

PROSPECT

WESTERN AUSTRALIA'S INTERNATIONAL RESOURCES DEVELOPMENT MAGAZINE December 2007 - February 2008 \$3 (inc GST)



GOLDEN ANNIVERSARY

The Gold Squad
celebrates 100 years

GORGON GAS

Environmental approval
advances massive project



From the Director General

Happy New Year!

This is the first edition of *Prospect* for 2008 and we are set for yet another remarkable year in resources.

Western Australia now accounts for over half the new private capital invested in the whole of Australia and, judging by the projects still in the pipeline, there is a lot more private investment to come. In addition, Western Australia now has more than \$100 billion in planned resources projects (page 4).

Of course, with this high level of activity comes a large influx of applications to government for project approvals. The State Government is adopting a strategic assessment approach to give greater clarity to investors about the critical factors which will be required for successful project approval and to give confidence to the community that cumulative impacts are being considered on a regional basis.

One example is the review of the banded iron formation deposits which form the ranges of hills in the Mid West region. These rocks play host to a rich biodiversity. A strategic framework for the responsible development of these iron ore resources was released by government in October 2007. The review indicates areas in the Mid West where the State Government is predisposed towards development and which areas are proposed for conservation (page 19).

A regional assessment is also being undertaken in the Kimberley region to find a site for a multi-user processing hub for Browse Basin gas developers (pages 8 & 9), while at the same time preserving the Kimberley's unique wilderness values.

Finally, Mr John Terrell, the editor of this magazine for 10 years, has recently retired from the Department. John, I thank you for bringing our readers interesting and topical *Prospect* articles over that time.

Jim Limerick
DIRECTOR GENERAL

Prospect

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Cover photo: Casting gold bars.
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Greater demand for port of Broome

New marine servicing facilities may be required because the port of Broome is experiencing increasing demands for berthing space

For more information turn to pages 8 and 9.

Gorgon gas development gets the green light

The recent environmental stamp of approval for the massive Gorgon LNG project has marked a major milestone for the marathon project.

It is 26 years since the original Gorgon gas discovery was made by Western Australian Petroleum, about 130 km off the northwest coast of Western Australia near Barrow Island.

With both Federal and State environmental approvals now securely locked away, all that remains to be done before construction begins is a formal financial commitment by the Gorgon Joint Venturers.

Shaping up as one of the largest resource development projects in Australia's history, the gas fields of the greater Gorgon area contain more than 40 trillion cubic feet of gas and will take an estimated 60 years to exploit.

To advance the project to this important stage, considerable behind-the-scenes work has taken place over the past four years. Chevron (50 per cent owner and

operator) and its partners ExxonMobil and Shell (each company has a 25 per cent stake) have already outlaid more than \$1.5 billion on engineering, environmental, financial and other studies.

The massive project involves:

- Development of Gorgon's gas resources with subsea pipelines linked to Barrow Island;
- A gas processing facility on Barrow Island consisting of two 5 Mt/a LNG trains;
- LNG shipping facilities to transport products to international markets;
- A domestic gas plant and pipeline to deliver gas to the mainland; and
- Greenhouse gas management through injection of carbon dioxide into deep formations beneath Barrow Island.

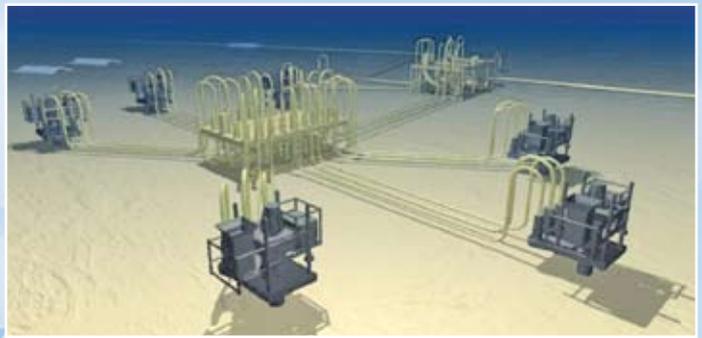
The strict environmental conditions associated with the project include:

- Development and implementation of a quarantine management plan, overseen by an expert advisory panel, to protect threatened species on Barrow Island;
- Development and implementation of a protection regime for the Flatback turtle overseen by a marine turtle expert panel;
- Environmental management plans for the operation of the gas field and refining plant; and
- Annual environmental performance reports to the State and Commonwealth environmental departments;
- Establishment of a dredging expert panel;
- Construction of a CO₂ injection system; and
- Development of a greenhouse gas abatement program.

Photo reproduced with the permission of Chevron Australia.



Gas gathering:
An artist's impression of the offshore subsea gathering equipment for the Gorgon gas project.



This builds on the Gorgon JV's existing commitment to implement a range of environmental protection measures, including a \$60 million commitment to conserve the Flatback turtle and other endangered species, as well as the \$40 million Net Conservation Benefit Fund required under the Gorgon State Agreement.

Federal and State environmental inspectors will have a regular on-the-ground presence on Barrow Island, and relevant offshore areas, to ensure that the development proponents strictly adhere to the environmental plan.

The Gorgon project is expected to cost up to \$20 billion. Chevron put an \$11 billion price tag on the project three years ago. However, a company spokesperson said recent media and industry speculation had placed the costing at between \$15 billion and \$20 billion.

While 10 Mt/a is the present scope of the project, Chevron's global chief David O'Reilly said that, "long-term, there is no question this project is going to be in the 20 Mt/a production range". However, further environmental approval would be needed if this were to happen.

Chevron Australia chief executive Jay Johnson said that expansion of Gorgon would be contained within the existing 300 hectare approved site on Barrow Island.

The next moves

Chevron Australia's general manager Colin Beckett said detailed environmental conditions would now be built into Chevron's work regarding the project's overall optimisation and engineering, which was aimed at making certain Gorgon was a beneficial, long-term project from a design, operability and economics point of view.

"We believe it is important to take time to get this project right. We are doing as much work as possible to ensure Australia's largest known gas resource is developed in an effective, efficient, responsible and internationally-competitive manner," Mr Beckett said.

Once this work has been completed it's expected that the joint venture will then be in a position to make a final investment decision and commence formal construction in parallel with obtaining other development approvals outlined under the Gorgon State Agreement and government legislation.

The Federal Government expects Gorgon to contribute \$20 billion to the national economy and provide other follow-on benefits to Western Australia. Such benefits include:

- \$17 billion in taxes and royalties;
- Additional export income of \$2.5 billion a year;
- 6000 direct and indirect new jobs, 1700 of which will be in Western Australia;
- Expansion of existing services and industries, and attraction of new ones;
- Underpinning the development of new technologies and skills, such as CO₂ injection and subsea; and
- Technology development, creating regional capacity for future growth. ■



Conservation: The Gorgon gas project includes a plan to protect the Flatback turtle.

Western Australia achieves \$100 billion in resources projects

Western Australia has reinforced its position as the nation's No.1 resources State after recently breaking through the \$100 billion barrier for planned resource development projects.

The attainment of this milestone coincides with the Federal Government's environmental clearance of the Gorgon and Pluto LNG projects in northwest Western Australia.

Gorgon will cost between \$15 billion and \$20 billion while Pluto will cost \$11.2 billion.

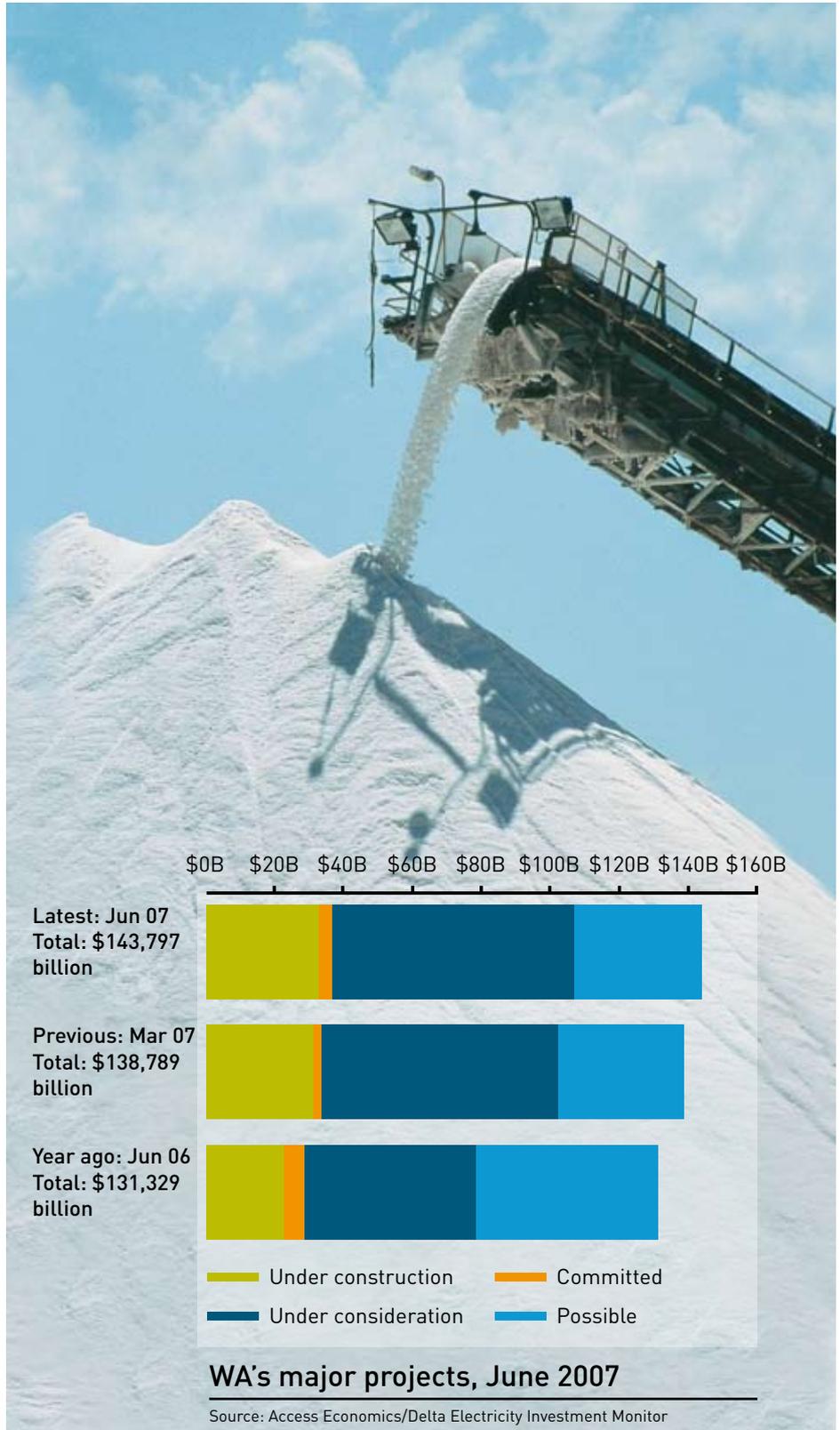
These and other resource development projects have effectively lifted the total value of projects either underway or planned in Western Australia over the \$100 billion mark. (Refer to the rear pages of this magazine for more details.)

These figures are conservative, with Access Economics and the Delta Electricity Investment Monitor suggesting the figure is at least \$140 billion (see graph aside).

The latest announcements reinforce Western Australia's staggering resources development growth over the past four years, increasing at least four fold in that period.

For the year ended 30 June 2003 the value of resources production in WA was \$27.8 billion. In the most recently completed reporting period (for the year to the end of June 2007) the value of resources production was nearly double that at \$53.4 billion.

When considering the scale of investment being contemplated, it seems inevitable that the production value will once again surge upwards. ■



Pluto bounds into action



It's all systems go for Woodside Energy since the company received environmental approval for its \$11.2 billion Pluto gas project in northwest Western Australia.

Within 48 hours of the approval, construction started on the Burrup Peninsula where onshore LNG production facilities for this world-class project will be established.

Woodside is extremely proud of the speed at which it has been able to advance the Pluto project — from the initial gas discovery in April 2005, to a financial commitment in July 2007, then the Federal Government's full environmental approval in October 2007.

..the company has had up to 500 people working behind the scenes in different parts of the world to get the project to this important stage.

So keen and confident has Woodside been to clear all the major hurdles prior to a construction start-up, the company has had up to 500 people working behind the scenes in different parts of the world to get the project to this important stage.

Timing has been crucial to the success of the project, and Woodside is now in a position to take advantage of an 'LNG window of opportunity' that exists between 2010 and 2015 in the Asia-Pacific and North American markets.

Japanese energy utilities Kansai Electric and Tokyo Gas, have signed agreements to receive the first shipments of Pluto gas in late 2010.

A Woodside spokesperson said the company expects the Pluto project to be producing 4.3 Mt/a of LNG by the end of 2010, with approved environmental conditions allowing for expansion to 10 Mt/a.

Pluto will involve up to 3000 people during construction and 500 full-time jobs once commissioning is completed.

Through extensive consultation with traditional custodians, archaeologists, anthropologists and government agencies, design of the Pluto facilities have been modified to ensure that, where possible, heritage sites are avoided on the Burrup Peninsula, adjacent to the North West Shelf's existing LNG production facilities.

An estimated 95 per cent of the 3000 indigenous petroglyphs (ancient rock carvings) will be undisturbed by construction activity on the Pluto development site. In addition, the construction work will have no impact on the proposed 5000 hectare Burrup Peninsula Conservation Reserve, which is home to literally hundreds of thousands of petroglyphs.

Woodside intends to relocate between 100 and 200 petroglyphs to undeveloped areas of its leases, in consultation with traditional custodians.

Economic modelling indicates the Pluto LNG development will contribute \$28.6 billion to the WA economy, and provide significant opportunities for local businesses. It will generate up to \$8.5 billion in government revenues. ■



Foster Wheeler Worley Parsons field engineer, James Ayers, on location at Woodside Energy's Pluto gas project in northwest Western Australia.

Photographs reproduced with the permission of Woodside Energy.

Northern Development Taskforce launches in Broome



Big decisions: Members of the Northern Development Taskforce at the issues scoping workshop.

A Northern Development Taskforce has been established to select a suitable site for the development of gas resources in the Kimberley and coordinate the issues associated with the National Heritage Listing of the Burrup Peninsula.

The purpose of the taskforce is to set the framework for balancing gas development with the exceptional attractions of the Kimberley – particularly those relating to the environment, Indigenous culture, tourism and the region's heritage.

The framework will be developed through an extensive community and stakeholder consultation program and will include the selection of a suitable location for a Browse Basin gas processing hub. The taskforce will also manage the cross-government planning processes involved in such site selection.

Implemented by the Western Australian State Government, the taskforce is a cross-government initiative led by the Department of Industry and Resources and includes representation from the Departments of Environment and Conservation, Indigenous Affairs, Planning and Infrastructure, Office

of Native Title, Kimberley Development Commission, Tourism WA and the Heritage Council.

The Terms of Reference for the taskforce were released by State Development Minister Eric Ripper and coincided with the first stakeholder workshop of the consultation program.

Mr Ripper said the taskforce represented the Government's commitment towards ensuring the best possible outcomes for everyone affected by development in the Kimberley.

"I am confident the Terms of Reference provide a new model for sustainable development and constructive outcomes for the community, the environment and the country as a whole," he said.

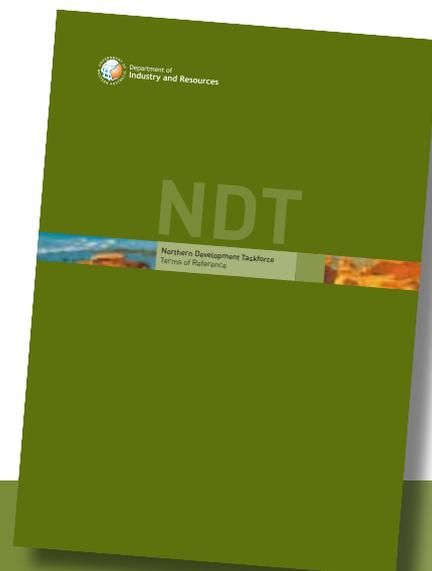
Taskforce members travelled to Broome to spend two days hearing from members of the Kimberley Alliance and Indigenous and community stakeholders about their concerns surrounding the development of a gas processing hub in the Kimberley.

Director General for DoIR and Chair of the Northern Development Taskforce Jim Limerick said the first meeting of the taskforce was informative.

"The Broome workshop was an intense experience and we heard from a range of stakeholders concerning the practical considerations for selecting a site to develop gas resources. This included environmental, conservation, tourism and community points of view," Dr Limerick said.

"Stakeholders are passionate about the Kimberley and its future. It's our job to ensure that all interests are considered and balanced in the forthcoming site selection process."

The Northern Development Taskforce Terms of Reference are available at: www.doir.wa.gov.au/NDT or email ndt@doir.wa.gov.au ■



Alcoa funds ARC Energy's gas search

In a first for the resources sector in Western Australia, a mining company has invested in the exploration program of an unrelated petroleum explorer.

Western Australian bauxite miner and alumina producer Alcoa has agreed to accelerate ARC Energy's onshore petroleum exploration program in the Canning Basin with a \$40 million pre-payment for the supply of up to 500 petajoules of gas over 15 years, should the program be successful.

ARC Energy says the money will be used to step-up exploration work in the vicinity of the Valentine-1 well which has already encountered strong gas shows. The company has a 14 well drilling program in the Canning Basin between now and the end of 2008.

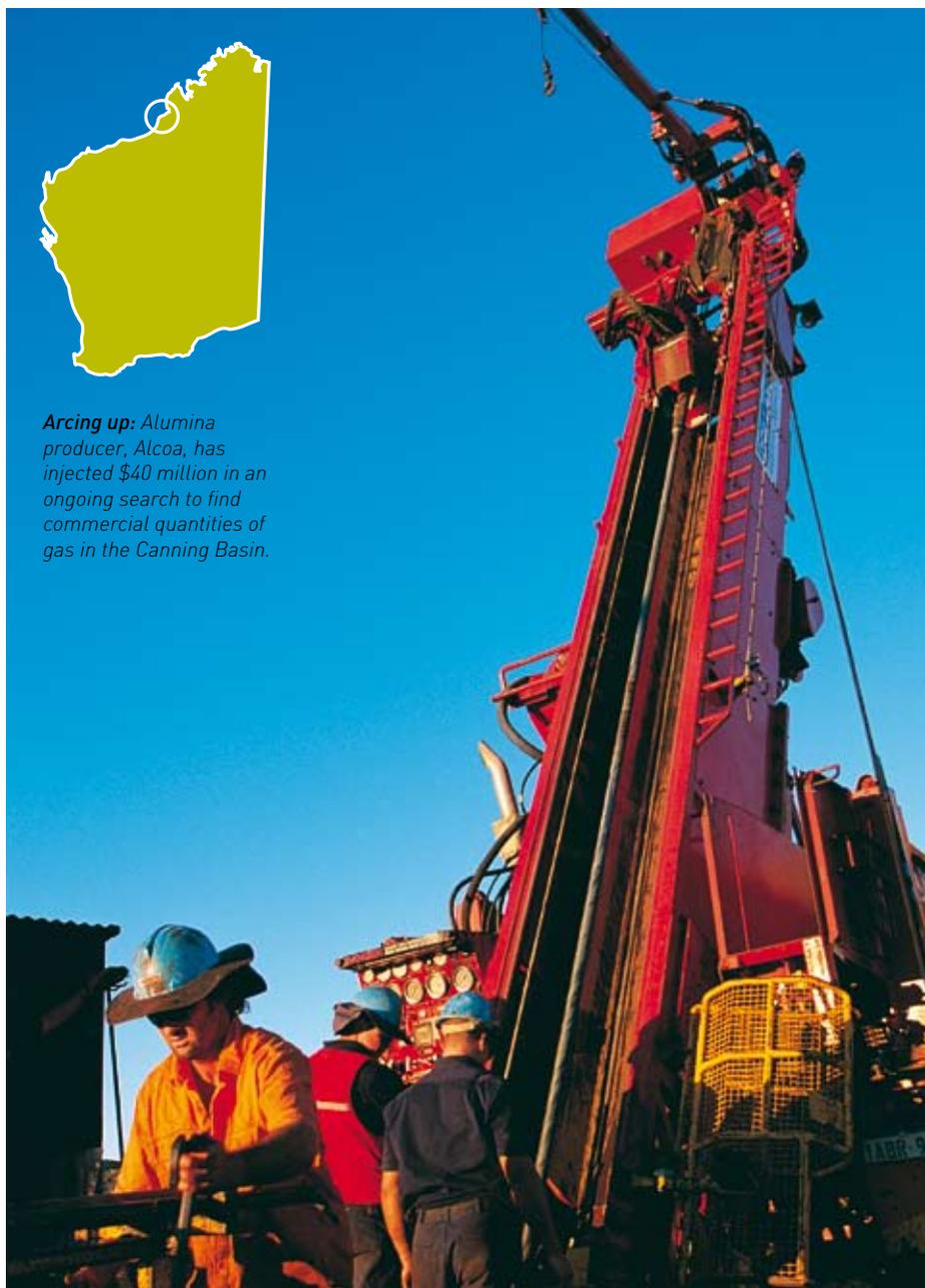
The agreement will also underpin infrastructure needed to deliver gas from the Canning Basin. This will require ARC Energy building a 650 km pipeline extension costing \$400 million to \$500 million from the northern Canning Basin to the Dampier-to-Bunbury gas pipeline. The latter pipeline is the only means of transporting gas from the north of the State to the South West, where Alcoa's alumina refineries are located.

The Alcoa/ARC Energy partnership highlights the value of Western Australian natural gas and the urgency of some downstream mineral processors to secure long-term gas supplies.

There is some concern that Alcoa may be forced to defer its planned \$1.5 billion expansion of the Wagerup refinery if it fails to lock-in a substantial new gas supply agreement.

Rival alumina producer Worsley Alumina already has a diversified energy stream and uses a combination of natural gas and coal to fire-up its refinery near Collie. In a win-win scenario, the plant provides gas-fired steam for the refinery and offloads about 120 megawatts of electricity into Synergy's South West Interconnected System. ■

The Alcoa/ARC Energy agreement highlights the value of Western Australian natural gas and the urgency of some downstream mineral processors to secure long-term gas supplies.



***Arcing up:** Alumina producer, Alcoa, has injected \$40 million in an ongoing search to find commercial quantities of gas in the Canning Basin.*

New marine servicing facilities required for the emerging Browse Basin

The potential for upgraded marine support facilities for the offshore petroleum industry is under consideration for the Browse Basin in far northwest Western Australia.

However, it is yet to be decided whether such facilities would come from an existing port or a greenfields site.

The port of Broome is currently experiencing significant growth from oil and gas exploration in the Browse Basin, as well as tourism, fishing and general trade. While the port is coping adequately, the local port authority predicts that the port of Broome will be unable to cope with additional demands for berthing space.

Broome appears to be the logical location for a new wharf or upgrade of the existing infrastructure, while Point Torment, about 40 km north of Derby, could be a potential choice if an entirely new port is established.

The Western Australian Government had earlier provided \$2 million enabling early exploration phases to be serviced by the Broome port rather than Darwin.

The port authority acknowledged that the Western Australian and Federal Governments contributed to grant funding towards the extension of the Broome jetty a few years ago. The 148-metre jetty extension, completed in May 2006, cost \$18 million.

Broome CEO and Harbour Master Vic Justice said the extension had certainly proved its worth with the Broome Port Authority reporting a six-fold increase in supply vessel activity.

“The port of Broome receives three to five supply vessels per week and can service three of these vessels simultaneously,” he said.

“However, if Broome becomes the main supply base for the Browse Basin, more than a dozen supply vessels could use the port, with six or seven of them being tied up at any one time.”



Busy times: The port of Broome is currently experiencing increased traffic.

Meanwhile, companies like Toll-Mermaid Marine have applied for an additional 10 hectares (above its present industrial land holding of five hectares at the port), while Woodside Energy has applied for a 15-hectare support base site. Woodside has indicated that its expanded base development will commence in 2008, in line with the expected start of its offshore projects in the Browse Basin.

The surge in offshore servicing traffic is also coming from activities associated with drilling programs by Shell, Inpex and Karoon/ConocoPhillips, plus joint ventures involving BHP Billiton, BP, Apache, Total, ENI, Exxon Mobil, Chevron and Nexus.

The Browse Basin is already known to contain at least 20 trillion cubic feet in gas reserves and associated condensate,



Bustling Broome: The port of Broome is experiencing significant growth from oil and gas exploration in the Browse Basin and expansion will need to be addressed very soon.



and this figure is predicted to rise in the years ahead. The region has the potential to host as much as \$30 billion worth of new oil, gas, condensate and LNG projects.

The nearest dedicated marine servicing ports for the offshore petroleum industries are 800 –1000 km away at Dampier and Darwin. Broome is 445 km from the main reservoirs of the Browse Basin, while Point Torment is less than 400 km.

The Broome Port Authority says it will continue working with the Department of Planning and Infrastructure to identify the scope of new works and the costs and funding required for any increased support capability at Broome for the Browse Basin.

Greenfields option

The other side of the coin is a potential greenfields port. Engineering consultants GHD recently found that Point Torment was a potential location for a new, stand-alone marine and industrial support facility in the Kimberley.

Overall, five different locations were investigated in the Derby/West Kimberley Shire area. The other sites included James Price Point, Cape Leveque, Wilsons Point and Broome.

The consultants' evaluation said that Point Torment could host a dedicated marine and industrial support facility for the Browse Basin region. Other potential uses could be linked to mining, aquaculture, tourism and government agencies.

A potential development scenario at Point Torment, as recommended by GHD, could see:

- A safe 400-metre berth on a piled wharf that could operate in all types of tidal conditions;
- A 6-kilometre rock causeway;



New resources: The port of Broome may receive a new wharf or upgrade.

- An 8-hectare hard-stand laydown area; and a
- 100-hectare potential lease area for port industrial support facilities (fabricators and material suppliers to offshore petroleum companies).

Planning issues for Point Torment did not present insurmountable problems, according to GHD. However, the consultants predicted that a comprehensive environmental, heritage and land tenure process would need to be followed.

The GHD study was a pre-feasibility assessment, therefore, considerable additional work would be required to examine potential flaws that could be detrimental to the project. These could include financial feasibility (given the large investments required for support infrastructure at a greenfields site, the long lead-time required for detailed investigation and construction) and the likely interim and ongoing competition for the Browse Basin business from ports such as Darwin. ■

100 year anniversary celebrates gold squad



Early days (1926-7): Detectives from the Gold Squad sorting through evidence (left) and using a map (right).

Gold has played an important role in the development of Western Australia since it was scratched from the red dirt more than 100 years ago.

The precious metal was first discovered in Coolgardie in 1892 and then in Kalgoorlie in 1893. In fact, Western Australia's population doubled within one year of the gold discoveries, as people flooded in from the neighbouring states of Victoria, New South Wales and South Australia.

Regardless of whether they struck it rich or not, the prospectors and miners were inclined to stay and by 1903 Kalgoorlie's population had reached 30,000 – the town also boasted 93 hotels and eight breweries. At this time, half of Australia's gold came from Western Australia and the nation had become the world's largest producer of gold.

Today, the State produces up to 75 per cent of Australia's gold per annum.

Gold has been an important part of Western Australia's economy for the past 100 years and the Gold Stealing Detection Unit has protected the industry from the very beginning.

The unit, affectionately named the 'Gold Squad', recently celebrated its 100th anniversary.

In the early days of the Western Australian Goldfields, most gold producers relied on regular police officers for protection. However, by the turn of the 20th century, the

theft of gold was so common it was threatening the industry.

A Royal Commission recommended the appointment of special detectives to combat and deter gold theft, and the Gold Squad was born.

Western Australian Minister for Resources Francis Logan said the unit had a proud history in WA's gold industry.

"The unit investigates offences related to the theft of gold and gold mining equipment throughout WA and other States, when necessary," Minister Logan said.

"It frequently patrols remote gold-mining locations and provides the only regular policing service to the main isolated mine sites.

"An extensive record of successful investigations in WA and at national and international levels, has firmly established the reputation of the unit.

"As a recognised authority on both gold theft and security of gold, it has provided advice and training to national and international enforcement agencies and gold producers."

The Gold Squad is funded by the State Government and the Chamber of Minerals and Energy of Western Australia.

Out-going CEO of the Chamber of Minerals and Energy Tim Shanahan said the unit has proved vital in protecting the

integrity and security of the gold industry in Western Australia.

"The Gold Stealing Detection Unit gives gold producers confidence that their industry will not be undermined by theft of the precious metal," Mr Shanahan said.

"There has been a long and effective relationship between the State's multi-billion dollar gold industry, and the unit."

The Department of Industry and Resources also has an Investigation Services Unit to monitor and enforce compliance with mining legislation. The Investigation Services Unit conducts enquiries into prospectors, miners and companies that may have breached the *Mining Act 1978* and the *Mining Regulations 1981*, rather than the more serious instances of internal or organised gold stealing that the Gold Squad investigates.

The Investigation Services Unit is also involved with educating those in the industry about their rights and obligations.

The Investigation Services Unit works with the Gold Squad to maximise the use of resources, intelligence and information sharing.

Western Australia's gold sector is the State's sixth most valuable resource product and was valued at \$4.06 billion for 2006-07. Recent discoveries, such as the Ramelius Resources Wattle Dam project in the Goldfields, highlights there is still plenty of gold left to be discovered in WA, even in well-mined regions. ■

More funds to help clear mining tenement backlog



Progress: The mining tenement backlog will be reduced to an operational level within three years.

A commitment to reduce the backlog of mining tenement applications in Western Australia has been undertaken by the State Government.

The Western Australian Government has committed \$3 million over the next three years, plus \$500,000 in ongoing funding,

The funding will enable the Department of Industry and Resources to employ people on a contract basis to process the applications.

The backlog, which peaked at 18,700 in February 2007, is a result of out-moded mining act provisions, native title processing issues and the resources boom.

Western Australian Resources Minister Francis Logan said he wanted to see the backlog reduced to an operational level of 5000 applications within three years.

“The resources boom is underpinning our economic growth and bringing huge benefits to the State and to Australia,” he said.

“But it is also creating many challenges and the backlog of mining tenement applications is something that needs to be rectified.”

The Minister said reducing the backlog would encourage more exploration activity in Western Australia.

“Last year’s amendments to the Mining Act have delivered significant short and long-term benefits to the mining industry,” he said.

“It has included mechanisms to revert from unwanted mining lease applications to new exploration titles and prevent the backlog in mining lease applications from recurring.

“Since the 2006 reversion period closed in February 2007, the backlog has

now started to decline.”

Mr Logan said the use of Regional Standard Heritage Agreements had also helped reduce the backlog.

He said these agreements were developed between industry and native title groups to address Aboriginal heritage and exploration activities to reduce objections by native title parties and speed up the processing of exploration applications.

“As a result of previous supplementary funding, a record number of tenement applications were granted last financial year,” the Minister said.

“A total of 2780 grants were achieved compared to the previous five-yearly average of 1570 grants.

“The department is once more on target to process a record number of applications this financial year.” ■

Apache reins up another commercial gas field



The Reindeer gas field is located approximately 100km offshore from the port of Dampier.

Another Western Australian gas field is set to be commercialised, with the Reindeer gas field gearing up to feed gas into the WA domestic market within three years.

Discovered in 1997 and appraised the following year via the Caribou-1 well, the Reindeer gas field contains up to 650 billion cubic feet of gas. It is located about 100 km offshore from the port of Dampier near Karratha.

Project partners Apache Energy and Santos recently took the unusual step of

inviting bids for the supply of gas from the Reindeer gas field.

The companies want to sell 110 terajoules of gas per day into the domestic market — and they have invited expressions of interest from potential buyers as to how much they are prepared to pay for the commodity.

While front-end engineering and design work is underway for the Reindeer project, the operation is not expected to be in commercial production until 2009.

Apache has a 55 per cent interest and is the operator of the Reindeer project,

while joint venture participant Santos owns the remaining 45 per cent interest.

Apache is eyeing the possibility of establishing a greenfields onshore gas processing facility at Devil Creek, on Mardi Station, about 45 km southwest of Dampier.

The plan is to link it up with the Reindeer field via a sea-bed pipeline. A second commercial product derived from the gas stream will be condensate, which could be exported south from the project area via heavy haulage trailers along the North West Coastal Highway to Kwinana. ■



Department of Industry and Resources

www.doir.wa.gov.au

Western Australia Opportunities to explore

BID FOR ACREAGE

(Bids close 6 March 2008)

Acreage release CDs are available from the Department of Industry and Resources. A web version is also available:

www.doir.wa.gov.au/mineralsandpetroleum/acreage_releases.asp

The acreage release CD package contains information about the release areas, land access and how to make a valid application for an exploration permit.

For further information contact:

Richard Bruce
 Department of Industry and Resources
 Tel: +61 8 9222 3273
 Email: richard.bruce@doir.wa.gov.au



Eastern Canning Basin

There are three release areas in the essentially Paleozoic Canning Basin. The sizes of the release blocks are 11,042 sq km, 6,745 sq km and 7,030 sq km.

Across the world there are more than 130 giant and super-giant oil and gas fields with Paleozoic sources and reservoirs that are similar to those in the Canning Basin. The Canning Basin may be the least explored of the known Paleozoic basins with proven petroleum systems. Current production is limited but proves the existence of petroleum systems.

Devonian-Carboniferous targets in this basin include Carboniferous and Devonian sandstones and reef carbonates. The Ordovician plays are characterised by the Carribuddy Group regional seal overlying Ordovician reservoirs which in turn overlie an excellent source rock in the Goldwyer Formation.

Officer Basin

There are three release areas in the Officer Basin. The sizes of the release blocks are 9,643 sq km, 12,437 sq km and 14,058 sq km.

Quality source rocks, reservoirs and seals have been found in this Neoproterozoic basin, and hydrocarbon shows have been found throughout the basin.

Salt movement during the Areyonga Movement (750 Ma) produced two laterally persistent zones: salt-ruptured and thrust zones. Numerous structural leads have been mapped by the Japan National Oil Company.

Northern Carnarvon Basin

The Northern Carnarvon Basin release area is located in the Barrow Sub-basin, an area noted for its Cretaceous oil production. The release area is located 10 km southwest of the giant Barrow Island oilfield. The block is 85 sq km in size. Water depths are less than 50 m.

www.doir.wa.gov.au/mineralsandpetroleum/acreage_releases.asp

Resources industry expert appointed by DoIR

The Department of Industry and Resources (DoIR) has a new Deputy Director General of Resources - Stedman Ellis, who brings a wealth of experience to the position.

In his previous roles at BHP Billiton, Mr Ellis was involved in meeting the requirements of several different regulatory regimes, as well as managing increasing expectations of diverse industry stakeholders.

Prior to BHP Billiton, Mr Ellis worked in public affairs roles for the Chamber of Minerals and Energy of Western Australia, Woodside Petroleum and Worsley Alumina.

Through his experience in corporate, government and community affairs, as well as communications roles, Mr Ellis has gained a good understanding of how approaches to regulating resources industry practices have evolved.

As Vice President of External Affairs for BHP Billiton, during a period of substantial change, Mr Ellis acquired a good grasp of the structural, operational and cultural changes necessary for large organisations to adapt to new challenges and directions.

Mr Ellis said it was the diverse set of challenges facing DoIR that attracted him to the role of Deputy Director General of Resources.

“As the State’s leading economic development agency, DoIR has a critical role in addressing many key challenges facing Western Australia, especially during this period of sustained growth,” Mr Ellis said.

“Western Australia has been able to ride on the wave of China’s industrial expansion, partly due to the large ore bodies and gas fields discovered in earlier decades.

“It falls to us in DoIR to make the most of current market conditions and to leave a similar legacy for future generations.

“We need to continue streamlining processes, informing policy direction at a whole-of-government level, improving our programs and regulatory measures and strengthening our communication, consultation and partnerships with all stakeholders.

“I have appreciated the opportunity to work with DoIR’s executive board and its Ministers to help develop our approaches to some of these challenges.

“I’ve been impressed with the level of commitment to supporting initiatives that will strengthen the systems, culture and capability of DoIR to address current demands and pressures successfully.”

Mr Ellis said he also enjoyed working with staff from the Resources Group on initiatives ranging from domestic energy plans to regulatory compliance in the minerals exploration sector.

He said he also had a keen interest in the work being conducted by the Aboriginal Economic Development Division, a team within the Resources Group.

Mr Ellis said achieving sustainable outcomes for the resources sector in this area was just as important as maintaining an investment in skills, science and education.

Born and raised in Western Australia, Mr Ellis spent several years living and working in Papua New Guinea and the United States, before moving back to Perth 10 years ago.

Mr Ellis said he was attracted to his previous role at BHP Billiton due to the opportunity to live and work in other countries and work on solutions to complex problems at both global and local levels.

“In a competitive world, we need to ensure our policy advice and regulatory frameworks reflect an international as well as local perspective,” he said.

Mr Ellis said he feels most successful in the work place when he achieves tough goals while still having fun. ■



Appointment: Stedman Ellis is the new Deputy Director General for the Department of Industry and Resources.

New public berth at Port Hedland



Trading State: Port Hedland is Australia's second highest volume port.

The development of a new \$225 million multi-user public berth at Port Hedland has received the 'go ahead' by the Western Australian State Government.

The new berth, which will have an annual capacity of around 18 million tonnes, will be located at Utah Point on Finucane Island, on the western side of the harbour and is expected to be operational in the first half of 2009.

State Planning and Infrastructure Minister Alannah MacTiernan said Port Hedland was Australia's second highest volume port with throughput of 111.9 million tonnes in 2006.

"By 2010 throughput is expected to significantly exceed 200 million tonnes. The additional berth is essential for the port to cater for future trade growth."

"We are a trading State and we need to be expanding our port capacity to enable our economy to function competitively."

The new public berth will provide many benefits including:

- capacity to accommodate small Cape class vessels of up to 120,000 DWT;
- freeing up access on existing public berths and berthside land to facilitate an additional 1.2 million tonnes annually in new bulk, general cargo and container trade;
- providing access to export facilities for emerging iron ore juniors; and
- relocating manganese and chromite stockpiles away from the town, reducing health risks and improving amenity at the west end of the town.

Ms MacTiernan said that \$105 million of the funding, to be sourced from foundation customers by way of prepaid charges and capital contributions, would be applied against capacity at the new berth. Up-front capital contributions will

come from BHP Billiton, Consolidated Minerals and Atlas Iron.

"The remaining \$120 million will be sourced from port borrowings, which will be fully repaid with port user fees within ten years," she said.

The port currently has three public berths. The No 3 berth was built in 1965 by Leslie Salt Company (now Dampier Salt Ltd) before it was transferred to the newly-created port authority in 1970. In 2005 the Port Authority extended its No 1 berth to recreate the No 2 berth, which was demolished in 1976.

In 2007, the Government approved expenditure by the Port Hedland Port Authority of \$9.5 million to undertake dredging and finalise conceptual planning of the berth, which forms part of the total development cost.

The project will require statutory environmental approvals and the Public Environmental Review will be submitted soon. ■

Petroleum explorer's guide: look no further than Western Australia

The 2007 edition of *The Petroleum Explorer's Guide to Western Australia* is now in circulation.

Produced by the Department of Industry and Resources (DoIR), the guide is designed to provide general information to companies considering exploring and investing in Western Australia's upstream petroleum industry, as well as existing companies involved in the industry.

Since the last edition of the guide in 2004, a number of changes to information and legislation have made it appropriate for the publication to be updated.

Included in the latest publication is an overview of the State, its economy, climate and lifestyle with revisions and updates on information about:

- Transport, infrastructure and pipelines;
- Legislation including environmental, native title and safety requirements;

- Resource management;
- Regional geology of Western Australia's sedimentary basins considered to be prospective for petroleum; and
- Taxation and commercial aspects relating to petroleum production.

The guide's editor, Petroleum Resource Geologist Karina Jonasson, said that contributions made to the guide came from within DoIR and several Commonwealth agencies that have a close involvement with the industry.

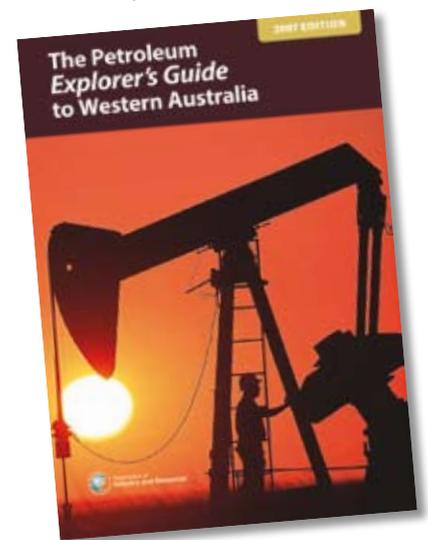
"Due to the informative nature of material in the guide, we have found that the guide has become a flagship publication, especially to new players in the industry," she said.

"Along with the recent release of the *Petroleum in Western Australia* magazine, the Petroleum Open Day and industry workshops, the guide forms an effective part of the division's communications

strategy with our customers in the petroleum sector."

The Petroleum Explorer's Guide to Western Australia can be found on the DoIR website at:

www.doir.wa.gov.au. Please enter: 'Petroleum Explorer's Guide' in the search facility. ■



2007 Award Recipient - Alcoa World Alumina Australia

2007 Award Recipient - Alcoa World Alumina

2007 Certificate of Merit - AngloGold Ashanti and Westwind Turbines

2008 Certificate of Merit - AngloGold Ashanti and Westwind Turbines

DoIR/007-1407



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Innovative technology for resources sector

Western Australia is well-known for its vast natural resources but, increasingly, the State is becoming home to impressive technological innovation for the resources sector.

In particular, four new technologies are set to revolutionise the resources industry in a variety of ways.

These are MillMapper, the Core Level Indicator System, CryoCell @ Technology and the T-Line Safety System.

These new technologies were highlighted with awards at the 2007 Inventor of the Year Award.

The Premier said the Inventor of the Year Award was part of the State Government's commitment to Western Australia's vital science and innovation sector.

"The State is experiencing unprecedented growth in the resources industry and the role that technology plays cannot be underestimated - it underpins everything we do," he said

"We have brilliant, talented and creative people who are achieving big things for the State and these awards are an outstanding indication of the depth of talent in Western Australia.

"Since 2001, the State Government has committed over \$220 million to critical science research, people and infrastructure in Western Australia and we will continue to provide support and recognition to our science community." ■



Scanalyse's MillMapper was the winning entry in the 2007 Inventor of the Year Awards.

MillMapper maps the inner workings of a grinding mill on a mine site, helping to increase safety as well as saving time and money for the global resources industry.

The MillMapper uses a specially calibrated 3D laser scanner to collect

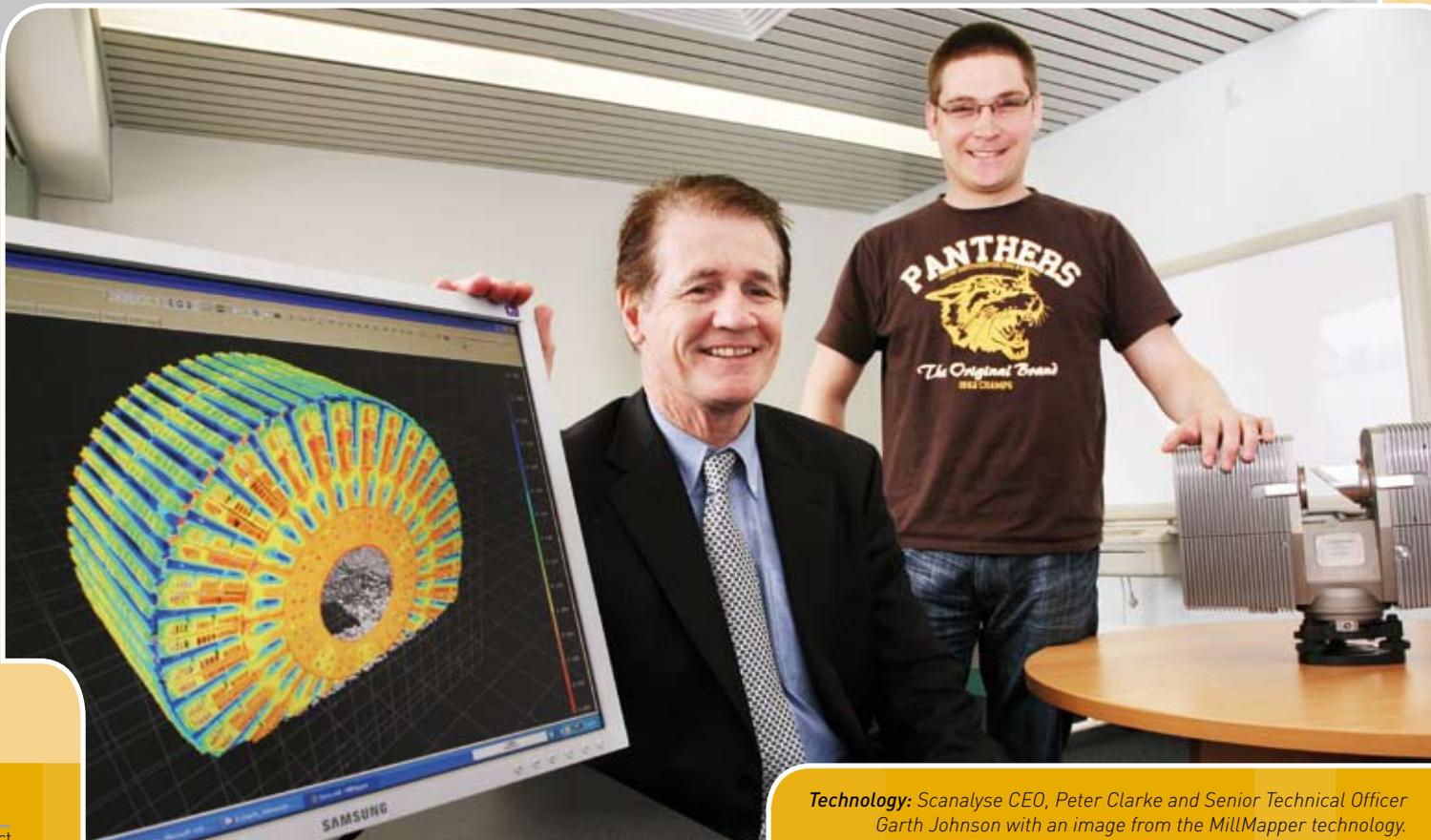
superior data on grinding mill liners.

Liners have a relatively short life span and there is currently no way of monitoring their deterioration without shutting a mill down for extended periods.

The innovative technology, which allows for the capture of real-time data, will help increase throughput levels and improve

the knowledge of wear liner shapes.

"This unique technology, which Scanalyse has developed, will save hundreds of thousands of dollars per year in reduced maintenance costs. In addition, it will increase mill throughput, resulting in millions of dollars of extra revenue for a mine site," Western Australian Premier Alan Carpenter said. ■



Technology: Scanalyse CEO, Peter Clarke and Senior Technical Officer Garth Johnson with an image from the MillMapper technology.



Coretrack Limited CEO Nanne van 't Riet said coring and core analysis are essential to the exploration phase of the oil and gas industry.

“One of the first steps in exploring a potential reserve is drilling for a core sample,” Mr van 't Riet said.

“A core provides engineers and geologists with a direct means of measuring properties of reservoir rocks, helping them to improve their understanding and performance of a reservoir, and eventually the ability to estimate the amount of reserves.

“The CLIS allows the operator to compare the amount of captured core against the depth of formation penetrated by the core barrel.

“If a core is not entering the core barrel, operators can then make the decision to pull the coring assembly to the surface, thereby saving time and money.

“The CLIS will significantly reduce the overall costs to the oil and gas exploration industry by increasing the efficiency and reliability of the core sampling process.” ■

▲ **Exploration:** Coretrack CEO Nanne van 't Riet with the Core Level Indicator System which will provide real time data in the hunt for oil and gas.

▼ **Protection:** Director of Meridian Safety, Leigh Dowie, takes the T-Line Safety System through its paces.

Meridian Safety Pty Ltd has invented a revolutionary new fall prevention system to maintain the safety of employees working off the ground.

The T-Line Safety System is a fall protection system that moves with the user in all directions. The user simply connects to the system and the device will automatically feed out or retract the safety line, depending on the user's movement. The innovative device can also be used to rescue a user once they have fallen, drastically reducing the time taken to rescue the person and the likelihood of serious injuries from suspension trauma. ■



Innovative technology for resources sector (continued)



Great minds: The team at Cool Energy have developed CryoCell® Technology.

Another invention, set to benefit the resources sector, is gas processing technology that will remove carbon dioxide from natural gas, in an environmentally-friendly manner.

Cool Energy has developed a new CO₂ capture technology known as CryoCell® Technology, with the aim of enhancing the potential to commercialise high CO₂ gas in Australia and around the world. Compared with conventional CO₂ removal technologies, the CryoCell® Technology provides environmental as well as capital and operating cost advantages.

Cool Energy CEO Jessie Inman said energy companies had traditionally given priority to using sweet gas fields avoiding, where possible, the acidic gas fields - which are less environmentally friendly and less commercially attractive.

Cool Energy's CryoCell® Technology may now enhance the potential for acidic gas fields to be exploited in an environmentally and commercially attractive way.

"Current gas industry processes for removing acid gas contaminants, such as carbon dioxide, are complex, bulky and have high capital and operating costs," Ms Inman said. "These processes also emit large amounts of carbon dioxide into the atmosphere.

"With CryoCell® Technology, removing carbon dioxide will be simple, compact and efficient, allowing for high concentrations of carbon dioxide to be captured in a liquid form making them suitable for geosequestration.

"Undoubtedly the CryoCell® Technology will play a large role in a decarbonised energy future.

"These inventions are set to benefit the onshore and offshore resources industry and further cement WA's position in the global resource services sector," the Premier said.

"Cool Energy has successfully been trialling the new technology on ARC Energy Limited's plant, Xyris gas field, in Dongara located in the Perth Basin in Western Australia.

"We are now ready to take this technology to the next stage and use it on a commercial plant.

"We have joined with the Great Artesian Oil and Gas Limited and Beach Petroleum Limited to study the feasibility of establishing the CryoCell® Technology gas plant project in the Cooper Basin, South Australia that will capture and store the carbon underground." ■



Banded iron framework review for Mid West's ranges

A landmark strategic framework, that will provide for the long-term sustainable development of Western Australia's Mid West iron ore industry, has been endorsed by the State Government.

The *Strategic Review of the Banded Iron Formation Ranges of the Mid West and Goldfields* was released by Resources Minister Francis Logan and Environment Minister David Templeman.

Mr Logan said the framework would deliver the best possible outcome for the State by maintaining a balance between the development of an iron ore industry and the conservation needs of the region.

It followed a strategic review of the mining and biodiversity values of the banded iron ranges of the Mid West and Goldfields undertaken by the Department of Industry and Resources (DoIR) and the Department of Environment and Conservation (DEC).

Mr Logan said the framework identified areas where the State Government favoured mining development, preferred sites for conservation and other areas that required further investigation.

"This framework represents a responsible middle ground that maximises the potential of the Mid West to share in the social and economic benefits of the resources boom, while maintaining a high degree of environmental responsibility," he said.

"We acknowledge that neither the mining industry nor the environmental sector has been given everything they wanted.

"We do not subscribe to the theory that the environment must be sacrificed for the benefit of industry - and vice versa.

"But responsible State Governments need to make tough decisions and we have considered the conflicting interests in this case and delivered a fair and responsible outcome for the State.

"The two government agencies central to this announcement, DoIR and DEC, are to be commended for rolling up their

sleeves and tackling what has been a very difficult and complex issue.

"There are still substantial challenges to be met before the Mid West iron ore industry reaches its potential, but this announcement successfully crosses one of the critical hurdles and provides some certainty for the future".

Mr Logan said the unique banded iron formation ranges in the Mid West were believed to contain between \$50-80 billion in mineral resources.

He said this quantity could sustain an iron ore industry with annual exports of 50 - 90 million tonnes, enough to underpin the development of a new port at Oakajee.

"World demand for iron ore is forecast to increase significantly in the next decade and, with much of the resources in demand located in the ranges, it is important that we plan for the future," Mr Logan said.

"This framework delivers that plan as a strategic approach to resource mining and biodiversity conservation decision making for the Mid West and Goldfields."

Mr Templeman said the ranges also had significant biodiversity value due to their unique geology, soils and relative isolation and they hosted a number of rare and restricted plant species and communities.

"The ranges are also very distinct features in the regional landscape, so it is important that we have a strong balance between conservation and development needs of this area," he said.

Since 2002, the Environmental Protection Authority (EPA) has completed formal assessments on three mining proposals in the region and is currently working on another three. There are a further three at the feasibility stage and 25 prospects under exploration.

Under the Environmental Protection Act, the EPA is limited to assessing only the environmental aspects of the proposals, while the State Government

is responsible for the assessment of the broader issues of sustainability, environmental, economic and social costs and benefits.

Mr Templeman said the large number of mining proposals in the region were presenting the EPA with an increasingly difficult challenge.

"This co-ordinated response will give industry greater certainty, while providing the EPA with clear guidelines about the economic and environmental objectives the State Government wants to achieve," he said.

"We must ensure examples of the banded iron landscapes are retained partially and in their entirety for their biodiversity and landscape values as well as tourism potential, while enabling responsible development in appropriate ranges.

"I also intend to consider how this document can be used to streamline the approvals process."

The *Strategic Review of the Banded Iron Formation Ranges of the Mid West and Goldfields* is available at:

www.doir.wa.gov.au ■



STRATEGIC REVIEW OF THE BANDED IRON FORMATION RANGES OF THE MIDWEST AND GOLDFIELDS

This review consists of:

- Executive Summary and Actions Arising, Endorsed by Government.
- DEC report 'Banded Ironstone Formation Ranges of the Midwest and Goldfields - Interim Status Report - Biodiversity Values and Conservation Requirements'
- DoIR report 'Strategic Review of an Iron Ore Industry in the Yilgarn Region (With Focus on the Midwest)'



Wind farms add green touch to WA's energy mix

Western Australia's commitment to cleaner, greener energy has been boosted by the recent official opening of another wind farm project at Hopetoun, near the State's south coast, about 175 kilometres west of Esperance.

The Hopetoun Wind-Diesel Project involved the construction of a new power station and a second 600 kilowatt wind turbine for the progressive town. The first turbine was commissioned in 2004.

Verve Energy undertook the \$7.5 million project, with Horizon Power investing \$1.5 million to connect the new power station to the local distribution network.

The project was also supported by the Australian Government, through the Renewable Remote Power Generation Program. This program was funded from diesel excise paid in Western Australia.

The new power station will ensure that Hopetoun has a reliable power supply as it accommodates an increasing number of new houses, as well as commercial and industrial customers. Most of the town's growth stems from the development of BHP Billiton's nearby \$2.8 billion Ravensthorpe nickel project.

The Hopetoun project follows the commissioning of a \$180 million wind farm at Emu Downs about 30 km inland from Cervantes in the State's Mid West region.

The wind farm is a joint venture between Griffin Energy and Stanwell Corporation Limited and comprises 48 turbines that are capable of producing 80 megawatts of electricity for the State's main power grid. That's enough to meet the power requirements of 50,000 WA homes.

There are now nine recognised wind farm sites in Western Australia which collectively produce 198 MW of electricity. Most of the energy is fed into Verve Energy's South West Interconnected System (SWIS) power grid.

The State has a total electricity generating capacity of about 6700MW, including about 5300MW for the SWIS grid.

Around 3 to 4 per cent of the State's electricity currently comes from renewable energy sources.

The Western Australian Government is on track to meet its renewable energy target of 6 per cent for the SWIS system by 2010, with the announcement of Synergy's decision to purchase power from a new bioenergy venture in Bridgetown. In addition, the State has set further targets for the SWIS of 15 per cent by 2020 and 20 per cent by 2025.

Victoria is currently the only State or Territory with a legislated renewable energy target scheme of 10 per cent by 2016, although the New South Wales parliament is considering a bill for a similar scheme. ■

WIND ENERGY SYSTEMS OUTSIDE OF THE SOUTH WEST ELECTRICITY GRID			
Generator	Proponent	Capacity (MW)	
Esperance - Ten Mile Lagoon	Verve Energy	2.025	2000
Denham	Verve Energy	0.69	2002
Rottnest Island	Rottnest Island Authority	0.6	2004
Esperance - Nine Mile Beach	Verve Energy	3.6	2004
Hopetoun	Verve Energy	0.6	2004
Bremer Bay	Verve Energy	0.66	2004
Exmouth	Verve Energy	0.06	2005
Hopetoun Expansion	Verve Energy	0.6	2007
Coral Bay	Verve Energy	0.825	2007

WIND ENERGY SYSTEMS ON THE SOUTH WEST ELECTRICITY GRID			
Location	Proponent	Capacity (MW)	Commissioned
Albany	Verve Energy	21.6	2001
Walkaway	Alinta	90	2005
Emu Downs Wind Farm	Griffin Energy	80	2006

Victoria	10% by 2016	Renewable, legislated
NSW	10% by 2010 15% by 2020	Renewable, bill in parliament
SA	20% by 2014	Renewable
Qld	10% by 2020	Renewable and low emission
ACT	10% by 2010 15% by 2020	Renewable
Western Australia	15% by 2020 20% by 2025	Renewable, under consultation
Commonwealth	9500 GWh by 2010 30 000 GWh (15%) by 2020	Legislated Renewable and low emission, proposed, to replace State schemes or commitments.

New hope for nickel laterites, as heap leach trials advance



Western Australia is already one of the world's leading producers of nickel, and output could be further accelerated if new heap leaching technology, associated with laterite deposits, proves its worth.

Two local nickel companies — Minara Resources and Heron Resources — each with large laterite nickel resources north of Kalgoorlie, are trialling the use of heap leach technology.

A third company, GME Resources, which has substantial lease holdings in the Murrin Murrin area, has included heap leaching as part of its long-term nickel laterite development plans. Additionally, it has an agreement with Norilsk Nickel to carry out a heap leaching trial on up to 20,000 tonnes of ore adjacent to Norilsk's Cause high pressure acid leach (HPAL) plant.

In December 2005 the board of Minara Resources committed \$25 million for the construction of a demonstration nickel-cobalt heap leach plant, which began operating in January 2007.

The company has been stockpiling low-grade ore and waste material, known as scats, at its Murrin Murrin operation since 1999. The scats stockpile comprises one million tonnes at 1.06 per cent nickel, while the ore stockpiles consist of 20 Mt at 1.02 per cent nickel.

If the heap leach technology proves successful (as indicated so far) it will add a low-risk production stream and deliver a year-in year-out source of revenue not previously available to Minara.

The low capital cost of the heap leaching technology could allow Minara to exploit lower grade deposits not currently being mined, and become a second processing stream independent from the company's existing HPAL plant at Murrin Murrin.

In October 2007 the board of Heron Resources approved the start of trial mining and construction of a demonstration leaching plant associated with its Jump-up Dam nickel project. The company aims to spend \$5.5 million on

the trial, which will involve the excavation of 100,000 tonnes of ore and the stacking of four 5000 tonne heaps of representative ore feed for leaching over a 10 month trial period.

The demonstration will provide key inputs for a definitive feasibility study.

The treatment technology is similar to that used previously in China and more recently by European Nickel at its Caldag project in Turkey.

The technology has been successfully applied to the treatment of copper and gold ores in different parts of Western Australia. During the nickel boom in the early 1970s, mining company Anglo American conducted column leaching test-scale trials using laterite ores from different parts of the world, including Western Australia.

If the latest heap leaching trials are successful, then it is possible that a commercial stamp can be put on additional, vast reserves of laterite nickel in Western Australia.

Western Australia has some of the biggest laterite nickel deposits in the world, with resources and reserves estimated at some 26.8 Mt of contained nickel. This is in addition to the more traditional nickel sulphide deposits with 9.8 Mt of resources and reserves of contained metal. Most of the State's past and current nickel production is from the treatment of sulphide ores.

The development of such resources could mean more resource development, more jobs, more export income and a greater life for nickel in WA, which is currently



Heaps of potential: Test columns being used by metallurgical researchers to test the effectiveness of laterite ores.



the third most valuable commodity with production worth \$7.9 billion in 2006-07 — up 109 per cent for the year.

Australia is the third largest global producer of nickel behind Russia and Canada, but could soon leap-frog Canada, given the rate that new resources are being exploited in Western Australia. ■

Big impact with new meteorite crater discovery

A Department of Industry and Resources geologist has made a very significant geological discovery — a large meteorite impact crater in the Hamersley Ranges, near Newman, 1186 km north of Perth.

Project Manager from the Geological Survey of WA, Dr Arthur Hickman, was using Google Earth, to compile and analyse geological field data when he made the discovery.

The structure is slightly bigger than the Melbourne Cricket Ground and has a 20 to 30 metre high circular rim.

As the crater was unusual in being so well preserved, Dr Hickman sent its

location details to Dr Andrew Glikson, a leading Australian authority on impact structures.

Dr Glikson visited the crater with his colleague John Vickers who immediately confirmed that the structure had many features and characteristics of a meteorite impact crater. It featured shock structures and veins of a glassy rock known as pseudotachylyte.

Further fieldwork confirmed the crater is, in fact, a previously undiscovered meteorite impact crater.

Dr Glikson collected samples from the crater rim, which will now be studied in the laboratory to provide additional

evidence related to the nature of the impact and to help identify its precise age.

The good preservation of the crater rim, combined with the fact that the meteorite landed on a present-day creek, which it effectively blocked, has helped establish that the impact occurred in geologically recent times — probably within the past million years. ■



Impact zone: A Google Earth view of the Hickman impact crater.



Engineering firm takes out Industry and Export Awards



World class: GRD Minproc's Langer Heinrich Uranium Project in Namibia. Reproduced with the permission of GRD Minproc.

Perth-based engineering firm GRD Minproc Limited has met success at the 2007 Western Australian Industry and Export Awards, receiving the prestigious Premier's Award for Excellence.

The award recognised the company's ability to deliver design, procurement and construction of mineral resource and waste-to-resources projects to both a national and international market. The honour also commended GRD Minproc Limited's ability to seek new markets, particularly outside Australia.

During the last two decades, GRD Minproc Limited has delivered services to more than 35 countries worldwide.

The company has undertaken projects from its head office in Perth, to growth hubs in Brisbane, Queensland, Johannesburg, Africa and Brazil.

The Premier's Award for Excellence was officially presented by Premier Alan Carpenter to the company's Chief Operating Officer Malcolm Brown.

Mr Brown said he felt honoured to be selected for the prestigious award.

"With the quality of companies who entered the various award categories, it was both humbling and rewarding to be recognised as the best of the best," Mr Brown said.

"It takes years of planning and implementation before a company can establish a reputation for excellence and innovation, and this award recognises the work of many people."

Mr Brown said that GRD Minproc was committed to ensuring that services provided to the minerals industry were technically superior and innovative.

"The most striking example of our commitment is the development of our waste to resource technology," he said.

"We commenced this initiative more than seven years ago, when the minerals industry was stagnant, and we needed a way to use our technical expertise in alternative areas.

GRD Minproc Limited also won the C.Y O'Connor Award for Excellence in Engineering.

A finalist in the 2006 Minerals and Energy Export category, GMA Garnet Pty Ltd, returned in 2007 to win the category. The company successfully demonstrated the breadth of its exports, distributing GMA Garnet to the Middle East, Europe, Africa and South East Asia for over 15 years.

The company produces garnet abrasive from a state-of-the-art mining and processing plant in Western Australia.

Rio Tinto Iron Ore, three-time winner of the Minerals and Energy Export category,

also entered the Western Australian Industry and Export Awards Hall of Fame.

Rio Tinto is the world's second largest producer of iron ore and the globe's most widespread supplier.

Risktec Australasia won the Education Export Award and Gold Corporation received both the Marketing and Design Excellence Award and Large Advanced Manufacturer Export Award.

All the State's export category winners automatically competed as finalists in the Australian Export Awards in Brisbane. GMA Garnet Pty Ltd was the only Western Australian national winner, taking the Minerals and Energy Export award. ■



Recognition: The Premier of Western Australia Alan Carpenter presents the Premier's Award for Excellence to GRD Minproc's Chief Operating Officer Malcolm Brown.

THE BIG PICTURE

Economic trends

World economic review and outlook

According to the IMF (October 2007), global economic growth remained above 5 per cent in the first half of 2007. For the first time, China, with growth of 11.5 per cent made the largest contribution to global growth measured at market and purchasing-power-parity exchange rates¹. India and Russia continued to grow at more than 9 per cent and about 8 per cent respectively. Together these three countries made up about one-half of world growth over the past year. In contrast, economic growth in the US in the first half of 2007 was about 2.25 per cent, while growth in the Euro area and Japan slowed in the June quarter, after experiencing two quarters of strong activity.

As a result, inflation has been subdued in these mature countries. In particular, prices in Japan were basically flat. On the other hand, prices rose in China and India reflecting strong economic activity and rising food prices (IMF October 2007).

Since its July 2007 World Economic Outlook Update, the IMF has maintained its global growth forecast for 2007 at 5.2 per cent, but downgraded growth for 2008 by about 0.5 percentage points to 4.8 per cent. The downgrade is due to financial problems in the US and uncertain prospects regarding its domestic demand (as well as in Europe).

The sub-prime mortgage problem that begun in the US in 2006 became a world credit problem from July 2007 as the US problem spreads to other financial institutions around the world. In August, to avoid a global credit crunch crisis, Central Banks including those of US, Europe, Japan and Australia injected about \$380 billion into financial markets. Since then, funds have been made available at higher costs as investors increase their risk premiums. The repricing of credit risk and fears of further mortgage-related financial losses at some of the world's largest banks such as Citigroup has also caused volatility in the stock markets around the world (AFR 13 August 2007, 5 November 2007 and IMF October 2007).

Tight financial conditions in the US are affecting its already deteriorating housing sector, and may spread to other sectors of the economy – increasing the likelihood of a sharp slowdown in economic activity.

The downturn in turn, is likely to affect the world economy. This along with uncertain conditions in the world credit market makes up the short term risk facing the world economy. Other risks are: potential inflation pressures arising from increasing oil² and other commodity prices, and robust economic activities in China and India; and continued large global current account imbalances (ABARE September 2007 and IMF October 2007).

US economy

The US economy grew unexpectedly at an annual rate of 3.9 per cent in the September quarter due to increased activity in exports, private consumption and business investment. In contrast, private residential investment continued in its seventh consecutive quarter of detracting from growth. According to the Federal Reserve and US Treasury, the housing sector is now considered to be the most significant risk to the US economy. The longer the sector remains in its downturn (along with tighter credit conditions), the higher the likelihood that debt-burdened consumers would spend less, leading to more adverse effects on the general economy. Consumption is a particularly important component of GDP in the US because it accounts for 70 per cent of economic activity. Latest employment and hourly earnings data suggest that consumption is likely to be supported in the short term (Bureau of Economic Analysis 2007 and Australian Financial Review 19 October and 5 November 2007).

The US Federal Reserve reduced the official interest rate by 0.25 of a per cent on 31 October and 0.5 of a per cent on 18 September because of fears that the tightening in the domestic financial market might cause further downturns in the housing sector (Federal Reserve 2007).

The IMF's GDP growth forecast for the US is 2.5 per cent for 2007 and 2.2 per cent for 2008. While these forecasts were made prior to the release of the stronger than expected September growth figures, the forecasts had accounted for the difficulties in the housing and financial markets.

China

The IMF (October 2007) continues to upgrade its 2007 growth forecast for China after the

Chinese economy grew by 11.9 per cent in the year to June quarter. China is now forecast to grow by 11.5 per cent in 2007, up by 0.3 percentage points from the July forecast. However, growth is forecast to slow down to 10 per cent in 2008.

In the year to September 2007, the growth rate eased slightly to 11.5 per cent. Exports and investment were again driving economic activity. Over the same period, the consumer price index rose by 6.2 per cent, also slightly down from the year to August. Basic food items, such as eggs, poultry and pork were the main source of price increases. The high inflation rates are well above the Government's target of 3 per cent (The National Bureau of Statistics 2007).

In its attempt to cool the economy, the Peoples' Bank of China has, so far this year, raised banks' reserve requirement rate six times to 13 per cent. This is the highest in a decade. Throughout the year, the bank has also raised interest rates – for the fifth time on 15 September. The one-year lending rate is now 7.29 per cent and the deposit rate 3.87 per cent.

However, with its trade surplus continuing to widen, and adding to domestic money supply, inflation is becoming another key concern for the Government. For the first nine months of the year, China's trade surplus reached US\$185.7 billion, surpassing the US\$177.5 billion record for 2006 (Commerce Ministry). The other main concerns facing the Government include: widening trade surplus and foreign reserves; rising prices in the stock market; growing income gaps between the rich and poor; and challenging environmental issues.

Japan and India

Compared to China, Japan is experiencing a slowdown in economic activity. Its GDP growth fell by 0.3 per cent in the three months to June, after an increase of 0.7 per cent in the three months to March. The decline was due to a contraction in private non-residential investment (-1.2 per cent) and slower growth in private consumption (0.3 per cent) and exports (0.8 per cent) (Japan Cabinet Office 2007).

As a result, the IMF (October 2007) has reduced its 2007 GDP forecast for Japan to 2 per cent. This is 0.6 percentage points lower than that forecast in July. Similarly, GDP

¹ The market exchange rate is the rate determined by forces of supply and demand for the currency. In contrast, the purchasing power parity (PPP) exchange rate is the exchange rate between two currencies, which would enable exactly the same basket of goods to be purchased. For example, if a basket of goods costs US\$50 in the US and the same basket cost AU\$65 in Australia, the PPP rate between the two countries would be AU\$13=US\$10.

² Please refer to discussion on the rising oil price in the Commodity trends.



growth for 2008 is also reduced to 1.7 per cent.

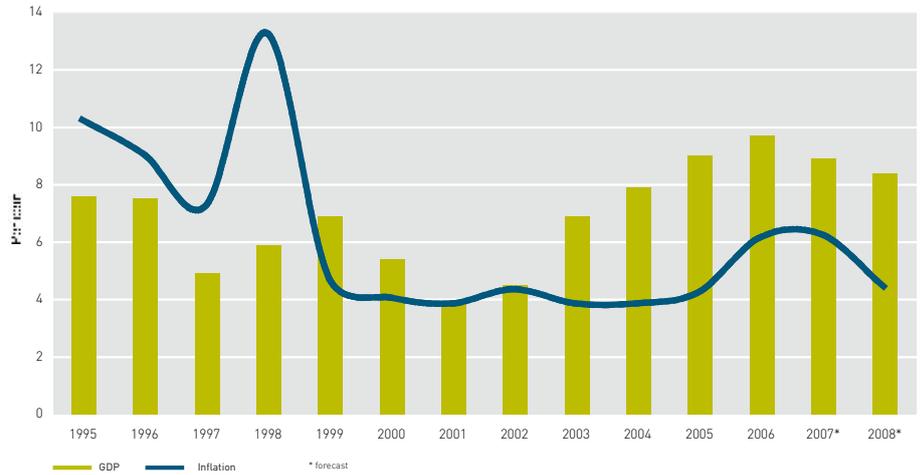
The slowdown in private consumption is a concern as it is the largest component of GDP. The unemployment rate has been rising for two straight months in September 2007 and wages (including overtime pay) have been falling - recording the ninth fall in 10 months. Furthermore, the outlook for Japan's exports is dependent on the US economy, which took close to a quarter of its exports in 2006. However, a possible slowdown in demand from the US is most likely to be offset by continuing strong economic activity in China and other parts of Asia (Ministry of Internal Affairs and Communications 2007, Bloomberg.com 30 October 2007 and The Economist 18 September 2007).

The Indian economy expanded by 9.3 per cent in the year to June quarter 2007 due to continuing strong activity in the manufacturing and service sectors (Reserve Bank of India 2007). Inflation, as measured by the wholesale price index, fell from 6.4 per cent in April to 3.1 per cent in October 2007. The decline in prices will continue to be supported by the strong rupee, prospects of a better harvest in summer oil seeds, such as palm oil and soybeans, and government programs in increasing food supplies through export and import tariff adjustments (ANZ September 2007). Nonetheless, inflation remains a risk for India because of its strong economic activity.

European economy

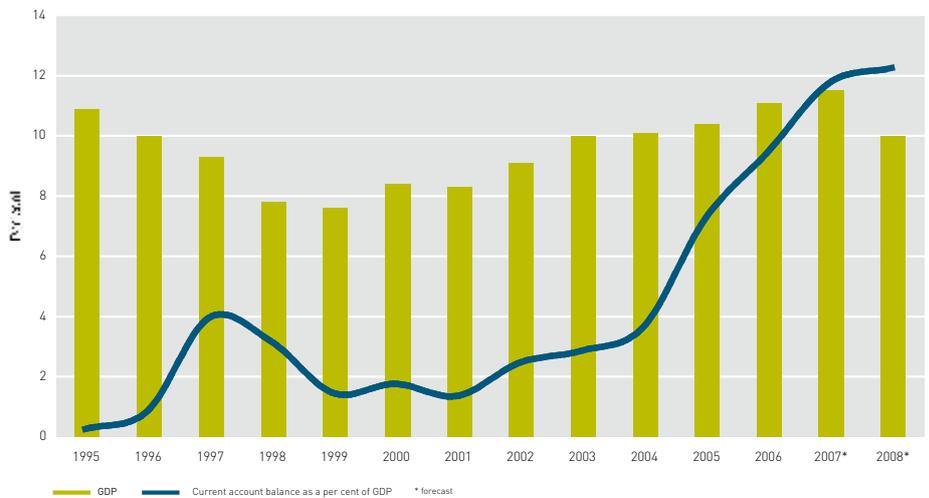
GDP in the Euro area increased by 2.5 per cent in the year to June quarter 2007, but it was substantially below expectations. The slowdown was largely due to declines in growth rates in Germany, France and Italy. Germany's slowdown, for example, was caused by a large fall in construction investment in a decade (EuroStats 2007 and Bloomberg 23 August 2007). The IMF (2007) has downgraded its GDP growth projections for the Euro area to 2.5 per cent in 2007 and 2.1 per cent in 2008.

Inflation in the Euro area is expected to be 2.6 per cent in the year to October, after annual increases of 2.1 and 1.7 per cent in September and August respectively. The increase in CPI was mainly due to rising prices in oil and food products (EuroStats 2007 and Bloomberg.com 31 October 2007).



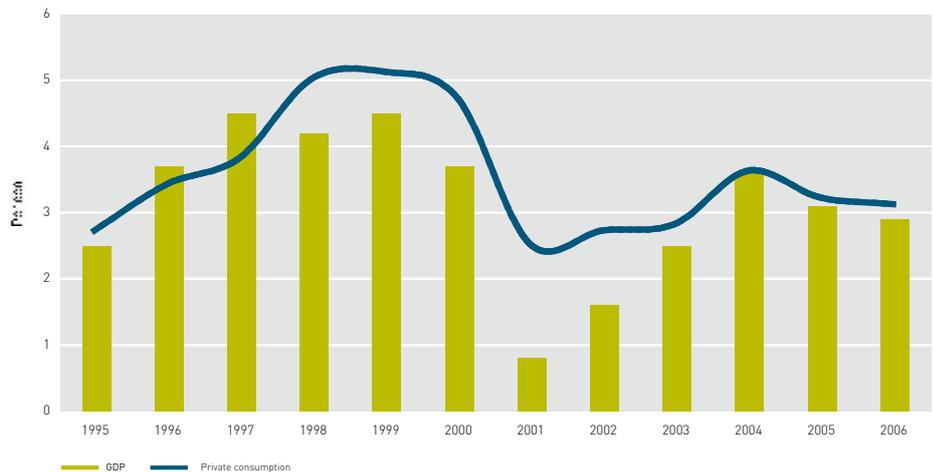
India: GDP and inflation

Source: IMF, October 2007. Figures for 2007 and 2008 are forecasts



China: GDP and current account

Source: IMF, October 2007. Figures for 2007 and 2008 are forecasts



US: GDP and private consumption

Source: Bureau of Economic Analysis 2007

THE BIG PICTURE

Commodity trends

With Rio Tinto mopping up the last few per cent of Alcan shares through compulsory acquisition and Xstrata set to takeover Australia's Jubilee Mines, mergers and acquisitions still feature strongly in the resource sector, moderated slightly by recent credit tightening due to the United States (US) subprime mortgage crisis.

Crude Oil

Despite reaching levels close to the inflation-adjusted highs of 1980, current oil prices appear far from triggering widespread recession. From an average price slightly under US\$55 per barrel in January, the West Texas Intermediate (WTI) oil price has increased dramatically to reach almost US\$95 per barrel in recent days. While the Organisation of the Petroleum Exporting Countries (OPEC) announced they would increase production by 500,000 barrels per day at their September 2007 meeting, they are resisting calls for further increases, stating that the current market situation is not the result of a supply shortage, but due to market speculation and politics.

On the one hand it is less prudent to hold large inventories of oil given the high prices, but on the other the drop in inventories in the US as reported by the US Energy Information Administration (EIA) is helping to fuel speculation of high oil prices. In light of concerns over the current crude oil market balance, OPEC has decided to convene an extraordinary meeting in December 2007 to reassess the situation.

The combination of the weaker US dollar, geopolitical instability, OPEC's reluctance to accelerate supply and relatively low spare crude production capacity levels, will result in another year of strong oil prices in 2008. EIA predicts the average WTI price to be US\$73.5 per barrel in 2008, while the Australian Bureau of Agricultural and Resource Economics (ABARE) forecasts an average WTI price of US\$66 per barrel for the same period.

Gold

After trading sideways for some months, gold prices appear to be responding to the lowering US Federal Reserve interest rates and the corresponding weakening of the US dollar. US Federal Reserve rates were cut half a per cent in September 2007, and a further quarter of a per cent in late October 2007, pushing gold up to nominal price levels not seen since 1980. At the time of writing gold futures had just breached US\$800 per ounce on 1 November

2007. In real terms it should be noted that the inflation-adjusted 1980 gold price represents approximately US\$2000 per ounce in today's currency.

While the increasing gold price has been welcome for Australian producers, it has been coupled by a strengthening Australian dollar (against the US dollar), such that the average gold price in September 2007 was approximately the same as that in January 2008 at AU\$840 per ounce, having dipped as low as AU\$766 per ounce in June 2007.

Factors still favour a strong gold price in the near future, including weakness of the US dollar, concerns about the ripple effects of the subprime mortgage crisis, geopolitical tensions and further dehedging by gold mining companies. In the medium term, forecasters including Credit Suisse and Citigroup speculate that gold prices may reach as high as US\$1000 per ounce. Perhaps credit is due to Pierre Lassonde, chair of the World Gold Council and vice president of Newmont Mining Corporation, for predicting US\$750 per ounce by the end of 2007 and US\$1000 per ounce prices at an undetermined date in the future.

Iron Ore

After finessing iron ore price negotiations earlier than usual last December 2006, Chinese steelmakers are undoubtedly bracing themselves for a tougher negotiation round in the coming months. Continued strong demand for iron ore, a weaker United States dollar, increased freight rates and the introduction of iron ore export duties in India all conspire to drive next year's iron ore prices higher.

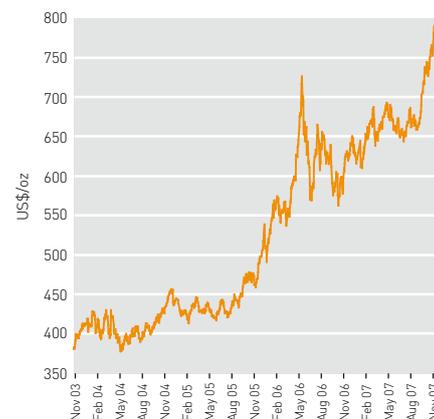
In the same manner that China's rapid growth and consequent demand for commodities was underestimated by the mining industry, so it was for the demand for dry bulk shipping services. As a result, insufficient dry bulk ships are available today, which has led to an escalation of freight rates for commodities such as iron ore, coal and grains. This is exacerbated by the fact that increasing iron ore tonnages are being shipped from Brazil to China, tying up vessels in longer journeys.

The Baltic Exchange Dry Index represents shipping rates averaged across a range of routes and vessel sizes and is therefore a suitable proxy for iron ore shipping rates. The index has more than doubled since the start of the year, rising from 4421 on 2 January 2007 to over 11,000 in October 2007. Given the lead time to construct new vessels, the index is not expected to drop significantly before 2009.



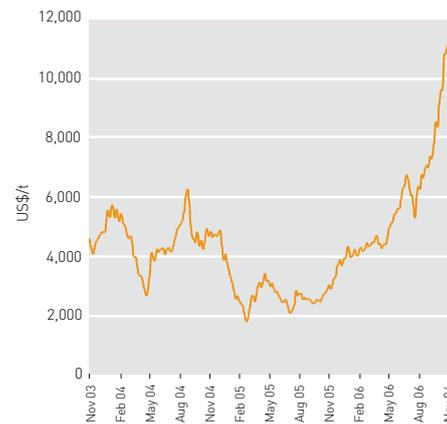
Oil Prices

Source: <http://www.eia.doe.gov/emeu/international/crude1.html>



Gold Prices

Source: London PM Fix



Baltic Dry Index

Source: The Baltic Exchange Ltd



Aluminium Prices

Source: LME Cash Official

The upshot of all this is that Western Australian iron ore landing in China enjoys a substantially lower freight charge than that arriving from Brazil, the so called "freight differential". Western Australian producers are seeking to leverage off the freight differential to justify higher FOB prices at home. At the same time Luo Bingsheng, vice chair of the China Iron and Steel Association, has rejected the freight premium concept for Australian ore.

More recently reports indicate that BHP Billiton may be abandoning the freight differential debate, but is still seeking to alter the fundamental nature of the current pricing system. That iron ore prices will rise in 2008 is undisputed, but speculation abounds regarding the margin of the increase, with analysts predicting anything from a 10 to 50 per cent rise.

Aluminium

Unlike many other metal markets, China dominates both the production and consumption of aluminium. ABARE predicts a strong rise in consumption of aluminium in China of 40 per cent in 2007, and a further 7 per cent in 2008. Production increases will also be led by China, with ABARE predicting a 34 per cent rise in 2007 followed by another increase of 12 per cent in 2008.

Overall, ABARE predicts the aluminium market to remain in a surplus supply situation for 2007, keeping the lid on prices for the remainder of the year, averaging US\$2655 per tonne. With surplus widening in 2008 ABARE predicts a further softening in price to an average of US\$2240 per tonne.

ABARE is forecasting a similar situation for the alumina market, with supply outstripping demand causing prices to drop from an average of US\$331 per tonne in 2007 to US\$265 per tonne in 2008. Part of the increase in the world alumina output will come from the 1.8 million tonne per year expansion at the Gove refinery in the Northern Territory, raising its capacity to 3.8 million tonnes per year.

Lead and Zinc

The world has certainly turned upside down in the lead and zinc markets with lead prices trading in excess of US\$3500 per tonne while zinc prices have softened to around US\$3000 per tonne, reversing the historical price positions for the commodities.

The International Lead and Zinc Study Group (ILZSG) met on 8 October 2007 and predicted

a continued strong growth pattern for lead in China, growing 17 per cent in 2007 and a further 10.2 per cent in 2008. This growth is fired largely by expansion in the domestic vehicle, communications and computing markets. Despite lead production expansions, which are in the pipeline, the ILZSG predicts the market will remain in deficit in 2007 and remain tight in 2008, assuring future strength in lead prices.

Both ABARE and the ILZSG predict zinc consumption to increase in 2007 (by 3 per cent) and to grow further in 2008. Despite this, prices are expected to remain soft as production expansions exceed the increase in demand in 2008. ABARE therefore predicts zinc prices to subside to an average of US\$2,875 in 2008.

Nickel

After a staggering, year-long climb to dizzying prices in excess of \$54,000 per tonne in May, nickel prices rapidly dropped back down to earth by July 2007. Steelmakers made good on their threats to delay nickel purchases and substitute to low nickel steels. One side-effect was that demand for the substitute chromium escalated, causing ferrochrome prices to double between January 2007 and June 2007 from around US\$1500 to US\$3000 per tonne (high carbon 60-65 per cent ferrochrome).

Despite the drop in nickel prices since May 2007, it has to be remembered that the current prices are still high compared to historic levels. Medium to long-term confidence in nickel prices would appear to be driving takeover activity in the market, with the most recent being Xstrata's \$3 billion dollar bid for Australia's Jubilee Mines.

ABARE reported that nickel consumption was up 9 per cent in the first quarter of 2007, but shed 6 per cent in the second quarter in response to high prices. With prices relatively stable since July 2007 it would seem likely that consumption levels will regain lost ground for the remainder of the year. While the bulk of additional supply originated from the Philippines, Indonesia and New Caledonia in 2007, most new production is expected from Australia (Ravensthorpe) and Brazil (Onça Puma) in 2008.

Given the drop in nickel prices since May 2007, ABARE has revised their price expectations downwards to an average of US\$37,200 per tonne for 2007 and US\$28,000 for 2008. ■



Lead and Zinc Prices

Source: LME Cash Official



Nickel and Ferrochrome Prices

Source: Metalprices

KAOLIN

Kwinana - Kaolin Processing Plant and Mine

WA KAOLIN HOLDINGS PTY LTD

WA Kaolin is in the process of commissioning its Kwinana pilot plant to produce a saleable product targeting the paper coating market. This will lead to a 250,000 t/a coating grade kaolin at a cost of about \$130 million. The kaolin will be sourced from its Wickepin resource some 200 km northeast of Kwinana

Expenditure: \$130m.

Employment: Operation: 50

AMMONIUM NITRATE

Kwinana - Ammonium Nitrate Plant & Expansions

CSBP CHEMICALS

CSBP has environmental approval to double the capacity of its existing ammonium nitrate facility at its Kwinana operations. Construction is nearing completion on the ammonium nitrate plant and the prill plant. The objective is to achieve commissioning in the second half of 2007.

Expenditure: \$260m.

Employment: Construction: 200

COAL

Collie - Coal Mine (Ewington I)

THE GRIFFIN COAL MINING COMPANY PTY LIMITED

Griffin Coal plans to develop its Ewington I deposit, approximately 2 km east of Collie, which has estimated recoverable reserves of 75 Mt. The mine will produce about 2 Mt/a coal for private sector customers, including Griffin Energy's nearby Bluewaters 1 power station, presently under construction, and its proposed Bluewaters 2 power station.

Expenditure: \$20m.

DIAMONDS

Argyle - Underground Diamond Mine

ARGYLE DIAMOND MINES PTY LIMITED

Argyle Diamonds has committed to an underground mine at Argyle after a \$100 million feasibility study was completed in late 2005. Argyle is progressing the main decline and full production for the first stage, involving 7-8 Mt/a ore extraction, is expected to be reached in 2011, with average production of about 17 Mcts/a of diamonds until 2018. A second stage project will extend mine life to 2024.

Expenditure: \$1.2b.

Employment: Construction: 250; Operation: 500

ELECTRICITY

Collie - Bluewaters 1 Coal-Fired Power Station

GRIFFIN ENERGY

Griffin Energy is constructing the first of two 208 MW coal-fired power stations at the proposed Coolangatta industrial estate, 10 km northeast of Collie.

Commissioning of the Bluewaters 1 base load power station is expected by late 2008.

Expenditure: \$400m.

Employment: Construction: 600; Operation: 50

GOLD

Boddington - Gold Mine (Wandoo Expansion)

BGM MANAGEMENT COMPANY PTY LTD

BGM Management Company Pty Ltd, on behalf of Newmont and AngloGold Ashanti, is developing the Wandoo project, based on mining the extensive bedrock resource that underlies the mined-out oxide resource. Production will be up to 600,000 oz/a of gold and about 20,000 t/a copper in concentrates over a 17-year mine life. Initial production is expected by late 2008. The Wandoo project will result in significant growth in and around the rural community of Boddington 120 km south east of Perth.

Expenditure: \$2b.

Employment: Construction: 1500; Operation: 650

HEAVY MINERAL SANDS

Gwindinup - Heavy Mineral Sands Mine

BEMAX CABLE SANDS (WA) PTY LTD

The Gwindinup mineral sands project is located

approximately 30 km south of Bemax's Bunbury Mineral Separation Plant ("MSP") and comprises the Gwindinup North and South deposits. Mine development activities are progressing and mining is expected to commence during Q1 2008. An existing wet plant will be used for the project and material will be treated in the Bunbury MSP. Gwindinup contains a reserve of 5 Mt of ore at a heavy mineral grade of 12.6% and is expected to have a mine life of more than 6 years.

Expenditure: \$88m.

Employment: Construction: 120; Operation: 35

IRON ORE

Hope Downs - Iron Ore Mine

HOPE DOWNS LIMITED

Development proposals were approved by the government on 31 March 2006. Hope Downs Iron Ore assigned a 50% interest in the project to Hamersley Iron. Construction work has commenced.

Expenditure: \$1.5b.

Employment: Construction: 1000; Operation: 300

Mid West Region - Koolanooka/Blue Hills Hematite Iron Ore Mine

MIDWEST CORPORATION LIMITED

Midwest Corporation commenced transporting iron ore fines from stockpiles at Koolanooka, about 160 km south east of Geraldton, in January 2006, with the first export shipment in February 2006. Midwest proposes to re-open the Koolanooka and Blue Hills hematite iron ore mines at a rate of 1-2 Mt/a, with timing dependent on the timing of government approvals. The re-opening of the mines is being environmentally assessed at a Public Environmental Review level.

Expenditure: \$26.4m.

Employment: Construction: 40; Operation: 60

Pilbara - Dampier Port Expansion

HAMERSLEY IRON PTY LIMITED

Hamersley Iron is currently expanding the capacity of its port facilities at Dampier Port from 120 Mt/a to 145 Mt/a. This work includes installation of a new car dumper, screen house and related facilities.

Expenditure: \$920m.

Employment: Construction: 800; Operation: 200

Pilbara - Iron Ore Mine Rail and Port Development

FORTESCUE METALS GROUP (FMG)

FMG is constructing a 45 Mt/a iron ore mine at Cloud Break in the Chichester Ranges of the eastern Pilbara. The mine will be serviced by a multi-user railway and new port facilities at Port Hedland. Earthworks and dredging are underway at Port Hedland. Construction of the railway and mine commenced in December 2006 to supply the Chinese market from Q2 2008.

Expenditure: \$3.2b.

Employment: Construction: 2500; Operation: 840

Pilbara - Rapid Growth Project 3

BHP BILLITON IRON ORE PTY LTD

In October 2005, BHP Billiton announced Board approval for the US\$1.5 billion Rapid Growth Project 3 ("RGP3") expansion, which will increase capacity of its Pilbara iron ore operations to 129 Mt/a. The key elements of RGP3 comprise the expansion of the Area C mine by 20 Mt/a, additional sidings on the Newman railway, and port works at Nelson Point and Finucane Island. Initial production is forecast to begin in Q4 2007, with actual production of 129 Mt/a anticipated by 2008-09.

Expenditure: \$2b.

Employment: Construction: 900; Operation: 150

Pilbara - Rapid Growth Project 4

BHP BILLITON IRON ORE PTY LTD

In March 2007, BHP Billiton announced its Board approval for Rapid Growth Project 4 ("RGP4") which will increase system capacity across its Pilbara iron ore operations to 155 Mt/a at a cost of US\$2.2 billion. RGP4 includes development of a new crushing and screening plant, as well as additional stockyards, car dumping and train loading facilities at Mt Whaleback. Infrastructure upgrades will also be implemented at satellite orebodies and the rail and port operations. Work has started and initial production is expected to commence in the first half of 2010, with ramp-up to full capacity expected to be achieved by the end of 2012.

Expenditure: \$2.6b.

IRON ORE PROCESSING

Kwinana - Hismelt Commercial Iron Making Plant

HISMELT CORPORATION LIMITED

Hismelt Corporation, in a joint venture with Nucor (25%), Mitsubishi (10%) and Shougang (5%), has developed a commercial-scale Hismelt process plant at Kwinana, near Perth. The first stage of the plant will produce 800,000 t/a of pig iron from iron ore fines, coal and fluxes. First hot metal production commenced in mid-2005, with commissioning continuing towards full production capacity.

Expenditure: \$800m.

Employment: Construction: 320; Operation: 65

NICKEL

Ravensthorpe - Lateritic Nickel Mine and Hydrometallurgical Processing Plant

BHP BILLITON - RAVENSTHORPE NICKEL OPERATIONS PTY LTD

The project includes an open-cut mine and hydrometallurgical process plant. The project will use proven technology to recover nickel and cobalt from laterite ores to produce a mixed nickel and cobalt hydroxide intermediate product. The plant will have the capacity to produce approximately 50,000 t/a of contained nickel in mixed hydroxide product and 1400 t/a of cobalt to be recovered at the company's Yabulu refinery in Queensland. Plant commissioning is underway and the first shipment of product to Yabulu is expected in Q1 2008.

Expenditure: \$2.2b.

Employment: Construction: 2000

OIL & GAS DEVELOPMENTS

Angel (Carnarvon Offshore Basin) - Gas and Condensate Field

WOODSIDE ENERGY LTD

The Angel gas and condensate field, operated by Woodside as part of the North West Shelf Venture ("NWSV"), includes the NWSV's third fixed production platform, which will be remotely operated, three subsea production wells and a 50 km subsea pipeline which will link the new platform to the existing North Rankin production facility. Angel is expected to start-up in Q3 2008. The platform will be capable of processing 800 million standard cubic feet of gas a day and 50,000 bbl/d of condensate.

Expenditure: \$1.6b.

Carnarvon Basin - Pluto LNG

WOODSIDE

The Pluto gas field was discovered in April 2005. It is approximately 180 km from the Burrup Peninsula. Woodside Energy Ltd plans to develop LNG facilities on the Burrup Peninsula to produce 5-6 Mtpa. Final environmental approval was issued in October 2007, with construction work underway.

Expenditure: \$11.2b.

Employment: Construction: 3000; Operation: 200

North West Shelf - Project Expansion - 5th LNG Train

WOODSIDE ENERGY LTD

A final investment decision for the 4.4 Mt/a Train 5 expansion, with an associated second LNG loading jetty and extra processing facility support, was announced in June 2005. Site work started in Q3 2005.

The project is expected to take about three years to complete, with commissioning due to start around mid-2008 and first LNG export cargoes planned for Q4 2008. The fifth train will boost the North West Shelf project's total LNG production capacity to 16.3 Mt/a.

Expenditure: \$2.425b.

Employment: Construction: 1500; Operation: 20

Pyrenees Development (Carnarvon Offshore Basin) - Oil Fields

BHP BILLITON PETROLEUM PTY LTD

In July 2007, BHPB Petroleum approved the Pyrenees oil development, located 45 km north of Exmouth. The development comprises the Crosby, Ravensworth and Stickle oil fields which have estimated recoverable oil reserves in the range of 80-120 million barrels. The project involves the development of 13 subsea wells connected via flowlines to a FPSO vessel, which will

be capable of producing about 96,000 bbl/d of oil. First production is expected during the first half of 2010 and the estimated economic field life is 25 years.
Expenditure: \$2b.

Stybarrow (Carnarvon Offshore Basin) - Oil Field BHP BILLITON PETROLEUM PTY LTD

Located approximately 65 km northwest of Exmouth in 825 metres of water, Stybarrow is the deepest oil field development ever undertaken in Australia. It involves a subsea development and a FPSO vessel which will be able to process approximately 80,000 bbl/d of oil. Stybarrow and the adjacent small oil rim of the Eskdale field have estimated recoverable oil reserves of 60-90 million barrels. FPSO is now on location and installation of subsea equipment is progressing. First production is expected at the end of 2007 and the estimated economic field life is 10 years.
Expenditure: \$860m.

Van Gogh (Carnarvon Offshore Basin) - Oil Field APACHE ENERGY LIMITED

The Van Gogh oil development, located around 50 km northwest of Exmouth, will utilise a FPSO vessel with a processing capacity of 63,000 bbl/d of oil and storage capacity of 620,000 barrels. It will be linked to two subsea drill centres with 10 production wells. Drilling is expected to commence in mid-December 2007 and continue until late-September 2008. Subject to obtaining all the necessary government approvals, the field installation of Van Gogh is expected to start in late 2008 and be in production by early to mid-2009. The expected life of the development is 12-15 years.
Expenditure: \$600m.

Vincent (Carnarvon Offshore Basin) - Oil Field WOODSIDE ENERGY LTD

Approval of the first phase of the Vincent oil development was given in March 2006. The field is located approximately 50 km northwest of Exmouth in a water depth of about 350 metres. Oil will be produced through an eight well subsea development and processed and stored in a FPSO vessel. Drilling activities commenced in April 2007 and fabrication of topside facilities and subsea equipment is progressing. First oil is planned for Q3 2008, with initial production at about 100,000 bbl/d.
Expenditure: \$1b.

RARE EARTHS

Mt Weld - Rare Earths Operations LYNAS CORPORATION LTD

The Mt Weld deposit, located about 35 km south of Laverton, contains an estimated resource of 7.7 Mt at 11.9% grade for 917,000 tonnes rare earth oxides ("REO"). The development involves open pit mining at Mt Weld, trucking the ore to Leonora and then railing it to Esperance Port for export. Mining has commenced, with first production scheduled in the second half of 2008. The ore will be shipped to a \$220 million processing plant in Malaysia, with initial production capacity of 10,500 t/a REO and is expected to be expanded to 21,000 t/a.
Expenditure (WA only): \$90m.
Employment: Construction (WA only): 12; Operation: 40

VANADIUM

Windimurra - Vanadium Pentoxide mine and processing plant

PRECIOUS METALS AUSTRALIA LIMITED
PMA plans to complete construction of its processing plant and begin operations in late 2008. Once operational, the mine will produce approximately 5600 t/a of contained vanadium. The process plant will produce both ferro-vanadium (an alloy of vanadium, aluminium and iron) and high purity vanadium pentoxide.
Expenditure: \$296m.
Employment: Construction: 400; Operation: 120

AGRICULTURE

Mantinea Flats - Ord River Irrigation Scheme (Stage 2 Development) - Mantinea Flats

TBD
The conceptual project consists of developing and servicing approximately 80 farms (about 4200 ha total)

at Mantinea Flats for irrigated intensive horticulture which will then be offered for sale.

Ord River - Ord River Irrigation Scheme

ORD STAGE 2 M2 AREA

The potential exists for a 30,000 ha irrigated agricultural development immediately to the northeast of the existing Ord Stage 1 development in the far north of Western Australia. Environmental approval has been given for an irrigated agricultural project, and a native title agreement has been signed. The State is currently considering development options.
Expenditure: \$500m.
Employment: Construction: 650

AMMONIA/UREA

Burrup Peninsula - Ammonia Urea Plant DAMPIER NITROGEN

Dyno Nobel has purchased the interests of Plenty River (Plentex) and Thiess in a large scale ammonia/urea project to be located on the Burrup Peninsula. The company is also conducting a feasibility study into developing a 230,000 t/a ammonium nitrate production facility, which could be located adjacent to the ammonia/urea plant. The alternative (to a large scale ammonia plant) of building a small scale ammonia plant to supply the ammonium nitrate plant is being investigated as part of the feasibility study.
Expenditure: \$900m.
Employment: Construction: 1000; Operation: 130

BAUXITE/ALUMINA

Wagerup/Willowdale - Alumina Refinery Train 3 Expansion

ALCOA WORLD ALUMINA AUSTRALIA
Alcoa is investigating the feasibility of a third production train expansion at its Wagerup alumina refinery to increase capacity up to 4.7 Mt/a. On 14 September 2006, the Minister for the Environment approved the expansion proposal. A decision on the project is expected in 2008.
Expenditure: \$1.5b.
Employment: Construction: 1500; Operation: 260

Worsley/Boddington - Alumina Refinery Expansion to 4.4Mt/a

WORSLEY ALUMINA PTY LTD
BHP Billiton has environmental approval to expand its Worsley alumina refinery from 3.7 Mt/a to 4.4 Mt/a. A final investment decision is dependent on market conditions, including construction costs.
Expenditure: \$900m.
Employment: Construction: 500; Operation: 150

COPPER

Pilbara - Panorama Copper/Zinc mine CBH RESOURCES LTD

The project is based on development of the Sulphur Springs copper-zinc ore body, and involves a 1.25 Mt/a open-cut mine and ore processing plant to produce 65,000 t/a of copper concentrates (25% Cu) and 75,000 t/a of zinc concentrates (53% Zn), with a mine life of more than 7 years. The project is in the environmental assessment phase.
Expenditure: \$250m.
Employment: Construction: 176; Operation: 150

ELECTRICITY

Mid West - Central West Coal & Coolimba Power Projects

AVIVA CORPORATION LTD
Aviva Corporation Ltd is progressing the development of the Coolimba Power Project, a 2 x 200 MW baseload coal-fired power station and an associated coal deposit located 20 km south of Eneabba. Coolimba will be the first power station in WA to deploy leading edge emissions technology for carbon capture, desulphurisation and air cooling. Upon commissioning, the Power Station will constitute 8% of the installed capacity in the SWIS network and have an operating life of 30 years. Construction is planned to commence in late 2008 and will extend over three years for completion in 2011/12.
Expenditure: \$1b.
Employment: Construction: 600; Operation: 100

Mirambeena Timber Processing Precinct - Bioenergy Project

BEACONS CONSULTING
Great Southern Bioenergy Holdings Ltd is planning a staged 2 x 45 MW base load bioenergy power station at Mirambeena, near Albany. The plant will burn residues from the harvesting of bluegums for export wood chips. Financial closure is expected in 2007 with the first 45 MW plant in operation by 2009. The second stage expansion is anticipated about two years later. The company is also planning a wood pelletising project based on processing plantation wastes as a feedstock for bio-energy plants.
Expenditure: \$94m.
Employment: Construction: 250; Operation: 45

Neerabup - Perth - Bioenergy SPIRITWEST BIOENERGY PTY LTD

SpiritWest is developing a 46 MW baseload power station at Neerabup, 33 km north of Perth. The power station will use timber waste from pine plantations nearby and other wood residues. Environmental approval was received in 2006, and a final investment decision is expected by mid-2008, with construction commencing shortly thereafter. Commercial operation is scheduled for 2010.
Expenditure: \$100m.
Employment: Construction: 250; Operation: 45

GOLD

Kalgoorlie

- Super Pit - Golden Pike Cutback
KALGOORLIE CONSOLIDATED GOLD MINES PTY LTD
KCGM is planning to extend the life of its openpit mine by five years to 2017, with the Golden Pike Cutback. This involves the mine pit edge moving closer to residential areas of Kalgoorlie. Additional tailings storage facilities and waste rock dumps will also be required. Environmental approval is expected by late 2007.
Employment: Operation: 1043

Sunrise Dam - Gold Mine - Underground Development

ANGLOGOLD AUSTRALIA LTD
AngloGold Ashanti commenced underground development in October 2003 at the Sunrise Dam gold mine to test the feasibility of expanding to underground operations. The study involves the development of two declines, totalling 9 km in length, in the vicinity of previously defined reserves. The first underground gold was produced in Q4 2004. Progress continued on the underground project in 2006-07, with 2305m of underground capital development and 5901m of operational development having been completed during the year.
Expenditure: \$87m.

HEAVY MINERAL SANDS

Cataby - Heavy Mineral Sands Mine ILUKA RESOURCES LIMITED

Iluka Resources is investigating the feasibility of developing a heavy mineral sands mine near Cataby, 200 km north of Perth, to produce up to 780,000 t/a of heavy mineral concentrates over a five-year period. The EPA has released its report and recommendations on the proposal.

Happy Valley - Heavy Mineral Sands Mine BEMAX CABLE SANDS (WA) PTY LTD

Located adjacent to the Bemax's Gwindinup deposits, the project will involve the mining of mineral sands from two deposits (Happy Valley North and South) located on private land and in a State Forest. The level of assessment for the project has been set at Environmental Review and Management Program and a document is expected to be completed during Q1 2008. Happy Valley contains a reserve of around 6 Mt of ore at a heavy mineral grade of 11.3%.
Expenditure: \$69m.
Employment: Construction: 100; Operation: 30

Jangardup South - Heavy Mineral Sands Mine BEMAX CABLE SANDS (WA) PTY LTD

The Jangardup South minerals deposit is situated 54 km south of the Nannup township and adjacent to the D'Entrecasteaux National Park. Cable Sands estimates

that the deposit would provide 1.8 Mt of minerals. Feasibility and environmental studies are well advanced. An environmental impact statement for the project is being prepared.

Expenditure: \$70m.

Employment: Construction: 100; Operation: 50

Kemerton - Titanium Dioxide Pigment Plant Expansion

MILLENNIUM INORGANIC CHEMICALS

Millennium has environmental approval for a major expansion of its Kemerton titanium dioxide pigment plant near Bunbury to a capacity of 190,000 t/a. A decision to proceed is dependent on market factors.

Expenditure: \$470m.

Employment: Construction: 500; Operation: 200

Keysbrook - Heavy Mineral Sands Mine

OLYMPIA RESOURCES LIMITED

Olympia proposes to develop an open cut mineral sands mine located near the township of Keysbrook, approximately 70 km south of Perth. Olympia has identified proven and probable reserves of 41 Mt of ore containing 1.2 Mt of zircon, ilmenite and leucoxene. The concentrate will be processed at Cable Sands' plant at Bunbury over the mine's eight year life. In late-October 2007, the EPA recommended approval of the project subject to Olympia meeting a number of conditions in the development and operation of the mine. If the EPA recommendations are accepted, Olympia will seek local government clearance to begin development of the mining operation in the second half of 2008.

Expenditure: \$18m.

Employment: Operation: 30

Kwinana - Titanium Dioxide Pigment Plant Expansion

TIWEST JOINT VENTURE

Tiwest has environmental approval for the staged expansion of its Kwinana pigment plant to 180,000 t/a. A decision to proceed with further stages within this approved expansion is dependent on market conditions.

Employment: Construction: 108; Operation: 98

Shark Bay - Coburn - Heavy Mineral Sands Mine

GUNSON RESOURCES LIMITED

Gunson proposes to develop the Coburn mineral sands project, located south of Shark Bay. The project consists of the Amy Zone deposit which has a total indicated and inferred resource of 837 Mt, averaging 1.4% heavy minerals. Mining approval has been received for the southern two thirds of this resource, which contains a proven and probable ore reserve of 124 Mt at 1.34%. A second MOU was signed in October 2007 with CTIEC of China providing for CTIEC's parent, CNBM and an electric power supply company in the Chinese city of Bengbu, to take a combined 40% in the project. A formal agreement between the parties is expected to be concluded by the end of 2007, so that construction of the Coburn mine and mineral separation plant in China can commence in early 2008.

Expenditure: \$100m.

Employment: Construction: 170; Operation: 110

IRON ORE

Brockman - Brockman 4 Iron Ore Mine

HAMERSLEY IRON PTY LIMITED

Hamersley Iron is currently undertaking pre-feasibility studies on developing a new mine at its Brockman 4 deposit. Preliminary construction works are likely to commence by early 2008, with commissioning anticipated in 2009.

Cape Lambert - Cape Lambert Port Expansion

ROBE RIVER MINING COMPANY PTY LIMITED

Robe River Mining recently announced its planned expansion of the capacity of its port facilities at Cape Lambert, east of Karratha. The expansion would lift the design iron ore export capacity of the facilities to 85 Mt/a. It is anticipated that the expansion would be completed Q4 2008.

Expenditure: \$1.1b.

Employment: Construction: 450; Operation: 70

Great Southern Region - Southdown Magnetite Mine

GRANGE RESOURCES LIMITED

Grange is finalising a bankable feasibility study on

the Southdown magnetite project, 90 km north-east of Albany. The company plans to produce 6.6 Mt/a magnetite concentrate from 2011. The concentrate will be transported via a slurry pipeline to the Port of Albany for export and pelletising overseas. The project is currently being environmentally assessed at a Public Environmental Review level. Subject to environmental approvals, construction is anticipated to commence in Q4 2008, with commissioning Q4 2010.

Expenditure: \$893m.

Employment: Construction: 700; Operation: 200

Jack Hills - Jack Hills Hematite Mine Stage 2

MURCHISON METALS LIMITED

Murchison Metals commenced trucking 1.5 Mt/a hematite from its Jack Hills operations to the port of Geraldton in December 2006. The company expects to increase production to 2 Mt/a in 2008 before proceeding to Stage 2, which would involve a further increase to 10-25 Mt/a of hematite. The ore would be transported by a new railway to a new deepwater port at Oakajee. A definitive feasibility study and exploration drilling program on its Jack Hills Stage 2 project is progressing. Subject to government approvals, construction of Stage 2 is predicted to commence in Q3 2008, with first ore shipments in late 2010.

Expenditure: \$750m.

Employment: Construction: 450; Operation: 350

Mid West Region - Extension Hill Hematite Mine

MT GIBSON IRON LIMITED

Mount Gibson Iron has environmental approval for a 2 Mt/a hematite mining operation at Extension Hill, 330 km southeast of Geraldton. The ore will be railed to the port of Geraldton for export. The company anticipates that construction will commence in Q1 2008, with first export planned for mid-2008, depending on the timing of government approvals.

Expenditure: \$73m.

Employment: Construction: 150; Operation: 100

Mid West Region - Extension Hill Magnetite Mine

ASIA IRON

Asia Iron has environmental approval to produce up to 5 Mt/a of magnetite concentrate, which will be transported by slurry pipeline to the port of Geraldton for export. Site construction is anticipated to commence in Q1 2008, plant site construction is planned for late 2008/early 2009, with first exports by the end of 2010.

Expenditure: \$715m.

Employment: Construction: 1000; Operation: 280

Mid West Region - Mt Karara Magnetite Mine

GINDALBIE METALS LIMITED

Gindalbie Metals plans to develop an 8 Mt/a magnetite concentrate project at Mt Karara, which has a resource life of about 60 years. It is proposed that the magnetite concentrate will be transported by slurry pipeline to the port of Geraldton for export and pelletising overseas. The project is currently undergoing environmental assessment at a Public Environmental Review level. The company anticipates that first shipment will occur in Q1 2010, subject to government approvals.

Expenditure: \$1b.

Employment: Construction: 400; Operation: 240

Mid West Region - Mungada Hematite Mine

GINDALBIE METALS LIMITED

Gindalbie Metals is proposing to develop a direct shipping hematite ore project of up to 3 Mt/a at Mungada. The ore will be trucked to Morawa, and then railed to the port of Geraldton for export. The project is currently undergoing environmental assessment at a Public Environmental Review level.

Expenditure: \$75m.

Employment: Construction: 200; Operation: 170

Mid West Region - Weld Range Iron Ore Mine

MIDWEST CORPORATION LIMITED

Midwest Corporation proposes to develop a 15-20 Mt/a iron ore mine at Weld Range 65 km southwest of Meekatharra, producing a mix of hematite lump and fines. The project is expected to utilise a new rail line and a new deep water port facility at Oakajee. The company commenced an extensive drilling program in June 2006 and is currently completing a pre-feasibility

study. Subject to completion of successful studies and government regulatory approvals the company anticipates that first shipment will occur late in 2010.

Expenditure: \$800m.

Employment: Construction: 900; Operation: 220

Pilbara - Pardoo Hematite DSO Mine

ATLAS IRON LTD

Atlas Iron is completing a Definitive Feasibility Study on the mining of 1 Mt/a from the Pardoo deposit 75 km east of Port Hedland. Atlas expects to commence mining at 1 Mt/a in 2008 (subject to government regulatory approvals) before increasing production to 3 Mt/a by 2010. The company intends to truck the ore to the public access berth at Port Hedland for export.

Expenditure: \$8.3m.

Employment: Operation: 70

Pilbara - West Pilbara Iron Ore Project

AUSTRALIAN PREMIUM IRON JOINT VENTURE

The Australian Premium Iron Joint Venture is proposing to develop the West Pilbara Iron Ore Project. Stage 1 of the project is based on the production of approximately 25 Mt/a of direct ship iron ore from a group of three mines sites approximately 50 km southwest of Pannawonica. The ore will be exported via a new railway and port facility located on the Pilbara coast. Subject to the successful completion of feasibility and environmental studies (in process) and receipt of government regulatory approvals, the company anticipates that the first shipment will occur in the second half of 2011.

Expenditure: \$2b.

Employment: Construction: 1300; Operation: 700

IRON ORE PROCESSING

Fortescue (Cape Preston - Iron Ore Processing

CITIC PACIFIC

CITIC Pacific, a Chinese company, is planning the development of a magnetite iron ore mine and processing plant producing 18 Mt/a of iron concentrate and 6 Mt/a of iron pellets. The development promises to be the first project under the Iron Ore Processing (Mineralogy Pty Ltd) Agreement. The project will require substantial infrastructure, including a port, desalination plant and a 450 MW power plant.

Expenditure: \$3b.

Employment: Construction: 2000; Operation: 800

Fortescue (Cape Preston) - Mine and Pellet Plant

MINERALOGY PTY LTD

The Iron Ore Processing (Mineralogy Pty Ltd) Agreement is based on the development of Mineralogy Pty Ltd's Fortescue magnetite deposits, located near Cape Preston, 70 km southwest of Dampier. Mineralogy has sold subsidiary companies with right-to-mine agreements to two purchasing companies, CITIC Pacific Ltd and Australasian Resources, which are planning the development of separate projects under the Mineralogy State Agreement. Australasian Resources Ltd has announced an agreement with Shougang Corporation which will fund a feasibility study on a combined concentrate/pellet and DRI project. If viable, Shougang will fund the project development, with Australasian keeping a 50% interest.

Expenditure: \$3b.

Employment: Construction: 2000; Operation: 800

MOLYBDENUM

Pilbara - Spinifex Ridge Mo/Cu mine

MOLY MINES LIMITED

The Spinifex Ridge Project is located 50 km northeast of Marble Bar in the Pilbara region of Western Australia. Moly Mines completed its pre-feasibility study in February 2006 and has progressed immediately into a bankable feasibility study. Once operational, the 15 Mt/a operation will be Australia's first world-class molybdenum and copper project. The project is seeking environmental approval.

Expenditure: \$622m.

Employment: Construction: 400; Operation: 375

NICKEL

Goongarrie - Kalgoorlie Nickel Project - Mine (laterite ore) and Hydrometallurgical Processing Plant -

HERON RESOURCES LTD

A detailed pre-feasibility study is continuing for the development of a 50,000 t/a mine and hydrometallurgical processing plant at Goongarrie, about 85 km north of Kalgoorlie. The project will be based on the company's laterite nickel resources of 903 Mt grading 0.74% Ni and 0.05% Co. Heron and Inco signed a formal agreement in July 2005 under which they will complete the feasibility assessment and, if warranted, develop the project. Inco is completing a confirmatory diamond drilling program, aimed at confirming leach feed grade estimates derived from Heron's previous RC drilling.

Expenditure: \$1.4b.

Employment: Construction: 1000; Operation: 300

North Eastern Goldfields - Yakabindie Nickel Mine

BHP BILLITON NICKEL

The Yakabindie project is based on a large nickel deposit situated near BHP Billiton's existing Mt Keith nickel project and is estimated to contain a resource of 289 Mt @ 0.58% nickel. BHPB is considering developing Yakabindie as an integrated part of the Mt Keith project, and is conducting a pre-feasibility study, including infill drilling of the ore body and metallurgical testing.

Expenditure: \$20m.

Pilbara - Nickel Mine

SHERLOCK BAY NICKEL COMPANY

Sherlock Bay Nickel Corporation owns the Sherlock Bay nickel project, 120 km east of Karratha. The project is comprised of the Symonds and Discovery deposits. The ore body extends over a length of approximately 1.6 km and varies in width between 5 m and 35 m. The deposits contain a combined proven resource of 25.4 Mt at 0.4% Ni, 0.09% Cu and 0.02% Co. This resource is expected to give a project life of 12 years. Processing of the ore will use the BioHeap bulk heap leach process, which will produce metal with an expected recovery of 88%.

Expenditure: \$30m.

OIL & GAS DEVELOPMENTS

Barrow Island (Carnarvon Offshore Basin) - Gorgon LNG

CHEVRON AUSTRALIA PTY LTD

The Gorgon Joint Venture is considering a 10 Mt/a LNG and domestic gas development at Barrow Island, based on gas from the Gorgon and Jansz fields. The project obtained State and Federal environmental approvals in September and October 2007, respectively. A final investment decision for the project will be made on completion of optimisation studies for the development. The Gorgon Joint Venturers have individual market commitments for approximately 75% of the LNG product.

Expenditure: \$11b.

Employment: Construction: 3000; Operation: 600

Browse Basin - Ichthys (Browse Offshore Basin)

INPEX

The Ichthys gas and condensate field was discovered in 1980 and is located in 250 metres of water, approximately 440 km north of Broome and 250 km from the mainland. Six discovery and appraisal wells have been drilled in the period 2000-2004. The P50 estimated recoverable resource in place is approximately 10 Tcf of gas and 312 mmbbl of condensate and LPGs. The permit is owned by Inpex Browse Ltd (76%) and Total (24%). Development of the field is planned to include offshore semi-submersible facilities and a subsea pipeline to an offshore location, where approximately 8 Mt/a of LNG will be produced for export to the Asia-Pacific market, with the first LNG shipment scheduled for 2012. The company is also looking at new technologies associated with GTL and DME, as well as possibilities for domestic supply.

Expenditure: \$8b.

Employment: Construction: 2000; Operation: 500

Macedon (Carnarvon Offshore Basin) - Gas Field

BHP BILLITON PETROLEUM PTY LTD

The Macedon gas field, located about 50 km north of Exmouth, was discovered in 1992 by the West Muiron-3

well, with a follow-up appraisal campaign in 1994. BHP Billiton is continuing to investigate domestic market opportunities for Macedon, which is estimated to contain a gas resource of up to 1.2 Tcf. Gas recovered to date is dry, containing no condensate or LPG.

Pilbara - Devil Creek Development Project

APACHE ENERGY LTD

Apache Energy intends to develop the Devil Creek Development Project (DCDP), 45 km southwest of Dampier. The DCDP is a proposed greenfield gas development comprised of an unmanned offshore gas production platform over the Reindeer gas field which is located about 100 km northwest of Dampier; offshore and onshore gas supply pipelines; a gas processing plant located near Devil Creek, near Karratha, and sales gas export pipeline. The DCDP will provide up to 300 TJ per day of dry natural gas and between 160 kl to 800 kl per day of gas condensate. All gas from the DCDP will service the domestic gas market in Western Australia. Construction is scheduled to start in August 2008, with first gas delivered into the DBNG pipeline by April 2010, subject to receiving all the required approvals.

Expenditure: \$600m.

Employment: Construction: 200; Operation: 20

Pilbara - Gas to Liquids Fuels

SASOL CHEVRON AUSTRALIA

Sasol Chevron Australia has commenced a feasibility study for a \$10 billion Pilbara based gas-to-liquids (GTL) project. The project will draw gas from the Wheatstone field north of Barrow Island and produce some 45,000 b/d of diesel and 20,000 b/d of naphtha.

Expenditure: \$10b.

Employment: Construction: 3000; Operation: 300

Pilbara - LNG Plant

BHP BILLITON PETROLEUM

BHP Billiton Petroleum and Exxon Mobil are working together to identify the optimal development plan for the commercial development of the Scarborough gas field located offshore in about 900 metres of water and about 280 km northwest of Onslow. The project is examining a number of concepts including the development of an associated 6 Mt/a LNG plant at a site approximately 4.5 km southwest of Onslow. The LNG produced may be sold to the American west coast and Asian energy markets.

Expenditure: \$5b.

Employment: Construction: 2400; Operation: 125

Scarborough (Carnarvon Offshore Basin) - Gas Field

EXXON MOBIL

The gas field is located in around 900 metres of water and about 280 km offshore, in the Carnarvon Basin with probable reserves of approximately 8 Tcf of gas. BHP Billiton Petroleum completed 3D seismic survey work and drilling of Scarborough-3, 4 and 5 wells during 2004 and early 2005. Evaluation of the data is complete and ExxonMobil announced in May 2006 that it is now interested in assessing the potential development. BHPB is also conducting a pre-feasibility study to assess the viability of providing Scarborough gas to its proposed Pilbara LNG plant near Onslow.

Expenditure: \$100m.

Scott Reef/Brecknock (Browse Basin) - Gas Fields

WOODSIDE ENERGY LTD

Woodside discovered gas and condensate at Torosa (Scott Reef) in 1971, Brecknock in 1979 and Calliance (Brecknock South) in 2000. The fields are located in water depths of up to 800 metres, about 425 km northwest of Broome and 250 km from the mainland. The reserves in these fields are currently held as a contingent resource and are estimated to be in excess of 20 Tcf of gas and 300 Mbbls of condensate. During 2007 and 2008 Woodside (Operator and ~50% interest holder) is planning to continue with field appraisal activities and concept evaluation studies to select a preferred development concept in the latter half of 2008. Woodside is targeting an LNG production facility capable of supporting up to 15 Mt/a of LNG. Start-up of LNG production is expected in the period 2013 to 2015.

Tern/Petrel (Bonaparte Offshore Basin) - Gas Fields

SANTOS LIMITED

The offshore Petrel gas field, discovered in 1969, is located about 250 km west of Darwin on the WA/NT seabed border in the Bonaparte Basin. The offshore Tern gas field, discovered in 1971, is located about 300 km west of Darwin in WA waters in the Bonaparte

Basin. Field development options include installation of unmanned offshore production platforms with a pipeline to a gas treatment plant south of Darwin. The development possibilities for these fields have been enhanced by recent significant discoveries by other parties nearby, which may provide tie-in potential for Petrel and Tern to service domestic gas customers. A conceptual plan involves initial development of Petrel with a pipeline to an onshore gas plant and a subsequent phase that completes Petrel and develops Tern.

Expenditure: \$1b.

PLATINUM GROUP METALS

Halls Creek - Panton Sill-Platinum Project

PLATINUM AUSTRALIA LIMITED

The Panton platinum-palladium deposit is located 60 km north of Halls Creek in the State's Kimberley region, and contains the highest grade of PGMs known in Australia. A feasibility study has found that while the project is technically sound, it is not commercially viable at current metal prices and exchange rates. Further optimisation study work will continue so that the project is in the best possible position to move forward when more favourable conditions prevail.

Pilbara - Platinum Deposit

HELIX RESOURCES NL

Helix Resources NL has established an indicated resource of 9.2 Mt at 2.9 g/t combined platinum, palladium, rhodium, and gold, 0.2% nickel, and 0.3% copper at its project site near Karratha. Preliminary mining studies suggested a mining rate of combined open cut and underground production of 1.5 Mt/a. Further activity was postponed in early 2003, as a result of poor exploration results and a decreased palladium price. The project is under review.

SALT

Exmouth Gulf - Yannarie Solar Salt Project

STRAITS SALT PTY LTD

Straits Salt is currently investigating the feasibility of producing up to 4Mt/a of salt in the eastern Exmouth Gulf area, 1100 km north of Perth. It has exploration licences over the area of interest while it undertakes its feasibility studies and has applied for a mining lease over the area where it wishes to implement the project. Public submissions to Straits' Environmental Review and Management Program closed on 12 March 2007. The company is undertaking additional environmental research following which the EPA will undertake a formal assessment of the project and make its recommendation to the Minister for the Environment. The company is also in discussions with Government regarding appropriate tenure and associated matters.

Expenditure: \$200m.

Employment: Operation: 120

TIMBER

Mirambeena Timber Processing Precinct - Engineered Strand Lumber

LIGNOR LTD

Lignor Ltd is proposing the development of an engineered strand lumber plant located at Mirambeena, near Albany. The plant will source most of its timber from the extensive eucalypt plantations growing in the Albany region and will use technology developed by the German engineering company, Siempelkamp. The company has completed its feasibility study, with construction planned for 2008 and operations by 2009.

Expenditure: \$350m.

Employment: Construction: 400; Operation: 140

VANADIUM

Pilbara - Balla Balla Vanadium/Ferroalloys Project

AUROX RESOURCES LIMITED

Aurox has recently completed a bankable feasibility study on the Balla Balla vanadium/titanomagnetite iron ore project located mid-way between Karratha and Port Hedland. Aurox has also signed two 15-year 3 Mt/a magnetite sales agreements with major Chinese steel companies. First export of magnetite is expected in 2011. Granted mining leases contain a 306 Mt resource grading 0.66% V2O5, 43% Fe and 13% Ti, including an initial ore reserve of 54 Mt at 0.73% V2O5. Figures confirm a likely 30-year mine life.

New petroleum drill core floods into Carlisle Core Library

Drill core and ditch cutting samples from mineral and petroleum drilling programs are arriving at the Department of Industry and Resource's Perth Core Library at record levels.

Part of the reason was the lodgement of 140 pallets of core and ditch cuttings from petroleum major Chevron Australia Pty Ltd from years of drilling activity in the Carnarvon and Canning Basins in northwest Australia.

The drill samples represent the aggregate of hundreds of millions of dollars worth of drilling campaigns in some of the most prospective onshore and offshore areas of the State. They were previously stored at various sites around Western Australia.

The Chevron drill core began arriving at the Perth Core Library in mid-September and continued for many weeks. It was the biggest single consignment of core and ditch cuttings ever received by the library.

The core is of immense value to geologists, from government, academia and private-enterprise.

Under State legislation, petroleum and mineral exploration companies are obliged to offer the Western Australian Government a proportion of their drill core so that present-day and future generations of geologists can examine below-ground rock features, thus avoiding the unnecessary expense of repeat drilling. For petroleum companies, it is a requirement for them to offer a one-third portion of their core to the

Usage of the Perth Core Library:

Year	No. visitors	No. samples	Hours of viewing
2002-03	195	811	1129
2003-04	456	1684	1818
2004-05	738	1713	3107
2005-06	716	1515	3041
2006-07	1229	3678	5453



Core samples: Geologists are able to draw on drill hole surveys before committing to exploration.

State, while other rules apply for mineral explorers.

The Perth Core Library has been very successful since its inception in 2003. Visitor numbers have jumped from 456 in its first full year of operation in 2003-04 to 1229 in 2006-07. The table below points to other increased activity through the library.

The facility is the repository for drill core from all parts of the State, except for the Goldfields. Core from the Goldfields region is stored and catalogued at a separate and similar core library in Kalgoorlie.

The Perth facility, based in the suburb of Carlisle, allows geologists to draw on drill hole surveys and previous studies of the core in computer databases and then personally examine drill core before committing to capital-intensive exploration programs. Some of the petroleum core comes from drill holes more than 4 km deep, whereas typical mineral exploration holes are less than 300 metres deep.

The Perth Core Library, which was designed to house more than 1000 km of drill core over 15 years, is now filling faster than originally anticipated. Land has been set aside to eventually double its storage capacity.

The Executive Director of the Geological Survey of Western Australia, Dr Tim Griffin, has praised both mineral and petroleum companies for their outstanding cooperation in assisting the Geological Survey. In particular, Dr Griffin has highlighted the benefit to industry of very old drill core, from mined-out deposits, being available for inspection.

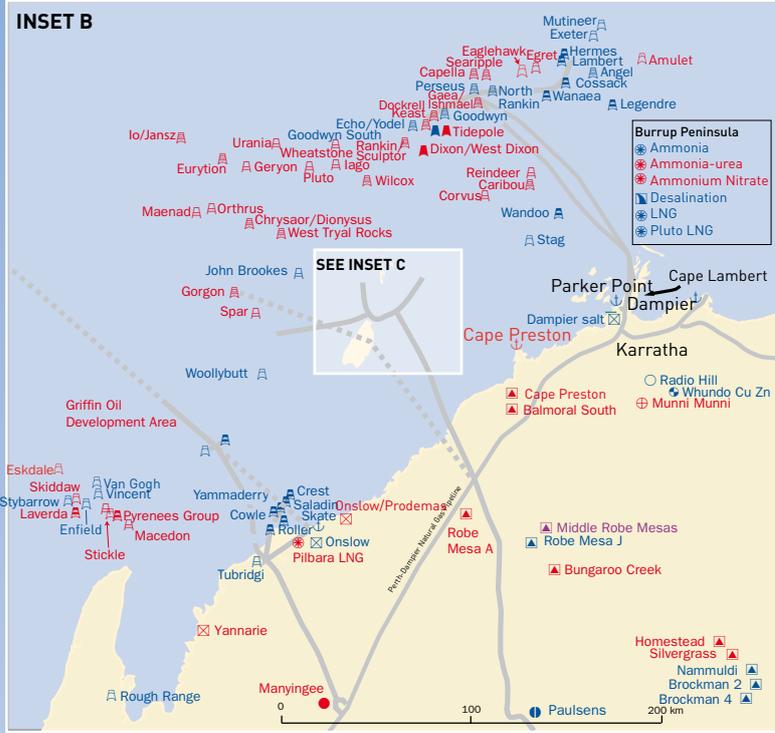
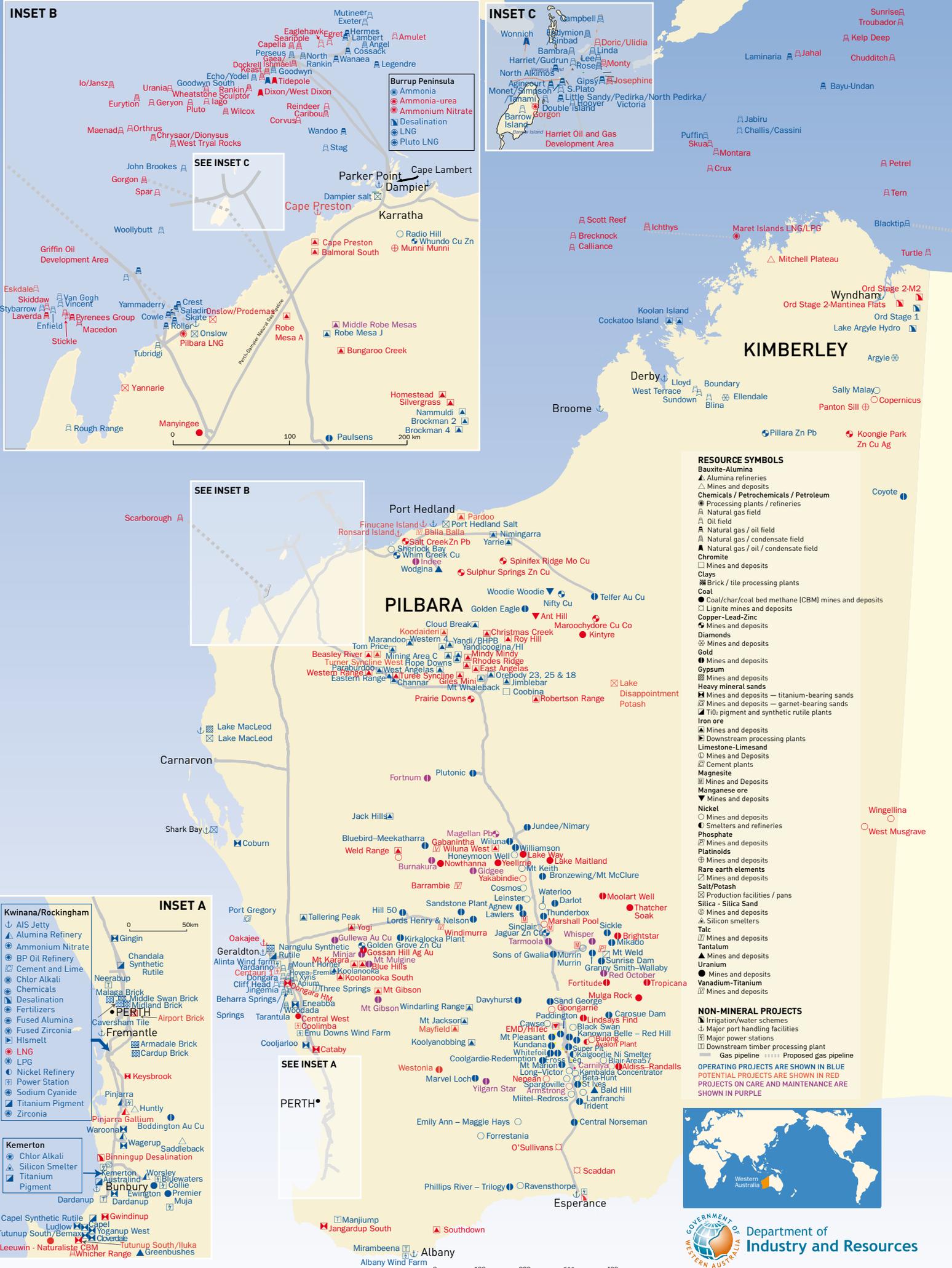
"While further liaison is required with some mineral exploration and mining companies, the overall level of cooperation is good," he said.

"We aim to capture approximately five per cent of all completed mineral diamond drill holes in key areas of Western Australia, with the view to providing current and future geologists with a representative core sample of all major commodities and styles of mineralisation in prospective areas of the State."

Full details of the quantities and selection criteria for mineral drill core in Western Australia can be found at the following web address: www.doir.wa.gov.au/gswa/onlinepublications

For further details about the Government's core libraries, please call **Gary Williams** on (08) 9470 0304 or visit: www.doir.wa.gov.au and enter 'Perth Core Library' in the search facility. ■

Major Resource Development Projects: Western Australia



RESOURCE SYMBOLS

- Bauxite-Alumina**
 - ▲ Alumina refineries
 - △ Mines and deposits
- Chemicals / Petrochemicals / Petroleum**
 - Processing plants / refineries
 - Natural gas field
 - Oil field
 - Natural gas / oil field
 - Natural gas / condensate field
 - Natural gas / oil / condensate field
- Chromite**
 - Mines and deposits
- Clays**
 - Brick / tile processing plants
- Coal**
 - Coal/char/coal bed methane [CBM] mines and deposits
 - Lignite mines and deposits
- Copper-Lead-Zinc**
 - Mines and deposits
- Diamonds**
 - Mines and deposits
- Gold**
 - Mines and deposits
- Gypsum**
 - Mines and deposits
- Heavy mineral sands**
 - Mines and deposits – titanium-bearing sands
 - Mines and deposits – garnet-bearing sands
- Iron ore**
 - Mines and deposits
 - Downstream processing plants
- Limestone-Limesand**
 - Mines and Deposits
- Cement plants**
 - Cement plants
- Magnesite**
 - Mines and Deposits
- Manganese ore**
 - ▼ Mines and deposits
- Nickel**
 - Mines and deposits
 - Smelters and refineries
- Phosphate**
 - Mines and deposits
- Platinum**
 - Mines and deposits
- Rare earth elements**
 - Mines and deposits
- Salt/Potash**
 - Production facilities / pans
 - Silica - Silica Sand
 - Silica smelters
- Talc**
 - Mines and deposits
- Tantalum**
 - ▲ Mines and deposits
- Uranium**
 - Mines and deposits
- Vanadium-Titanium**
 - Mines and deposits

NON-MINERAL PROJECTS

- Irrigation/water schemes
- Major port handling facilities
- Major power stations
- Downstream processing plant
- Gas pipeline - - - - - Proposed gas pipeline

OPERATING PROJECTS ARE SHOWN IN BLUE
POTENTIAL PROJECTS ARE SHOWN IN RED
PROJECTS ON CARE AND MAINTENANCE ARE SHOWN IN PURPLE

Department of Industry and Resources

GOVERNMENT OF WESTERN AUSTRALIA