tr>
<td>Cote d’Ivoire</td>
<td>PSC regime, corporate tax accounted for in profit oil</td>
</tr>
<tr>
<td>Tunisia</td>
<td>PSC regime (all other taxes governed by PSC terms)</td>
</tr>
<tr>
<td>Angola</td>
<td>PSC regime, corporate tax 50%</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>PSC regime, royalty, corporate tax 35%</td>
</tr>
</tbody>
</table>

Source: Various

Contribution to World Supply

Africa is a significant player in the production of oil and gas, producing 12% of the world’s oil supply in 2009 with the vast majority of production from Nigeria, Algeria, Angola and Libya.

Figure 8: World Proven Oil Reserves

Figure 9: African Proven Oil Reserves

Source: BP Statistical Review

Source: BP Statistical Review
Egypt, Algeria and Nigeria and are significant players in the LNG market, contributing ~23% of the world’s supply with Equatorial Guinea and Libya also in production. Algeria is Africa’s largest and the world’s 5th largest exporter of LNG. Nigeria will be a key determinant in the growth of LNG supply to the Atlantic basin with three projects at various stages of expansion growth. However, a similar volume of gas is delivered directly into Europe and the Middle East directly from Northern Africa via pipeline.
### Overview

There are a number of ASX listed participants with interests in prospective exploration permits and appraisal/development assets located both in West and North Africa. This will see considerable activity over the coming 24 months with several of these companies planning significant exploration and appraisal programs and include COE, JKA, RIA, TAP, ROC, ADX and XST. The following table provides a summary of the key assets/targets and a schedule of planned activity.

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<td>Tunisia - Offshore</td>
<td>Kerkuou-Pantelleria</td>
<td>ADX</td>
<td>60%</td>
<td>Abiod formation</td>
<td>Abiod formation limestone reservoir</td>
<td>Additional seismic in deepwater. Shallow water exploration well</td>
<td></td>
<td>Q3 2011</td>
<td>$0.26</td>
<td>$0.10</td>
<td>260%</td>
</tr>
<tr>
<td>Tunisia - Offshore</td>
<td>Kerkuou-Pantelleria</td>
<td>ADX</td>
<td>40%</td>
<td>Abiod formation</td>
<td>Abiod formation limestone reservoir</td>
<td>Appraisal drilling</td>
<td>q3 2011</td>
<td>$0.26</td>
<td>$0.10</td>
<td>260%</td>
<td></td>
</tr>
<tr>
<td>Tunisia - Central</td>
<td></td>
<td>ADX</td>
<td>50%</td>
<td>Metlaoui and Abid formations</td>
<td>P50 Contingent Resource of 44mmbbls oil and 175bcf gas</td>
<td>Exploration drilling</td>
<td>q4 2010</td>
<td>$0.45</td>
<td>$0.10</td>
<td>450%</td>
<td></td>
</tr>
<tr>
<td>Tunisia - Central</td>
<td></td>
<td>XST</td>
<td>10%</td>
<td>Sidi-Daher Prospect</td>
<td>P50 Contingent Resource of 44mmbbls oil and 175bcf gas</td>
<td>Exploration drilling</td>
<td>q4 2010</td>
<td>$0.39</td>
<td>$0.13</td>
<td>312%</td>
<td></td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>Block H</td>
<td>ROC</td>
<td>19%</td>
<td>Various</td>
<td>Cretaceous channel sand system</td>
<td>Drill H-2 well - post farmout</td>
<td></td>
<td>2011</td>
<td>$0.44</td>
<td>$0.45</td>
<td>98%</td>
</tr>
<tr>
<td>Angola - Onshore</td>
<td>Cabinda South</td>
<td>ROC</td>
<td>10%</td>
<td>Various</td>
<td>Pre-salt play - primary reservoirs are the Lucula sandstones</td>
<td>Small discovery in the order of 20mmbbls</td>
<td>Drill Castanha-3 then flow test 2&amp;3. Additional seismic planned</td>
<td>Q4 2010</td>
<td>$0.03</td>
<td>$0.45</td>
<td>6%</td>
</tr>
</tbody>
</table>

**Source:** Various

### North African Action

**Bargou Permit, Tunisia (COE 85%, JKA 15%)**

The Bargou permit is located in Tunisia and is held by operator COE (85%) and JKA (15%) following the recently announced farm-in deal. COE acquired a 100% interest in the Bargou exploration permit in north-east Tunisia in 2008 with commitments of 1 well and 200km² of 3D seismic over the initial 5 year term. The permit is located in the Gulf of Hammamet in water depths less than 100m and extends onshore at several locations. The region is a proven petroleum system and adjacent to a number of offshore and onshore discoveries. There are multiple stacked target structural traps consisting of the Birsa and Fortuna sandstone formations and the Ain Grab, Bou Dabbous and Abiod limestone formations. The permit includes both the Menzel Horr prospect and Hammamet West discovery. COE recently announced it had farmed out a 15% interest in its Bargou permit in Tunisia to Jacka Resources (JKA). The details of the farmout are as follows:

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All information and advice is confidential and for the private information of the persons to whom it is provided and is provided without any responsibility or liability on any account whatsoever on the part of this firm or any member or employee thereof.
JKA farmed into 15% of the Bargou Permit in Tunisia for a value of approximately US$12m. The transaction value is an estimate based on payment of a proportion of back costs and a promote on the cost of the drilling of both the Menzel Horr-1 exploration well and the Hammamet West-3 appraisal well. Working interests in the permit will apply thereafter.

Gross well costs are estimated at $10m for Menzel Horr-1 to drill (~$8m) and test (~$2m) and $30m for the Hammamet west appraisal well. On this basis, if we assume some minor back costs, it would appear that JKA is paying approximately a full carry on its 15% interest. The US$12m entry price for 15% values COE’s remaining 85% interest in the permit at US$68m ($0.26/sh). We believe that COE should target a final equity interest of ~50% to fully de-risk the drilling of Hammamet West-3. On the basis of US$12m for 15%, COE could potentially farmout a further 35% for a further US$28m which would provide US$40m to cover the cost of the two wells.

In addition to the two wells the permit contains a large number of prospects and leads which total over 600mmbbls of mean undiscovered prospective resource.

Menzel Horr Prospect (COE 85%, JKA 15%)

The Menzel Horr prospect is located onshore Tunisia in the Bargou permit, held by COE at 85%, subject to completion of the farmout. It is estimated to contain 24mmbbls of prospective recoverable resources (P50) from multiple carbonate formations which include the Bou Dabbous Abiod and Ain Grab formations. The primary target is the Abiod chalk, given the number of fields surrounding the block that produce from this formation. COE has identified “excellent structure and folding” and highlights the key risks as trap and reservoir migration, with an estimated chance of success (COS) of 30%. Based on a nominal value of A$10/bbl, we estimate unrisked upside for COE of $0.70/sh and of $0.99/sh for JKA, however successful appraisal and development could yield a higher project NPV.

An exploration well is planned to be drilled on the prospect in November this year, to a total depth of 2,400m with gross well costs estimated at A$10m (A$8m to drill and $2m to test). COE recently announced it had secured the H&P 228 drilling rig to drill the Menzel Horr-1 well. Based on its current work program, the well is scheduled to spud on the 11th of November, but is subject to the completion of previous well commitments. It is expected to take approximately 25 days to complete, followed by testing. Hence if the well starts on time we could see a result by Christmas, however with some typical schedule over-runs we would hope for a result in early 2011.

Figure 13: Bargou Permit – Menzel Horr

Figure 14: Bargou Permit – Hammamet West
Hammamet West Discovery (COE 85%, JKA 15%)

The Hammamet West discovery is a lower-risk oil field appraisal opportunity of a previously discovered oil accumulation located in 50-60m of water. The Hammamet West-1 (1967) discovered a 7m oil column in the Birsa formation, followed by Birsa-2 (1990) which discovered a 192m oil column in the Abiod and flowed at a minor 20bopd. Contingent resource estimates were recently increased from 49mmbbls as a result of the interpretation of high resolution 3D seismic. The contingent resource estimate now stands at 67mmbbls (P50), with 10mmbbls attributable to the Birsa and 57mmbbls to be recovered from the Abiod. Given the large in ground resource, the challenge is to determine the optimal solution to produce oil flows from the carbonate structure - with fracturing of the carbonate a key consideration. The ENI operated Maamoura field which lies 12km to the south of the Hammamet West discovery provides an analogue, utilising horizontal wells to produce from the Abiod reservoir.

The JV plans to drill and test a horizontal well into the Abiod reservoir to test whether the naturally fractured carbonates will deliver commercial flow rates over the large fractured area. In addition to the recent seismic interpretation, COE plans to undertake further processing of the data to better model the Abiod carbonate formation and assist with optimal placement and design of the well. At this stage a well is planned for Q3 2011, which will be drilled to an estimated TD of 2,200m, subject to materials and rig availability. Gross well costs are estimated at A$30m.

The field is located in 50-60m of water, indicating that successful delineation of a recoverable resource could readily be commercialized via a tie-back to shore. The figure above illustrates a preliminary development concept with a 1,110 tonne unmanned platform to house the dry-completions, pipelines to shore for full processing and a CALM offtake buoy. CAPEX is estimated at US$6-8/bbl, depending on the size of recoverable volumes and subsequent design capacity. Applying US$7/bbl to the P50 case of 67mmbbls implies CAPEX of US$469m. Successful appraisal of the field could provide considerable upside to COE if the planned horizontal drilling yields commercial flow rates. Assuming COE farm-down to a final 50% WI, we estimate unrisked upside of $1.15/sh, at a nominal A$10/bbl. On a similar basis we estimate JKA is exposed to unrisked upside of $1.36/sh, allowing for further dilution in order to fund its ~$9m share of the well costs.
Hammamet Permit, Tunisia (COE 35%)

The Hammamet permit is located adjacent to the Bargou Permit in water depths ranging 80-350m. The permit is currently in the first of two, 2-year extension periods (expires September 2012), having completed the committed work program for the initial term and requiring a further 300km$^2$ of 3D seismic acquisition. Initial work has focussed on the Tazerka field and Fuchsia prospect, with 409km$^2$ of 3D seismic acquired across both these structures and the Kasserine prospect. This prospect is on trend with the Oudana (operated by Lundin with an IP rate of 20kbopd) and Birsas fields.

The Fuchsia-1 exploration well was drilled in mid-2010 to a depth of 2959m, targeting an estimated 46mmbbls of undiscovered recoverable oil on a P50 basis. The well encountered a 16m gas column in the Birsas formation sandstones but no oil. While logging indicated porosity of 30% and gas saturation of 85-90% the small gas intersection was deemed sub-economic and was plugged and abandoned. The Tazerka field was abandoned in 1998 after producing 21.6mmbbls. Remaining oil in place is estimated at 55mmbbls on a P50 basis. A renewed development of the field has been subject of feasibility studies, but is on hold pending the assessment of near field opportunities. Acquisition of 300km$^2$ of 3D seismic is planned for Q3 2011 and will focus on the East of the Block, over exploration targets in the both the Birsas sandstone and deeper carbonate plays.

Lambouka Discovery (ADX 30%, XST 10%)

The Lambouka discovery is located in the Kerkouane permit offshore Tunisia. Lambouka straddles two licenses (the Kerkouane permit in Tunisia and the Pantelleria license in Italy) as well as the border between Tunisia and Italy. Both the Kerkouane and the Pantelleria permits were the focus of ADX’s technical and operational efforts during the past financial year which culminated in the drilling of the Lambouka-1 prospect (later confirmed as a discovery) after funding was secured through a number of farm-outs to incoming joint venture partners. The Lambouka-1 drilling location is approximately 160kms North East of Tunis (Capital city of Tunisia) in the Sicily channel. Lambouka is a large 70sq km area tilted horst block which was thought to contain three hydrocarbon bearing zones (Birsas sandstone, Ain Grab formation, Abiod carbonate) which are proven and producing reservoirs in the Sicily Channel and adjacent Gulf of Hammamet. The nearest offset well is the Dougga-1 gas condensate discovery in the Kerkouane permit located approximately 22kms SSW of Lambouka. The well was spudded on the 11th of July 2010 with a target depth of ~3000m and pre-drill volume estimate was 270mmboe at a gross well cost of ~ US$22m.
In September, ADX announced that the Lambouka-1 well encountered hydrocarbon bearing zones based on analysis of wireline logs, hence confirming the Lambouka-1 well as a discovery. At least two hydrocarbon-bearing zones were present in the Abiod formation (the primary objective for the Lambouka-1 well). The JV decided to suspend the well with the ability for future re-entry to obtain additional hydrocarbon and reservoir information in a cost effective manner from a customised drill stem test of the Abiod Formation. The preliminary resource estimate of the Lambouka well is 309bcf (mean recoverable gas). It is believed that condensate rich gas is present at Lambouka and using a similar gas condensate ratio to the nearby Dougga discovery for Lambouka would result in a condensate resource of 24mmbbls based on the mean resource estimate. It is important to note that further appraisal of the Lambouka discovery is required to confirm final resource numbers.

The forward plan for the JV is to drill a Lambouka appraisal well in 3Q 2011. The gross appraisal well cost is estimated to be ~US$10m.

**Figure 18: Lambouka Discovery**

**Figure 19: ADX Sicily Channel Fields (Including Dougga)**

**Dougga Gas Condensate Discovery (ADX 60%, XST 10%)**

The Dougga gas field was discovered in 1981 by Shell at a time of low gas prices and at a water depth that was near the technical limit for oil and gas development. The discovery well intersected and tested gas in the late Cretaceous Abiod and Allam formations. Dougga contains liquids rich gas (approximately 70bbls/mmscf) but also contains considerable levels of CO2 (~30%). Dougga is located in 328m of water approximately 45kms East of Cap Bon in the Sicily channel. The discovery is positioned close to domestic and export infrastructure. In late 2009, ADX commissioned TRACS International Consultancy Ltd (TRACS) to undertake an independent resource evaluation of the Dougga gas discovery and its potential for commercial development. The study indicated Dougga is potentially a significant resource with a recoverable mean of approximately 42mmbbls of condensate and 196bcf gas. A Dougga appraisal well is planned to be drilled in 3Q 2011 with an estimated gross cost of ~$US45m. It is anticipated that ADX may farm down to 30% pre-drill to mitigate the financing risk. A revised resource review incorporating field development studies and the recent drilling results from Lambouka is planned to be completed in early 2011 and should provide a significant catalyst.

**Sidi Daher Prospect (ADX 50%, XST 10%)**

ADX is operator of the Chorbane permit which covers 2,438km2 and is located in central Tunisia. Technical work on the first prospect to be drilled, the Sidi Daher prospect, is supported by a Direct Hydrocarbon Indicator which upgraded the prospect to drill-ready status. The multi-target prospect has estimated prospective resources of 175bcf of recoverable gas at the Letlaoui level and 44mmbbls oil in the Abiod formation. ADX has secured industry funding and mitigated its financial exposure while retaining a material 50% interest in the permit by securing two farm-outs on a promoted basis. Gulfsands Petroleum Plc and Xstate Resources Ltd have farmed in to earn 40% and 10% working interest, respectively. The Sidi Daher prospect is planned to be drilled in December 2010 and has an estimated gross cost of ~US$5.5m.
Figure 20: Chorbane Permit

Source: ADX
West African Action

CI 202 Permit - Cote d’Ivoire (RIA 63.75%)

The CI-202 concession is located off the coast of Cote d’Ivoire, extending from the coastline into depths of 1000m and is within the Ivorian Basin, which encompasses offshore Eastern Cote d’Ivoire and offshore Western Ghana. It covers 675km2 offshore acreage (mainly in relatively shallow water) and is a highly prospective permit located 80km to the west of the large Jubilee offshore discovery made in Ghana in 2007 (~1.8nbbls oil) by Tullow oil and Kosmos Energy, Tweneboa (>250mmboe) and Odum (120mmbbls) discoveries which has established the Ivorian Basin as one of the most exciting and promising offshore locations in the world. All three discoveries are either wholly stratigraphic or combined structural/stratigraphic traps. They were all defined and de-risked using modern seismic techniques (3D, seismic inversion processing). The permit contains 6 un-appraised oil and gas discoveries plus several exploration prospects. On the 21st of July 2010, RIA completed the acquisition of CLNR Holdings Ltd (CLNR), which held a 75% interest in C&L Natural Resources Ltd (C & L Natural) for a consideration of ~A$27m ($17m in shares and the repayment of a A$10m loan to CLNR Holdings provided by shareholders). C&L Natural is the holder of an 85% interest in Block CI-202. This transaction has given RIA an effective working interest of 63.75% in block CI-202. The balance of 15% is held by the Cote d’Ivoire State Petroleum Company, PETROCI.

The license contains multiple pre-existing un-appraised oil and gas discoveries. Between 1977 and 2001, 13 wells were drilled in block CI-202. These prospects were located using vintage 2D seismic data with the targets being deep structural closures analogous to the producing fields of Espoir (discovered in 1979) and Foxtrot (discovered in 1981), located about 100km to the west of the field. Drilling results confirmed the deep structural closures were not hydrocarbon bearing. However, in the shallower, younger reservoir intervals, 12 of the 13 wells did intersect hydrocarbons. These reservoirs are of similar age to the recent giant Jubilee and Tweneboa discoveries of Ghana. Production testing of wells within the block realised rates of 2,280bopd and 37mmscfd but were not deemed economic due to low oil prices at the time. RIA engaged RPS Energy Pty Ltd (RPS) to prepare a competent persons report in respect of block CI-202 and resulted in the following independently certified estimates.

Source: RIA

Figure 21: Permit CI-202

![Map of the region showing the location of CI-202](Source: RIA)
The forward program for block CI-202 is expected to be extensive in the near term and will be the focus for RIA during late 2010 and 2011. RIA is expected to finalise the integration of new seismic mapping with reprocessed 3D seismic and inversion datasets by the end of 2010 which is expected to result in a material resource upgrade in 2Q 2011 which we view as a key near term catalyst. We believe that this will result in maiden reserves certification in the order of 40-50mmbbls of 2P reserves. The 2011 drilling sequence is expected to be announced in early 2011 which will lead to a 3 to 6 well appraisal/exploration program starting in late 2011 and continuing into 2012. Cote d’Ivoire has a developed infrastructure to support the energy market due to the producing fields of Foxtrot, Lion, Baobab and Espoir and has become an export terminal for international oil supply. Hydrocarbon resource development has assisted Cote d’Ivoire’s economic growth over the past thirty years. However, the fields that supplied the resources to allow this growth are now in decline and the market requires additional oil and gas to support the country’s continued growth. CI-202 is well located and has the potential to meet this demand in the near term.
Offshore Accra Contract Area, Ghana (TAP 36%, RIA right to 18%)

The Offshore Accra Contract Area is located in the West African Transform Margin offshore Ghana in a relatively unexplored basin, with important similarities to the adjacent Ivorian Basin. The Accra block has great prospectivity in both the shallow and deep water and has the potential to hold Jubilee type plays in the deeper water. The permit covers 2,000km² and is located to the southeast of Accra, the capital of the Republic of Ghana, in water depths ranging from less than 50m to greater than 2,500m. Existing 3D seismic covers a large portion of the block and shows potential for large +100mmbbl oil accumulations. TAP is the operator of the contract area with a 36% interest, which was ratified by the relevant government authorities in April this year. Other participants include Afex International (27%) Challenger minerals Inc (27%—see below) and the Ghana National Petroleum Corporation (10% and carried). Under a JV agreement between RIA and Challenger Minerals (CMI) and a memorandum of understanding concerning the offshore Accra petroleum agreement, RIA has the right to seek an 18% equity interest in the Accra Petroleum Agreement subject to approvals from the Ghana National Petroleum Company (GNPC) and the Ministry of Energy of the Republic of Ghana. This approval is expected to be finalised by the end of 2010.

Figure 24: Offshore Accra Exploration Permit

A number of moderate risk but high reward structures have been identified on existing 3D seismic in shallow to moderate water depths in the Accra contract area, each of these is considered to have potential to contain in excess of +100mmbbls of prospective resources. The offshore Accra contract area has an initial exploration program consisting of 3D seismic reprocessing, acquisition of 850km of 2D seismic data and a single exploration well over the next 2.5 years. The area is located over the West African Gas pipeline which will assist in the monetisation of a gas discovery.

Seismic studies will be conducted in the Accra block during 2010 with the first Accra exploration well potentially drilled late 2011. This will focus on the shallow water Albian play, which is a proven play type with similar discoveries at Espoir (110mmbbls) and Baobab (200mmbbls). 3D seismic reprocessing will be utilised to upgrade leads via improved imaging and potentially DHI/AVO analysis. The acquisition of seismic in the deeper water areas will allow for exploration of turbite prospects, similar to the Jubilee discovery.
Block H, Equatorial Guinea (ROC 37.5%)

Block H is located in the Rio Muni Basin, offshore Equatorial Guinea which operated by Atlas Petroleum. It is located in a proven petroleum system with adjacent producing fields including the Hess operated Ceiba and Okume field development (~100kbopd) some 65km to the south. ROC is in the process of farming out interest in the drilling of H-2 in the Aleta prospect, a large Cretaceous channel sand system identified on block-wide 3D seismic.

Figure 25: Block H Location

Figure 26: Possible Reservoir Targets for H2

Source: ROC

The H-2 well will target an estimated 166mmbbls of unrisked mean potential reserves in the primary sands and up to 542mmbbls in the stacked sand interval. In addition, the permit contains a number of potential follow-up and independent exploration targets. The well is in deepwater and will be drilled to a depth of 4,600m to 5,000m at an estimated cost of US$50m. ROC is targeting drilling of the well in 2011, subject to a successful farmout.

Cabinda South Block, Angola (ROC 10%)

ROC has a 10% interest in the Cabinda South block, located onshore Angola. The JV has completed a series of 2D and 3D seismic surveys on the block and in 2007/2008 completed a 7 well exploration program, which resulted in a number of sub-commercial discoveries. In March 2010 the Castanha-1 exploration well encountered a gross hydrocarbon column of 15m in the pre-salt Chela formation which tested 33 deg API oil at 2,275bopd. Castanha-2 was subsequently drilled, encountering a gross hydrocarbon column of 21m. The forward plan is to production test the well following drilling of Castanha-3, which is currently underway. The discovery is estimated to be in the order of 20mmbbls of recoverable oil, which is relatively immaterial for ROC given its interest.

On the other side of the continent ROC has a 75% interest and is operator of two permits in the Mozambique Channel, which consists the Belo Profond (Madagascar) and the Juan de Nova Maritime Profond (France). The permits are located in the Mozambique Channel which is a newly identified deep-water play. The permits are early stage, with ROC planning to conduct a large 8,000km 2D seismic survey over both permits in 2011.
Company Summaries

COE (BUY with a Price Target of $0.67/sh)

COE is underpinned by cash at $0.32/sh plus its producing Cooper Basin reserves at $0.19/sh and provides exposure to some significant short-term exploration upside. The recent acquisition of producing assets in Indonesia and staged investments in Poland and Romania provide further diversification and highlight the value-add optionality of COE’s strong cash position. COE has a busy program ahead with exploration drilling recommencing in the Cooper post-flooding and commencement of work-over activities in Indonesia, however its key catalyst will be the upcoming activity in Tunisia which includes the Menzel Horr-1 exploration well in November, followed by the Hammamet West appraisal well in Q3 2011. Menzel Horr-1 will target 24mmbls of oil, providing unrisked upside of +$0.70/sh.

JKA (Not-Rated)

JKA is an emerging oil and gas explorer with interests in the Carnarvon Basin and in Tunisia via its recent farm-in for a 15% interest in the Bargou Permit. The company has a 20% interest in WA-399P, subject to the completion of farm-in works. Re-processing of 2D seismic has identified the Gazelle lead with a best estimate mean recoverable resource (P50) of 50mmbbls which will be the subject of further studies until a decision to drill or drop the permit in 2011 is made. However the key catalyst looking ahead will be the drilling of Menzel Horr in November which provides unrisked upside of +$0.99/sh should the well successfully discover the pre-drill estimated 24mmbbls of oil. Following Menzel Horr-1, the company will also participate in the drilling of Hammamet West-3 appraisal well which provides unrisked upside of +$1.36/sh. Hence JKA provides significant upside leverage to a successful program in the Bargou permit. JKA has a strong board with broad experience in domestic and international oil and gas exploration and anticipate the company to continue to expand its portfolio of projects.

TAP (BUY with a Price Target of $1.37/sh (under review))

TAP provides a cash and asset backed investment with a now complete portfolio of production, development, through to long term exploration activities following it’s recently announced acquisition of a 75% interest in Northern Gulf Petroleum. Its cash, zero-risk 3rd party contracts and producing Woollybutt and Harriet JV assets underpin the current share price with its new acquisition and exploration portfolio providing further upside. TAP has a number of short term catalysts which include the drilling of Zola-1 in Q4 2010 targeting 1tcf of gas (+$0.30/sh unrisked upside), followed by the drilling of Craigow-1 in the Bass Basin in Q1 2011 targeting estimated recoverable reserves of 20mmbbls (+$0.40/sh unrisked upside) and appraisal drilling of the acquired Manora field currently under way, with potentially more in late 2010/early 2011. However the Ghana Accra Offshore agreement area provides the ‘blue-sky’ exploration upside with 2 x leads identified in the order of +100bbls. The JV plans to conduct further seismic reprocessing, and the acquisition of further seismic acquisition in the deeper water, leading up to drilling in late 2011/early 2012. While the permit commitment requires further 2D acquisition the JV is considering the acquisition of further 3D. The initial focus will be on shallow water targets in the Albanian play with new seismic acquisition to explore the deeper water turbite play. We believe that the activity in this region will provide a number of significant medium term catalysts for TAP.

Note that the recently announced acquisition and significant capital raising is yet to be incorporated into our valuation.
RIA (SPECULATIVE BUY with a Price Target of $0.94/sh)

RIA holds interests in prospective exploration permits in West Africa and Australia and will commence a high impact appraisal/exploration drilling program in 2011 focused on block CI-202 located offshore Cote d’Ivoire. Block CI-202 is not a pure exploration play as the acreage contains pre-existing discoveries which present only appraisal risk. Block CI-202 is estimated to hold gross total mean contingent and prospective resources of 220mmbbls of oil and 893bcf gas. RIA’s Accra block in Ghana has great prospectivity in both shallow and deepwater with the potential of Jubilee type plays in the deeper water. Going forward, we expect an updated independent resources report in 2Q 2011 to provide a significant catalyst for RIA with further catalysts including the announcement of a firm 2011 drilling sequence (expected early 2011) and the commencement of the exploration/appraisal drilling program in late 2011 continuing into 2012. We view RIA as an exceptional explorer within the small to mid-cap oil and gas space underpinned by several un-appraised discoveries and a high quality exploration portfolio which offers significant upside.

ADX (Not-Rated)

ADX has four key oil and gas licenses across Europe and North Africa highlighted by the Kerkouane permit offshore Tunisia which holds the Lambouka (30% ADX) and Dougga (60% ADX) discoveries. The Lambouka discovery was announced in September and is estimated to hold 309bcf gas and 24mmboe condensate. The Dougga gas/condensate field was discovered in 1981 by Shell and is estimated to contain 42mmboes of condensate and 196bcf gas but also contains high levels of CO2. Both of these discoveries are planned to be appraised in 3Q 2011 and will be key catalysts for ADX. A near term catalyst will be the exploration drilling of the Sidi Daher prospect in central Tunisia (50% ADX) which is planned to be drilled in December 2010 with a pre-drill resource estimate of 44mmbbls oil and 175bcf gas. In addition, an updated resource review of the Dougga field is expected to be completed in early 2011, which will incorporate development studies and the impact of the recent Lambouka well.

XST (Not-Rated)

XST has a 10% stake in the onshore and offshore Tunisian permits of Chorbane and Kerkouane and is therefore a JV partner with ADX in the Lambouka (309bcf gas and 24mmboe condensate) and Dougga (42mmboes of condensate and 196bcf gas) discoveries and the Sidi Daher prospect (44mmbbls oil and 175bcf gas). The key catalysts for XST will be the revised resource assessment, exploration drilling of the Sidi Daher prospect in December, which will be followed by the Lambouka and Dougga appraisal drilling planned for 3Q 2011.

ROC (BUY with a Price Target of $0.63/sh)

ROC is trading at a significant discount to our valuation and continues to improve its financial position and on this basis we maintain our BUY recommendation. China will be the focus of development for 2011 with continued development drilling at Zhao Dong and the Beibu Gulf project close to FID. However exploration activity and other short term catalysts are limited. Upcoming activity includes ongoing appraisal of Castanha in Angola (ROC 10%), planning for drilling of Aleta-1 in Equatorial Guinea (ROC 37.5%) subject to farmout, and planning for 2D seismic acquisition in the Mozambique Channel (ROC 75%). In Africa, ROC continues to highlight its intention reduce its exposure.
20/10/10 Oil and Gas Research

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