

Gorgon rises

Australia's largest resources project set for development

PROSPECT





New dawn for resources industry

No mature economy has proven immune to the effects of the global economic downturn, but few could be better prepared than Western Australia to emerge from it in good shape.

A large number of resource projects are likely to be developed in this State during the next few years.

These will be supported by tens of billions of dollars worth of infrastructure funded by the State and Commonwealth Governments, with industry contributions.

Development of the biggest single resource project in Australia's history is poised to begin shortly off the north west coast of Western Australia.

State and Commonwealth Government environmental approval has been granted to the Gorgon Project, paving the way for the recent final investment decision from its joint venture operators.

A \$50 billion arrangement that constitutes this country's biggest ever trade deal will see China take liquefied natural gas (LNG) from the project for 20 years.

Gorgon will create as many as 10,000 jobs and add billions of dollars to Australia's gross domestic product.

The development of Western Australia's uranium sector, also featured in this issue of *Prospect*, provides further room for optimism, as do the expansion and diversification of the iron ore sector and the rebound in gold exploration.

While the unbridled optimism of the past few years has been necessarily tempered, Western Australians should remain confident the State's resources industry has a long and bright future ahead of it.

Colin Barnett
PREMIER OF WESTERN AUSTRALIA & MINISTER FOR STATE DEVELOPMENT

Norman Moore
MINISTER FOR MINES AND PETROLEUM

Prospect

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Cover photo: Chevron employees inspect the Barrow Island site to host the Gorgon Project.

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ALL SYSTEMS GO FOR GORGON

September 14, 2009, was a historic day for Western Australia and Australia with the decision by the Gorgon Joint Venture partners to invest in the massive Gorgon natural gas processing project.

The Gorgon Joint Venture (GJV) has made the single largest investment in a resource project in Australian history and the world this year.

In today's dollars, the project is estimated to cost A\$43 billion.

Gorgon is set to boost the Australian economy and provide thousands of jobs, with contracts worth about A\$2 billion already awarded and a further A\$10 billion to follow.

An independent assessment commissioned by the GJV estimated the project would result in Australian-purchased goods and services worth about A\$33 billion over a 30-year period.

The joint venture participants have already entered into long-term liquefied natural gas (LNG) sales agreements with customers including Japan, China, India and South Korea.

The historic day also saw the State Government grant two key approvals for the project, enabling construction to proceed.

Preliminary works will commence in 2009 and full construction in 2010.

The Gorgon Project is a joint venture between petroleum giants Chevron (50 per cent), Exxon Mobil (25 per cent) and Shell (25 per cent).

Its gas processing component will be located on Barrow Island, 70km off Western Australia's Pilbara coast.

The development includes:

- gas production from sub-sea facilities in the Gorgon Jansz and Io fields in the Greater Gorgon Area, 130–200km from the coast in waters up to 1350 metres and estimated to contain more than 40 trillion cubic feet (Tcf) of natural gas;
- sub-sea pipelines from the fields to Barrow Island;
- a 300 terajoules per day domestic gas plant and pipeline from Barrow Island, 70km offshore, joining Western Australia's onshore domestic gas supply;
- three LNG trains, each capable of producing 5 million tonnes per annum (Mt/a) on Barrow Island;
- LNG shipping facilities to handle about three shipments per week for international markets; and
- greenhouse gas management through carbon dioxide injection into a deep geological formation beneath Barrow Island.

Western Australian Premier Colin Barnett said the State Government worked very closely with Chevron and its partners to bring Gorgon to fruition.

"In the past 12 months, the Government has worked tirelessly to facilitate major developments, particularly the massive Gorgon project," he said.

"The capital value of the Gorgon project of some A\$43 billion is by far the largest resource project, indeed the largest project of any sort, in Australia.

"This will be an enormous boost for the Western Australian and Australian economies."

The State Government played an important role in coordinating and ensuring key assessments were met.

These included:

- a detailed and stringent environmental impact assessment, including the establishment of a host of environmental management plans that provide a high level of protection for the significant environmental values of Barrow Island and its surrounding waters;
- an in-depth assessment of the GJV's development plans, including the commissioning of an independent expert assessment of the proposed carbon dioxide injection project; and
- offering and granting production licences for the Gorgon Jansz and Io gas fields.

The project provides an excellent example of the State and Commonwealth Governments cooperating in a number of areas.

These included environmental approval for the project and the commitment from both governments to share the long term liability for the carbon dioxide injection project following closure.



Western Australian Premier Colin Barnett (left) inspects the Barrow Island site for Gorgon with Chevron Project Manager Colin Beckett.

The injection project will be the largest commercial scale geosequestration project in the world.

It is expected to reduce greenhouse emissions by 40 per cent or 3.4 million tonnes per annum, through injection of carbon dioxide from the gas into a reservoir more than 2km below Barrow Island.

It will see the application of this technology to the management of greenhouse gas emissions, providing opportunities for the transfer of skills within this unique field in Western Australia.

Based on independent research the GJV partners have estimated Gorgon will create some 3500 jobs directly during construction, most of them located on Barrow Island.

Employment is expected to peak at about 10,000 during construction, including indirect jobs for suppliers, contractors and service industries.

A PROJECT ALMOST 30 YEARS IN THE MAKING

Gorgon's origins are in the discovery of gas in the West Tryal Rocks field, part of the Greater Gorgon Area, in 1973.

The discovery of the Gorgon field followed in 1980.

The GJV participants reviewed various alternative development concepts until deciding on Barrow Island in 2002 as the most viable location for their processing facility.

Barrow Island housed the State's first and largest producing oil field and is a Class A nature reserve.

Maintaining the island's treasured environmental status is one of many major challenges for the project operators.

In 2002-03 a public environmental, social and economic review of the proposed development assessed the site against a number of other locations on adjacent islands and the Pilbara coast.

The State Government decided with rigorous environmental management, the project could in principle proceed and would return major economic and social benefits.

The Gorgon Gas Processing and Infrastructure Project Agreement (Gorgon State Agreement) was signed between the joint venturers and the State Government in 2003, and ratified by the Western Australian Parliament through the *Barrow Island Act 2003*.



Barrow Island is a Class A nature reserve in recognition of its unique biodiversity values.

This enabled the project evaluation and development to progress, while outlining conditions including environmental compliance, quarantine obligations, local content expectations and domestic gas reservation.

Since 2003, ongoing feasibility studies, State and Commonwealth approvals processes and detailed negotiations have continued.

These cover land and petroleum titles, heritage surveys, geosequestration studies, risk analyses and extensive environmental management assessments, and quarantine management.

In 2007, the GJV gained State and Federal Government environmental approval for a two-train 10Mt/a LNG proposal.

In August 2009, the GJV also received State and Commonwealth environmental approval for the addition of a third LNG train that would increase capacity to 15Mt/a.

On September 14, 2009, Premier Barnett signed the final development approval required under the *Barrow Island Act 2003* and the Gorgon State Agreement.

MASSIVE ECONOMIC IMPACT ANTICIPATED

Even before a final decision was made Chevron had awarded contracts worth about A\$2 billion, and a further \$10 billion worth of contracts will follow during the next few months.

Contracts already signed include engineering design, supply facilities at Dampier and the Australian Marine Complex (AMC), and construction of a 3300 unit construction camp.

The establishment of the logistics, quarantine and supply base at the AMC will enhance the capabilities of Western Australia's offshore marine support industries and further strengthen the State as a logistics hub for the oil and gas industry.

The Gorgon State Agreement requires the GJV to use local labour and services where reasonable and economically practicable and to give preference to local suppliers, manufacturers and contractors where price, quality delivery and service are equal to, or better than, that obtainable elsewhere.

The State Government has committed to ensuring local industry is provided full, fair and reasonable opportunity to bid for the significant work packages to flow from this development.

The scale of the project will ensure an impact felt not only in Australia but in petroleum industries and engineering centres around the world.

The Gorgon State Agreement requires the GJV to reserve 2000 terajoules of gas for the local market and to establish a project on Barrow Island capable of delivering at least 300 terajoules of gas to the local market.

The delivery of domestic gas is expected to commence by 31 December 2015 or at the same time LNG is first produced from the third LNG train, whichever is earlier.

The construction phase for the three train LNG project is expected to last up to five years, with LNG production expected to commence in 2014.

ENVIRONMENTAL SIGNIFICANCE OF BARROW ISLAND

Barrow Island was established as a nature reserve in 1910 in recognition of its outstanding flora and fauna values.

It is currently a Class A nature reserve for the purpose of conservation of flora and fauna, which represents the highest level of protection afforded under State legislation.

In 2004, the majority of the waters around the island were included in the Barrow Island Marine Park and Barrow Island Marine Management Area.

Its isolation provides a haven for a range of native species that are rare and endangered on the mainland.

Barrow Island's biodiversity values are unique and significant on an international scale:

- it is Western Australia's second largest island at approximately 23,600 hectares and one of the largest land masses in the world without established introduced animal species;

- at least 24 of its terrestrial species occur nowhere else in the world;
- thousands of years of isolation have resulted in genetic differentiation of species, with some endemic such as the Barrow Island euro, white-winged fairy wren, Barrow Island skink, and a subterranean blind snake;
- most reptile and invertebrate species on the island appear genetically distinct from mainland populations of the same species;
- it is significant for subterranean fauna at the regional, state and national scales; and
- it is a significant nesting site for marine turtles, with four species known to nest on island beaches and a regionally important nesting area for green turtles and flatback turtles.

The stringent conditions imposed on the project under State and Commonwealth environmental approvals will ensure:

- coral lost through dredging is minimised to three per cent of total coral off the east coast of the island;
- artificial light and noise emissions are minimised to protect the local population of North West Shelf flatback turtles;
- a turtle conservation plan is in place for the life of the project; and
- monitoring is undertaken for other unique and endangered fauna.

The State Government also obtained a A\$90 million commitment by the GJV for a series of new initiatives to conserve the flatback turtle population and protect other endangered species.

This is in addition to the GJV's requirement under the Gorgon State Agreement to provide Net Conservation Benefits funds in the region of A\$60 million and fund the costs associated with a permanent Department of Environment and Conservation presence on the island. ■



Barrow Island, off Western Australia's north west coast, will house the onshore infrastructure for the massive Gorgon Project.

THE STATE OF URANIUM

Uranium mining in Western Australia is firmly back on the agenda.

After being banned under the previous Labor government, uranium mining is expected to begin by the end of 2011 at Mega Uranium's Lake Maitland project.

The move comes less than a year after the ban was lifted by the current Government and will likely be followed by a second mine in 2012-13 and a third – the biggest – by 2014.

Canadian-based Mega will be the State's first uranium producer if it meets its expected timelines and environmental approvals.

Its flagship project, Lake Maitland, located 110km south-east of Wiluna, holds about 11.4 kilotonnes of uranium oxide at 100 parts per million and has an expected lifespan of 10 to 12 years.

Mega's Executive Vice President of Project Development, Peter McNally, said the project's Definitive Feasibility Study (DFS) and Environmental Impact Study (EIS) were well advanced and on schedule.

"We expect the DFS and EIS to be finalised by the end of March 2010," he said.

"We are, to date, on schedule with our studies and, once approved by Government, believe that we will be providing uranium to our customers in the first half of 2012."

Mr McNally, who has extensive experience in uranium projects

throughout Australia, including the Northern Territory's Ranger mine, said Lake Maitland would produce up to 750 tonnes a year.

"That's our main goal," he said.

"Although we are confident that we will achieve this, it will take us some time to get to that production rate."

Mr McNally said the uranium industry was in step with the State Government's commitment to apply the world's best regulatory framework to uranium mining.

"Having been involved with uranium for a long time, we are well aware of what the expectations of Government, with its



Canadian company Mega Uranium is developing the Lake Maitland project with an expected startup of 2011.



BHP Billiton has several drill rigs in operation at its Yeelirrie deposit to confirm the size of the uranium resource.



A drill core sample from BHP Billiton's Yeelirrie uranium deposit in Western Australia.



Ore from Yeelirrie.

world's best practice, and the Australian and international communities, are in regard to uranium mines," he said.

"Uranium mining is something that everyone in the community wants to have a say about, and many do, so you are expected to meet the highest government standards.

"We've had a lot of engagement with governments, both Commonwealth and State, and it's made very clear by well-intentioned systems and politicians that you have to meet the highest standards.

"And we at Mega are committed to these standards."

Mr McNally said the uranium industry had established its own strong code of practice through the Australian Uranium Association (AUA).

"Probably more important is that the AUA has a set of Best Practice Principles and has a governance process where its members have regular reviews to ensure that members are meeting their commitment to the code," he said.

"We have to meet high standards of performance and we have to be rigorous in our evaluations and we have to be open and transparent.

"That's a culture that we've built from the start."

Fellow AUA member Toro Energy plans to have Western Australia's second uranium mine, at its Lake Way project.

Toro Project Development General Manager Dayle Kenny said the

company's production target was late 2012 or early 2013.

The company is currently focused on completing the necessary approvals processes and getting on top of technical and environmental issues.

Mr Kenny said there was some environmental data from the region resulting from decades of gold mining, but the company would investigate further.

"So there is some data, but normally with uranium mines, the data collection and the diligence that goes into environmental reports is a level up from other mines," he said.

"One of the things we will be looking at early on in our environmental study is how we plan to transport."

The State Government has said that uranium will not be exported through any port surrounded by residential development.

It is expected that uranium will be exported from South Australia or the Northern Territory.

Mr Kenny, who also has a long history in uranium mining, said he believed the community's attitude toward uranium mining had shifted.

"But I think there are still people out there who don't fully understand uranium and what the risks are and how manageable the risks are," he said.

He said that employees were well-grounded in the understanding of

uranium and radiation and what the risks were, and what was needed to do to protect people and themselves.

BHP Billiton is the third significant player in the State's uranium sector and owns the State's largest uranium deposit at 52.5 kilotonnes of uranium oxide at its Yeelirrie project.

The project is also covered by a State Agreement Act, which was ratified by the State government of the time and the previous owners Western Mining Corporation in 1978.

Yeelirrie Project Manager Matt Weaver said the change in government late last year gave BHP Billiton the opportunity to reactivate the Yeelirrie Project and examine its potential.

"We are currently undertaking a pre-feasibility study and looking at a number of mining, processing, tailings management and transport options," he said.

"Our priority is upgrading the status of the deposit in order to declare a Mineral Resource in accordance with the JORC (Joint Ore Reserves Committee) code, so currently we have several drill rigs on site undertaking a confirmatory program.

"A number of environmental studies are also underway as part of our work in developing an Environmental Review and Management Program.

"We have also started consulting with a wide range of stakeholders, and are holding a number of community

information sessions along our proposed transport corridor as part of this consultation which will be ongoing throughout the course of the project.

“Our current plans project initial production in 2014, subject to government and BHP Billiton Board approvals.”

This drive to develop the State’s uranium reserves was foreshadowed by an increase in uranium exploration.

Exploration for uranium was never banned under the previous government, and actually increased before the ban was lifted in November 2008.

DMP Resources Safety Division Senior Scientific Officer Ivan Fetwadjieff, who assesses radiation management plans submitted by uranium explorers and miners, said that in the last two years he’d assessed 40 radiation management plans.

“Before that, there weren’t anywhere near that amount,” he said.

“The spike in submissions and the interest in radiation protection actually came before the ban on uranium mining was lifted.

“It was the increase in the price of uranium that led to an increase in uranium exploration.

“Interestingly, the demand actually dropped off after the ban was lifted, but it’s started to increase again.”

Ivan said he expected demand to stay strong, especially if the number of uranium applications for Western Australia’s Co-funded Industry Drilling Program was any indication.

The program, which gives explorers up to A\$150,000 towards their exploration costs, recently received about 30 applications from uranium explorers, making it the third most sought-after mineral.

One of those companies was Toro Energy.

Toro has identified an area close to the Western Australian border that it wants to explore for uranium prospectivity.

Toro’s Dayle Kenny said the State Government’s Co-funded Industry Drilling Program benefited industry and increased the knowledge of the State’s geology.

“It’s a very remote region that is under explored ... and it will certainly boost exploration in that area, which we consider to be very prospective,” he said. ■



Uranium exploration and mining are well regulated in Western Australia.

Western Australia ready to regulate uranium

Uranium mining may be relatively new to Western Australia, but the regulation of radioactive materials is anything but.

Radioactive materials are found in mineral sands and tantalum, which have been mined and processed in the State for about 40 years.

Consequently Western Australia has a long history of regulating these industries and in the process has established guidelines and regulations that are internationally recognised.

Nonetheless the Department of Mines and Petroleum formed an interagency working group to assess whether the existing State regulations and legislation could be applied to uranium mining or whether amendments were required.

The group, which was formed shortly after the ban on uranium mining was lifted, concluded Western Australia’s current regulatory framework – when combined with international and Commonwealth legislation, guidelines and policies – did provide for the development of uranium mining and associated activities.

The group presented a report to Mines and Petroleum Minister Norman Moore which outlined these findings and included a recommendation that, consistent with national practice, environmental bonds be required for uranium mines to cover rehabilitation costs.

The report was endorsed by the Minister in mid-August 2009.

Department all EARS ... and PGR

The transparency and accountability of the Department of Mines and Petroleum's processes have been significantly improved in the past few months with the introduction of two online approvals systems.

The EARS Online system was introduced in June and gives proponents the ability to track online the progress of their environmental applications.

This system provides a 'window' for proponents to view the Department of Mines and Petroleum's (DMP) Environmental Assessment and Regulatory System (EARS), which is used to process all environmental applications received by the department.

Environment Director Phil Gorey said EARS Online was a very important mechanism for industry to ensure it had the most up-to-date information on-hand.

"The EARS Online system is another example of where the department is leading Australia in the area of world-class regulatory processes," he said.

"Nowhere else in Australia can proponents get real time updates on the status of their applications for major mining and petroleum developments.

"EARS Online also increases the transparency and accountability of the department, which we are more than happy to explore."

Dr Gorey said industry feedback about the system had been very positive, particularly from the exploration sector.

"We recognise the urgency of explorers," he said.

"This is part way towards where we see the department utilising resources."

DMP has this year also upgraded its Petroleum and Geothermal Register (PGR), which went online to industry and the public in December 2008.

PGR has improved the department's identification of approval bottlenecks.

Its most recent release allows proponents to track the progress of their applications online.

The system, as with EARS Online, shows whether an application is under assessment by the department or another agency, if it is on hold, and its status as to whether it has been approved, rejected or withdrawn from the process.

Both these systems allow proponents to print reports that assist with identifying:

- The length of time taken to process an application from the start of the approval process to completion;
- The number and percentage of applications completed within timeline targets;
- The percentage of applications progressing on-schedule; and
- The average time taken by assessors (internal or external to the department) over a given period of time.

Project Coordination and Information Management Manager Hazel Harnwell said PGR would benefit industry and the department.

"It allows management to monitor the progress of an application, identify any issues and to make improvements for the future," Ms Harnwell said.

"In addition to this, industry and the public can go online and conduct a title search on all publicly available information.

"This has enabled staff to dedicate more time to processing approvals as well as other value adding duties."

She said DMP's Petroleum and Environment Division's introduction of the PGR system made it the first government regulator in Australia to introduce online payments to the petroleum and geothermal sectors.

"Our system is being appraised by interstate agencies who are looking at PGR as the benchmark so as they can develop similar systems," Ms Harnwell said.

The next PGR release goes live in early October 2009 and will integrate pipeline titles information from the existing electronic titles register.

This pipeline module will include a pre-consultation stage, allowing industry to submit documentation for review and comment prior to formal application.

Petroleum and Environment's General Manager of Business Development, Mark Gabrielson, said this would ensure that when the proponent submitted a formal application, the approval process would progress smoothly.

"This will help industry plan projects as they will have more surety for final investment decisions," he said.

"The pipeline module will also allow industry to lodge and pay application and annual fees online.

"In addition to this they will be able view and monitor all fee transactions and due payments."

Further PGR releases will include the integration of other application types and further enhancements to functionality, to provide a better service to industry.

The EARS Online and PGR systems can be accessed at www.dmp.wa.gov.au ■

BIG EXPECTATIONS

as geothermal acreage spreads

The Department of Mines and Petroleum's recent re-release of the Perth Basin for geothermal exploration is expected to improve Western Australia's position as Australia's leading energy producer.

The release of acreage in the Perth, Eucla and Canning Basins is underpinning the development of a geothermal industry covering the southern and northern areas of the State.

Acreage is released through a competitive bidding system under the *Petroleum and Geothermal Energy Resources Act 1967*.

The Perth Basin acreage release closed on June 25, 2009, and the Eucla Basin release closed on August 20, 2009.

The Perth Basin acreage covers a vast area extending from north of Geraldton in the State's Mid West region to south of Busselton in the South West.

The basin was first opened up to exploration in 2008 as the first geothermal acreage offered in Western Australia.

The re-release covered those blocks for which the Department of Mines and Petroleum (DMP) had not selected preferred applicants.

DMP Senior Titles Officer Chris Ferrinda said the re-release attracted both familiar and new applicants.

"As with the initial release of this area, the size of the permits offered was predetermined and consisted of four five feet by five feet contiguous graticular blocks," Mr Ferrinda said.

"Thirty-six of the four block areas were excluded from the re-release as applications from the first round release were still pending.

"The bids received will now be assessed by the members of our Resources Branch and Tenure and Land Access Branch to assess the work programs of applicants, and their technical and financial capabilities to undertake the work proposed."

The northern Canning Basin acreage will be released on September 3, with bids closing on January 28, 2010.

At that time the entire State will have been released for geothermal exploration.

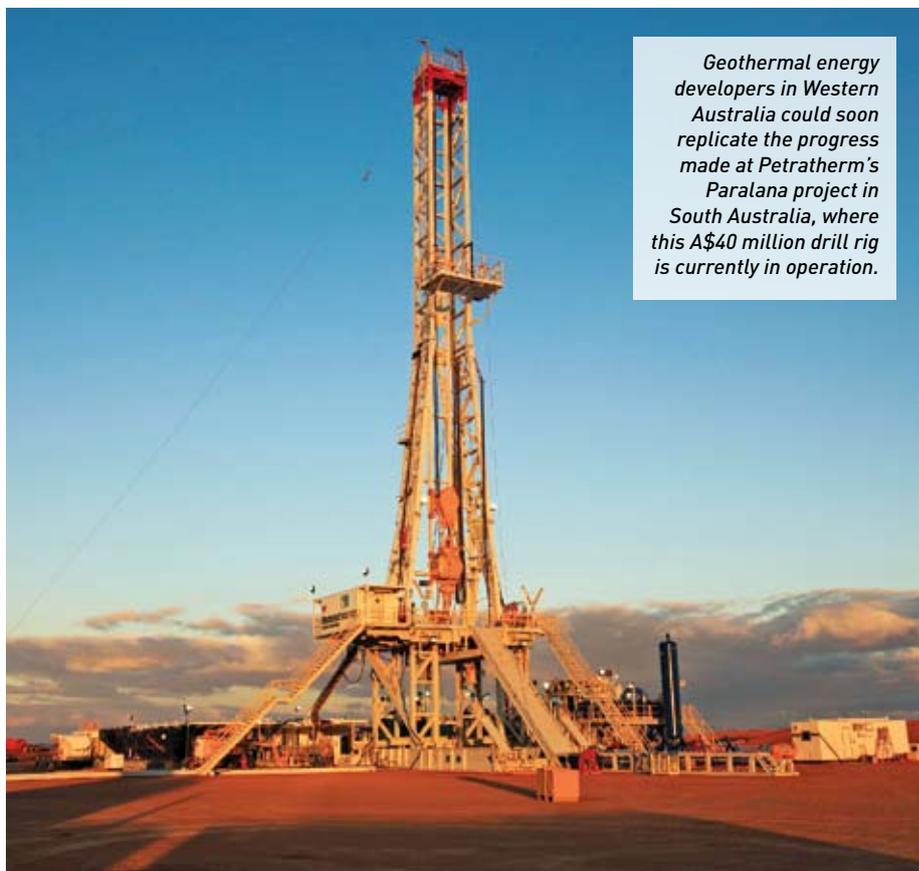
Interest in these acreage releases has intensified with emerging technologies targeting natural hot water motions

particularly suited for direct use of heat from deep sedimentary basins, such as the Perth Basin.

Direct use of thermal heat can exploit lower temperature resources than power generation, opening the door to the use of geothermal heat directly in metropolitan areas.

Geoscience Australia estimates that if one per cent of Australia's geothermal energy was extracted, it would provide 26,000 times Australia's total annual energy consumption.

Further information including maps are available at www.dmp.wa.gov.au ■



Geothermal energy developers in Western Australia could soon replicate the progress made at Petratherm's Paralana project in South Australia, where this A\$40 million drill rig is currently in operation.

LEADING

the balancing act



They may not generate as much international interest as its vast mineral and petroleum deposits, but Western Australia's environmental resources and landforms are just as vital to the State.

The task of protecting these while allowing mining and petroleum production to occur largely falls to the Environment Division of the Department of Mines and Petroleum (DMP).

The Division is now headed by Dr Phil Gorey, who took up the position this year after serving as the principal of a private Western Australian environmental consultancy.

Dr Gorey also has a decade's experience with the South Australian Environmental Protection Authority (EPA) in various

regulatory roles, and completed a PhD on groundwater contamination, at Flinders University.

He said the Environment Division played a major role in the successful operation of DMP.

"Our role is to ensure regulation of the mining and petroleum industry happens in an efficient and effective manner so that it delivers the responsible development of the State's resources," Dr Gorey said.

The Division's activities include administering the environmental aspects of State and Commonwealth mineral and petroleum legislation, and providing environmental assessment, auditing and compliance monitoring services for the resources industry.

It also conducts incident investigation services, initiates DMP's enforcement policy where required, liaises with core stakeholders and benchmarks DMP's performance against customer expectations.

Dr Gorey's roles with the South Australian EPA included the Assistant Director of Regulatory Reform, in which he coordinated that organisation's regulatory reform and red tape reduction program.

This is experience that has prepared him well for his current position.

The Western Australian Government has made reform of the approvals process for new mineral and petroleum projects one of its major priorities.

It is attempting to remove some of the complexity and uncertainty that project proponents had reported when dealing with agencies such as DMP and its predecessor the Department of Industry and Resources.

"There is a keen focus on the need to streamline approvals without compromising environmental or social outcomes," Dr Gorey said.

"There are some challenges in meeting the expectations of all stakeholders, but DMP has already rolled out a number of initiatives to improve efficiencies within approvals during the past 12 months, and that will continue to be the focus."

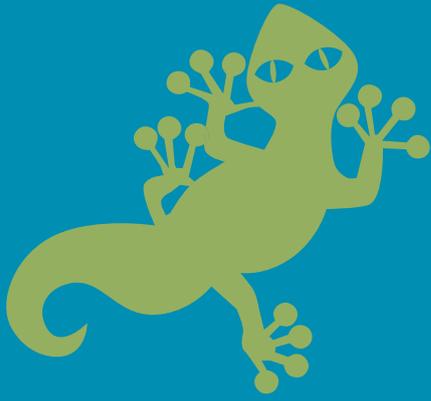
Dr Gorey said the Department's new on-line Environmental Assessment and Regulatory System (EARS) was a good example of this.

"This is an example of where Western Australia is leading the country in transparency of its assessment processes – we are unaware of any other State where proponents can check online, any time of the day or night, the exact status of their application," he said.

Dr Gorey said DMP was a very dynamic department and one with which he was pleased to be involved.

"It has a lot of expectations upon it from industry and community," he said.

"In some areas clearly the department is meeting and exceeding these expectations, but it is always looking at areas where it can improve." ■



™

GOLDEN GECKO
Awards for Environmental Excellence





GOLDEN GECKOS

turn spotlight on environmental leadership

The broad range of projects entered in the Golden Gecko Awards for 2009 has once again advanced the cause of environmental management in the Western Australian resources industry.

The awards are organised by the Department of Mines and Petroleum (DMP) and are now in their eighteenth year.

They strive to recognise environmental excellence and leadership in responsible resource development, with a focus on advances and innovations that can be adopted throughout the industry.

Importantly, the awards provide an opportunity for companies to pass their knowledge on to others.

The winners of this year's Golden Gecko awards were announced by Minister for Mines and Petroleum Norman Moore at a September 10 ceremony at the Perth Convention Centre.

DMP Environment Director Phil Gorey is the chair of this year's assessment panel.

"The Golden Gecko Awards have grown to become the most prestigious

awards for environmental excellence in the Western Australian mineral and petroleum industry," Dr Gorey said.

"The high quality of this year's nominees is testament to the commitment industry has to environmental leadership."

The awards are evaluated by an assessment panel which reviews a written submission and may conduct an inspection of the project site for each entry.

The assessment panel includes representatives from DMP, the Department of Environment and Conservation, the Department of Agriculture and Food, the Department of Water and the Environmental Protection Authority.

The panel then presents its findings to the selection committee, which judges the entries on the four criteria of commitment to environmental excellence, demonstrated excellent environmental outcomes, community engagement and what makes the operation or project special.

In 2008, a Golden Gecko was awarded to the three worthy recipients Hismelt

Corporation, Kings Park and Botanical Gardens with Rocla Quarry Products, and Minara Resources.

Rio Tinto Iron Ore also received a Certificate of Merit for its design and construction of the Lang Hancock Railway.

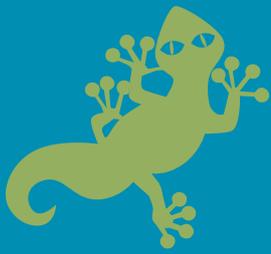
Hismelt received the award for developing a new steel-making process that creates less pollution than existing processes.

Kings Park and Rocla received their award for successfully researching, restoring and rehabilitating sand quarries to banksia woodland.

Minara received its award for developing key performance indicators for rehabilitation success and for improving rehabilitation planning, design, adaptive management and assessment.

For more information about the Golden Geckos please visit www.dmp.wa.gov.au/goldengecko

Full details of the winners will be included in the next edition of Prospect.



GOLDEN GECKO
Awards for Environmental Excellence

2009 GOLDEN



CHEVRON AUSTRALIA

Project: Engaging citizen science for monitoring programs

Chevron and the Gorgon Project partners have supported the baseline scientific research program for flatback turtles on Barrow Island since its inception in 2005, in order to minimise the potential impact of the construction and operation of the Gorgon LNG project.

One of the largest research programs of its kind, the success of this program is attributed to incorporating a citizen science approach.

Over four years, more than 200 volunteers have spent approximately 2400 days tagging 3000 flatback turtles nesting on the eastern coast of Barrow Island.

This baseline data of the flatback turtle demographics and nesting ecology will be used as a reference against ongoing monitoring on Barrow Island.



CLIFFS NATURAL RESOURCES

Project: Managing impacts on Schedule 1 Fauna

Cliffs Natural Resources operates the Koolyanobbing Iron Ore Project.

Cliffs identified a previously disturbed site for the construction of the Koolyanobbing A Pit Waste Rock Dump.

However, surveys of this preferred site also indicated the existence of a Schedule 1 listed fauna, the tree-stem trapdoor spider *Aganippe castellum*.

Cliffs undertook a translocation trial for the *A.castellum* to avoid impacts on the species and utilise the preferred site to minimise the overall environmental impact of the operation.

Cliffs has shown innovation and contributed to the scientific knowledge of *A. castellum* to assist in the future management of this species.



SODEXO REMOTE SITES

Project: Resource recovery initiatives for mining villages

The Sodexo Remote Sites Resource Recovery Program is aimed at providing a sustainable alternative to existing waste management practices for mining villages in Australia's remote areas.

Mine sites in remote areas typically require land managed as dedicated landfill sites.

Sodexo's recycling program to March 2009 has avoided the need for 1275 cubic metres of landfill space for the 12 clients that have adopted the program.

All money raised through the recycling program is donated to Ruggies Recycling, which uses donations to purchase equipment for Princess Margaret Hospital and the Royal Flying Doctor Service.

Sodexo is also developing initiatives beyond recycling, including biodiesel, disposal of incandescent globes and printer cartridges, and providing re-usable crib bags for residents.

GECKO CANDIDATES



ST BARBARA

Project: Improving environmental design of mining villages

St Barbara Ltd has constructed a temporary mine village in Leonora that demonstrates improvements in environmental performance and developing knowledge of sustainable building design for mining applications.

Architect Ian Hooke and construction company Ausco were engaged to design the village, incorporating the recommendations of a study by SKM.

Initiatives included improved insulation, photovoltaic power units, solar hot water, water-wise landscaping, energy efficient appliances and providing flyscreens for natural ventilation.

Monitoring undertaken since the completion of the project has demonstrated a 30 per cent reduction in energy use and a 50 per cent reduction in water consumption. Ongoing monitoring will be undertaken.

St Barbara is encouraging the adoption of these initiatives for other mining villages.



WOODSIDE ENERGY

Project: Reservoir appraisal in coral reef environments

Woodside's scientific research program at Scott Reef has contributed to the understanding of the effects of seismic and drilling reservoir appraisal on coral reef environments, to ensure these activities can be undertaken with minimal environmental impact.

Woodside engaged marine science expertise from Australia and the United States to perform in situ research to understand the effects of seismic noise on coral reef communities.

The study demonstrated that the seismic survey would not result in impacts on coral fish behaviour or hearing and existing drilling techniques were also refined.

Ongoing monitoring was undertaken to develop a further understanding of the impacts of appraisal operations on the environment.



GOLDEN GECKO RECIPIENTS ANNOUNCED

The recipients for this year's Golden Geckos were announced as Prospect went to print.

Woodside Energy was recognised for its scientific research program at Scott Reef and Sodexo Remote Sites was recognised for its sustainable alternative to existing waste management practices for mining villages.

St Barbara received a Certificate of Merit for improving the environmental design of mining villages.

More details on the awards and the recipients will be covered in the next issue of Prospect. ■

浙江省·西澳州交流 Western Australia and Zhejiang

Third Meeting

2009年7月20日
July 20, 2009



China visit builds bridges

Western Australian Premier Colin Barnett says his week-long July visit to China will help in securing future investment from the country in the State's resources industry, including the processing and infrastructure sectors.

The visit to Western Australia's largest export market took place during a time of some tension between Australia and China, mainly over investment in Western Australian resources.

However, Mr Barnett said the openness with which these issues were discussed gave him great optimism, and that the visit had resulted in a number of significant initiatives.

"High level meetings with government and industry leaders allowed me to reassure them that China was valued by Western Australia as a customer, and that its investment and participation in resources development is welcome," the Premier said.

"Western Australia has a lot to offer and my mission in China was to secure and expand our future potential growth.

"Greater Chinese investment will directly benefit businesses and families in Western Australia by creating jobs and opportunity.

"We need to move ahead in our relationship with China, understand our differences and work to achieve benefits for everyone."

Among the senior public officials Mr Barnett met were Mr Zhang Ping, the chairman of the National Development and Reform Commission (NDRC) and Han Zheng, Mayor of Shanghai, China's second largest city.

"The NDRC is China's premier economic planning agency and its role includes approving major foreign investment projects," Mr Barnett said.

"Mr Zhang advised me that the NDRC actively wants to expand China's involvement in mines and infrastructure construction in Western Australia's Mid-West region.

"I was also able to put the case for direct flights between Shanghai and Western Australia to Mayor Han and he was very receptive.

"With Western Australia providing 68 per cent of Australia's exports to China and China's growing investments in the State, there is great potential for increasing passenger numbers in both directions – not only for business, but also as tourists and students.

"We agreed that we would work towards a direct air service in the lead up to the Shanghai World Expo in 2010."

Mr Barnett also met with the Chairmen of Presidents of major Chinese industrial companies, including Anshan Iron and

委员会第三次会议 Exchange Committee Meeting

日 · 杭州
Hangzhou



Western Australian Premier Colin Barnett (centre) at one of the many trade meetings he attended while in China.

Steel Group (Ansteel) BaoSteel, Chinalco and Sinosteel.

With Ansteel's president Dr Zhang Xiaogang the Premier witnessed the signing of a memorandum of understanding (MoU) to conduct a feasibility study of establishing steel plants and rolling mills in Western Australia over the next 18 months.

"Ansteel Mining Company is China's largest and most cost-efficient producer of domestic ore," Mr Barnett said.

"The company has shown interest in iron ore processing in Western Australia, particularly in the Mt Karara operation, and is keen to be part of the Oakajee development."

Mr Barnett promoted Chinese involvement in the Oakajee Port and Rail project and industrial estate development.

His visit coincided with the announcement by the project operators Oakajee Port and Rail (OP&R) of the appointment of China Communication Construction Company as port design consultant, and an alliance with China Rail Construction Company.

In September, the Western Australian Government and OP&R will jointly host a Chinese trade delegation visit, to further explore opportunities at Oakajee.

Mr Barnett inspected several LNG terminals, which are taking a growing share of Western Australia's exports and a number heavy manufacturing plants, leaders in the magnetite ore beneficiation technology, which is helping to develop a new iron ore export industry in Western Australia.

During his visit he was also able to reinforce Western Australia's 20 year-plus Sister State relationship with Zhejiang Province and witness MoUs

for inter-government cooperation on agricultural and water management research, land information and police personnel development and training.

Mr Barnett also joined Liaoning Province Governor Mr Chen Zhenggao in the foundation of another significant relationship, by signing an MoU that aims to further trade and economic co-operation between Western Australia and one of China's major mining and industrial regions.

The Premier also met with the highest ranking Government officials in both provinces.

"In the Chinese context, these government-to-government level relationships are vital in fostering links and contacts through which business and trade and educational and cultural exchanges can prosper," Mr Barnett said. ■

COAL STUDY

helps create a cleaner future

A new study examining the potential for carbon storage to help in the development of low emissions coal technology is currently underway in Western Australia's South West region.

The Lower Lesueur Carbon Dioxide Geosequestration Study, launched by Minister for Mines and Petroleum Norman Moore in May this year, involves a desktop analysis of the suitability of locations to store carbon dioxide in the Southern Perth Basin between Bunbury and Mandurah.

Funding for the study has been provided through a memorandum of understanding (MoU) between the Department of Mines and Petroleum (DMP), Griffin Energy, Verve Energy, BHP Billiton Worsley Alumina, Wesfarmers Premier Coal and Perdaman Chemicals and Fertilisers.

DMP contributed A\$250,000 towards the A\$522,000 analysis, to study seismic data and existing well cores to help identify potential injection points and the migration behaviour of carbon dioxide.

Industry provided the remainder of the funding.

DMP Project Manager Dominique Van Gent said the study's results would determine if work could progress to drilling and accessing a test hole for carbon dioxide storage as well as a pilot injection and monitoring program.

"There is a need to identify a number of carbon sequestration sites in today's carbon constrained world," Mr Van Gent said.

"The Lower Lesueur measures are a geological anomaly that have the potential to be a major onshore carbon sink in the South West area, but it

needs proving up in a rigorous and scientific manner.

"The State Government is very pleased to be able to support industry in the first steps of the process."

Carbon Storage Solutions, a division of international oilfield services provider Schlumberger, is carrying out the 12-month study, which began in May.

The work follows earlier research by the Cooperative Research Centre for Greenhouse Gas Technologies, which identified the geosequestration potential of the Southern Perth Basin.

Mr Van Gent said the study was a valuable investment for Western Australia's coal industry and in striving towards a low emissions future.

"International studies have demonstrated that coal will remain a major fuel source for electricity generation for the next 40 years," he said.

"These studies also show that carbon capture and storage from coal-based industries can provide up to 19 per cent of the reduction in carbon dioxide that will be required in 2050.

"Work needs to be done on a raft of measures and the coal industry has demonstrated its preparedness to make significant contributions.

"What is critical to this local contribution is the identification and subsequent investigations into showcasing how effective local geosequestration sites can be."

Mr Van Gent said examining the sequestration potential of the Lower Lesueur study would therefore help contribute to the long-term viability of

Western Australia's coal industry, the energy security of the State, and to the Government's commitment to a low emissions future.

Verve Energy's Engineering Services Manager Andy Wearmouth said the study would be extremely helpful for his company's key operations.

"Verve Energy is the largest generator of electricity in Western Australia and as a consequence has a large carbon footprint," Mr Wearmouth said.

"The key to addressing this in a meaningful way, in a carbon-constrained environment, will be the ability to sequester carbon dioxide.

"Our company is also the State's single biggest coal consumer, and electricity production from coal has a significantly larger carbon footprint than natural gas or other sources of energy used for the production of electricity.

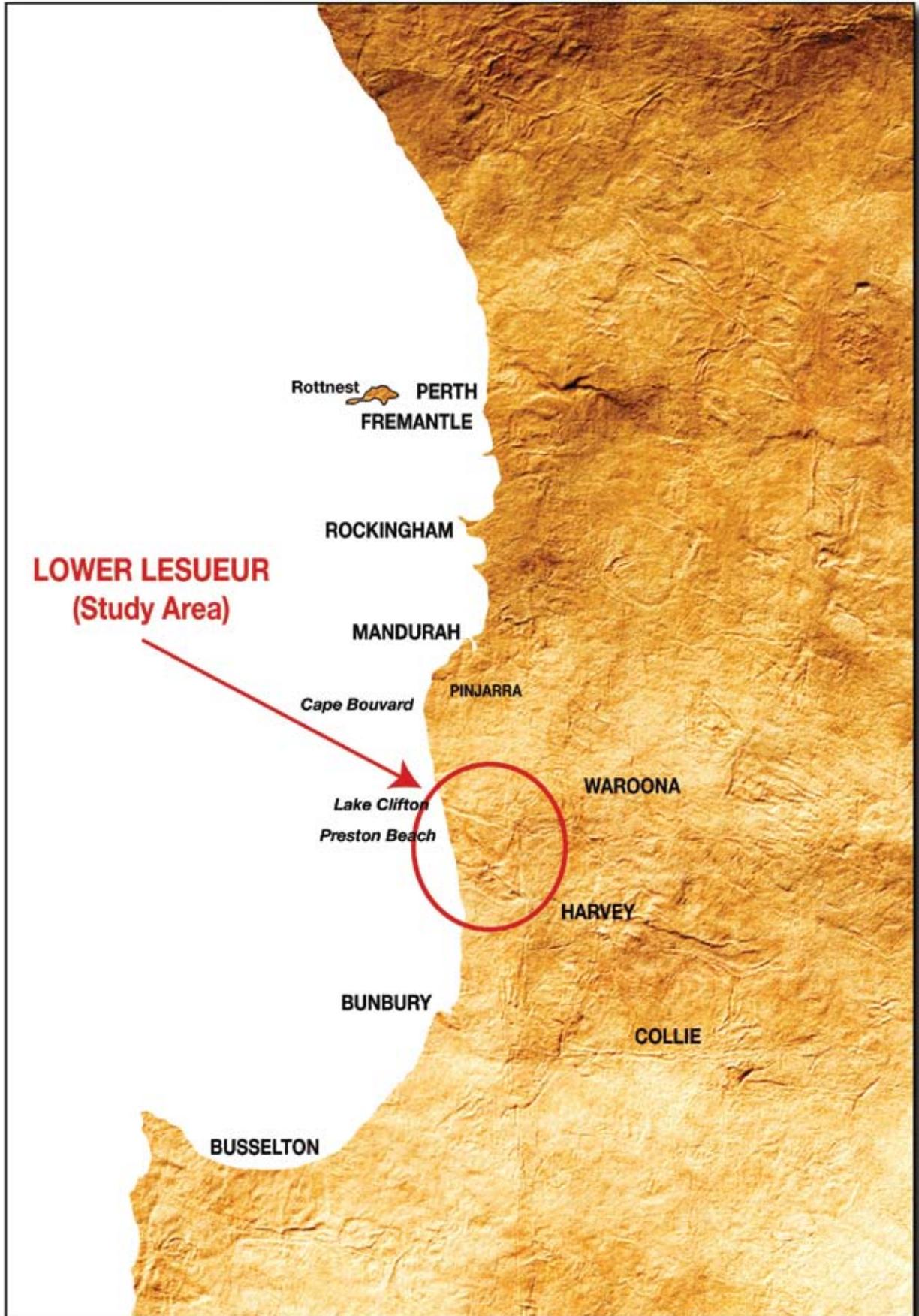
"The key to reducing the environmental impact on this coal consumption will be the ability to capture and sequester carbon dioxide."

Mr Wearmouth said the science surrounding carbon capture and storage was relatively underdeveloped.

"It's important to build an understanding of the likely feasibility of geosequestration locations and provide confidence in the community that geosequestration is a technically feasible and socially responsible technology," he said.

"The study results will hopefully be positive and encourage the potential for demonstration of the technology at scale and from there, provide critical input into the future generation planning options for Verve Energy." ■

LOWER LESUEUR GEOSEQUESTRATION STUDY AREA



AUSTRALIA'S UK LINKS REMAIN STRONG

Despite its strong historical ties to the United Kingdom and Europe, Australia has increasingly looked to Asian countries such as China, Japan and India for trade and investment purposes.

This is especially true in Western Australia, with its mining and petroleum-focused economy.

This change in economic relationships has arisen from Australia's proximity to Asian markets and the incredible growth in the region over the past few years.

During the same period, the UK economy has strengthened its ties with fellow European Union member states.

However, despite the shifting priorities of the two countries, there remain significant opportunities for bilateral trade and investment between Australia and the UK.

This was in evidence at the recent G'Day UK event held in London.

The forum presented UK attendees with a snapshot of the exciting and dynamic nature of the Australian market.

Western Australia was represented by employees from the Western Australian Global Network's Europe Office, located in London.

The event featured a Chief Executive Officers' Forum focused on trade and investment opportunities in the two countries, including a lengthy discussion on the resources industry.

Companies that participated in the forum included BHP Billiton, Rio Tinto, Blue Scope Steel, National Australia Bank, the Royal Bank of Scotland and the Commonwealth Bank of Australia.

Western Australia's Agent General to the UK, Kerry Sanderson, said G'Day UK emphasised the importance of the UK market to Australia.

"The UK is Australia's largest trading partner in Europe, with two-way trade

amounting to approximately A\$20 billion per annum," Mrs Sanderson said.

"The Euro zone is Australia's third largest market after Japan and China for merchandise exports and Australia's largest market for services exports.

"The region continues to invest strongly in industry in Australia and during 2007 was our largest source of inward investment, and second for outward investment by Australian companies."

Speakers at the CEO Forum predicted commodity prices would soon recover, with a full rebound expected within two to three years.

It was noted that China and India still had low per capita consumption and Chinese demand in particular would rise in the short-to-medium term.

Commodities expected to be in particular demand in the future were iron ore, bauxite, liquefied natural gas (LNG) and uranium.

All of which can now be exported from Western Australia, after the State Government overturned a ban on mining uranium late last year.

Australia accounts for one quarter of world bauxite production, 40 per cent of identified nickel resources and 15 per cent of iron ore production.

The 8 per cent of global LNG currently supplied by Australia could rise to 20 per cent as a raft of new projects come on-line in the next few years.

Mrs Sanderson said Australia compared favourably with other countries in discussions on the competitiveness of the development process for resources projects.

"Our strong resource base is a significant benefit," she said.

"The skilled workforce is also a plus, but skill shortages reported in the recent boom were seen as a problem.

"The fact that Australia has strong links to the UK and other established markets is seen as a distinct advantage over developing countries in terms of its overall trade performance."

Other benefits for the country included its experienced customer base, capacity to raise capital and stable fiscal, legal and government regimes.

One of the few negatives to be raised was the infrastructure challenge proposed by Australia's sparsely populated landmass.

The Western Australian Global Network hosted a science and technology satellite event at G'Day UK.

This was designed to highlight the high standard of scientific research in Australia and the UK and what could be achieved through greater collaboration between the two countries.

The Square Kilometre Array (SKA) radio telescope project was discussed at length.

The project, which Australia is bidding to host, will create an instrument 50 times more sensitive and with 10,000 times the discovery potential of present models.

It will involve an array of several thousand receiver dishes spread across Australia, and potentially New Zealand, with a collecting area of one million square metres.

More than 100 guests attended the science and technology event, including high profile researchers and representatives of the UK and European government agencies involved in the SKA project.

Other events held as part of G'day UK focussed on migration and tourism, and included major skilled migration expos and a round table tourism forum. ■



Attending the G'Day UK launch were (left to right) Chevron Australia's Greater Gorgon Area General Manager, Colin Beckett; Western Australia's Agent-General to the UK, Kerry Sanderson; Rio Tinto Chief Executive Tom Albanese; and Rio Tinto Chief Executive of Iron Ore, Sam Walsh.



Government of **Western Australia**
 Department of **Mines and Petroleum**
 Resources Safety



MINES SAFETY ROADSHOW TRAVELLING YOUR WAY

Do you work in the mining sector and want to learn more about occupational health and safety issues or find out what is happening in mines safety regulation?

Resources Safety, from the Department of Mines and Petroleum, invites you to attend the Fifth Annual Mines Safety Roadshow.

All roadshows will discuss radiation safety and include a session on how to engage people to think about safety. The roadshows also represent a great opportunity for you to network and consult with mines inspectors and other staff from Resources Safety.

In particular, the regional roadshows will provide an insight into concerns surrounding safe access to vehicles and other equipment, and include a practical session on performing hazardous manual tasks.

The Perth roadshow will address equipment design issues, with a presentation by Stuart Evans of the Earth Moving Equipment Safety Round Table (EMESRT), and safety on processing plants.

The Mines Safety Roadshow will travel throughout Western Australia to:

- Kalgoorlie on Thursday 8 October 2009**
- Tom Price on Wednesday 14 October 2009**
- Bunbury on Friday 16 October 2009**
- Perth on Thursday 29 October 2009**

All regional roadshows open at 8.30am for a 9am start. The Perth roadshow opens at 8am for a 9am start and will be webcast.

Pre-registration is required. Tickets are \$77 each and include morning tea, a buffet lunch and a roadshow resources pack.

To receive further information about the webcast or registration, please contact Resources Safety before the event on:

- Telephone:** (08) 9358 8154
- Email:** RSDComms@dmp.wa.gov.au
- Visit:** The events page at www.dmp.wa.gov.au

www.dmp.wa.gov.au/resourcessafety

DMPAUG09_0263



Kemerton Industrial Park near Bunbury is one of the five priority estates targeted by the State Government's A\$5 million Heavy Use Industrial Land Strategy.

A better plan for industrial land

A State Government injection of A\$5 million into Western Australia's heavy use industrial land will make it quicker and easier for interested companies to develop these areas.

The new Heavy Use Industrial Land Strategy was funded through a 2009 State budget commitment and is being led by the Department of State Development (DSD).

The strategy aims to make the State's industrial estates project ready.

This means all initial environmental, planning, heritage and other necessary approvals will be obtained prior to companies taking up any land.

These companies will still need to apply for approvals specific to their own land use.

DSD Strategic Industrial Lands General Manager Tim Fraser is leading the project with a team of 10 within DSD and assistance from other Government agencies.

He said the strategy was trying to make industrial estates more attractive

for industry, particularly during the economic downturn.

"It's something that Western Australia has rarely done and it's put us a little behind the eight ball when you compare us to other jurisdictions," Mr Fraser said.

He said the State's heavy use industrial areas had often been little more than lines on a map.

"We're trying to make them more than that, to make them integrated as part of local and State planning, and, more importantly, to make them as ready as possible for industry to come in and establish themselves," Mr Fraser said.

The strategy has set five key industrial estates for development: Oakajee, Ashburton North, Kemerton, Mount Anketell and Maitland.

These are in line with State Government priorities and will be constantly reviewed to assess whether changes are required.

The strategy is considered a significant contribution to the Government's focus

on reducing approvals timelines for new mining and petroleum projects.

Addressing the basic approvals requirements for each targeted estate can also improve the planning for industrial and social infrastructure.

"If we've planned an area and we've got a structure plan in place, then that will inform future infrastructure needs such as road, rail and power and so on," Mr Fraser said.

"What we're also doing is reducing the risk to the Government from stranded infrastructure.

The Keating Review and a report from the Western Australian Auditor-General, which both dealt with project approvals, highlighted the need for better planning of industrial land in the State.

DSD is working on the new strategy with the Department of Planning, Department of Transport, Landcorp, the Department of Environment and Conservation and the Environmental Protection Authority. ■

MERIWA fosters next generation of resources research

Four Western Australian students at the forefront of mineral and petroleum research have been rewarded for their efforts with A\$10,000 scholarships to further their projects.

The areas of research covered by the students include minerals exploration, minerals processing, and mine and processing site rehabilitation.

The scholarships were awarded by the Minerals and Research Institute of Western Australia (MERIWA) as part of an annual program open to PhD students conducting mineral and petroleum research at a Western Australian university.

MERIWA aims to encourage students to embark on careers in the industry, and to establish internationally recognised Western Australian researchers.

"The scholarship program allows MERIWA to encourage research and development to establish a strong technological base for the industry, through the universities, and other Government and private laboratories," MERIWA Executive Officer Don Martin said.

The scholarships comprise a A\$5000 stipend, and A\$5000 for project maintenance.

MERIWA has been funding research to benefit the resources industry for the past 28 years.

As a result, more than 276 research projects have been completed and reports published in the public domain since 1981.

During this period a State Government investment of A\$18.4 million has been matched by a A\$23.2 million contribution from industry.

The recipients of the 2009 scholarships are Erin Gray, Carla Zammit, Simon Assmann and Talitha Santini.

2009 MERIWA SCHOLARSHIP RECIPIENTS

Carla Zammit

Now in the third year of her PhD at Curtin University of Technology, Carla is studying biomining under high levels of total dissolved solids.

Biomining utilises microorganisms to economically extract metal from low grade or difficult-to-process ores.

Carla said the greatest challenge was trying to balance research with some form of a personal life.

"Research can be very consuming, it becomes easy to spend all your waking hours either in the lab, writing or thinking about your PhD," she said.

Erin Gray

Erin is commencing the first year of her PhD at Curtin University of Technology, where she is investigating the deformation of the earth's upper mantle through naturally occurring fabric types.

Erin's research integrates new technologies to address important processes related to fluid-rock interaction.

It could play an important role in the optimisation of mineral processing techniques.

Erin says her work forces her to challenge herself everyday and continually improve her skills,

Simon Assmann

Simon is in the first year of his PhD at the Western Australian School of Mines studying mass transfer in electrostatic liquid-to-liquid extraction.

The expected benefits from the project will be a detailed understanding of the fundamentals of electrostatic agitation.

"I think the greatest challenge of my research project is that I am investigating a relatively unexplored area of process metallurgy," Simon said.

"This research is also challenging because of the specialised laboratory equipment that I require...my MERIWA scholarship will contribute significantly towards purchasing this equipment."

Talitha Santini

Studying soil formation in bauxite residue is the focus of Talitha's first year as a PhD student at the University of Western Australia.

The successful completion of the project will result in improved rehabilitation outcomes associated with bauxite residue deposits.

Talitha said the greatest challenge she faced in her research project was finding a treatment for bauxite residue that was both time and cost effective.

"Encouraging phyto-remediation of residue by irrigating (and minimal fertiliser addition) should present a relatively cheap but potentially slow process," she said. ■



Carla Zammit



Simon Assmann

WA opens doors to new resource discoveries

Western Australia is set for significant new resource discoveries following the State Government's announcement of 35 successful applicants for its Co-funded Industry Drilling Program.

The 2009-10 drilling program, which is part of the Government's A\$80 million Exploration Incentive Scheme (EIS), provides up to 50 per cent of direct drilling costs, capped at A\$150,000, to successful applicants to fund their exploration activities.

The successful applicants were officially announced by Minister for Mines and Petroleum Norman Moore in June.

Mr Moore said successful applicants presented proposals aimed at boosting

new resources discoveries and helping significantly increase the knowledge of the State's geology and resources.

"The Co-funded Industry Drilling Program has come at a time when the State's resource industry is facing tough economic challenges with strong potential to hinder exploration," he said.

Gold was targeted in 17, or almost half, of the successful applications.

The next most popular target was base metals, appearing in 14 applications.

The Goldfields and Esperance regions proved the exploration hot spots, featuring in 16 of the successful applications, followed closely by the Mid West region with nine applications.

Other target minerals included uranium, iron ore, manganese, nickel and platinum group elements, while the other exploration areas included the Pilbara, Gascoyne, Kimberley and Wheatbelt.

EIS Coordinator Margaret Ellis, of the Department of Mines and Petroleum, was very pleased with the number of applicants who nominated for funding.

"The response was amazing, I was very pleasantly surprised considering the short lead time," she said.

"The total number of dollars that were asked from all the applicants was over A\$15 million and we only had A\$3 million available in 2009-10.



The announcement of successful companies for the Co-funded Industry Drilling Program was attended by (left to right) Susan Vearncombe of Silver Swan Group, Department of Mines and Petroleum Director General Richard Sellers and Association of Mining and Exploration Companies Vice President Peter Buck.



The Exploration Incentive Scheme was designed to stimulate new exploration activity throughout Western Australia.

“In the following three years we will have about A\$6 million available per year.”

Ms Ellis said the next step involved distributing agreements to the successful companies at a briefing.

She said companies would be reminded of their obligations to the State Government under the drilling agreements.

“Once companies give us their final report, which must be submitted three months after the drilling has finished, we will give them the final payment,” Ms Ellis said.

She said A\$20.5 million would be provided to the Co-funded Industry Drilling Program in the next four years.

The 35 successful applicants, chosen from a total of 168, were selected by a panel of industry experts and endorsed

by an advisory committee which included representatives from:

- The Association of Mining and Exploration Companies (AMEC)
- Chamber of Minerals and Energy WA
- Australian Petroleum Production and Exploration Association
- Amalgamated Prospectors and Leaseholders Association of WA
- Research organisations

The selection process was audited by an independent probity auditor.

AMEC Vice President Peter Buck said his organisation and the resources industry were very pleased to see the implementation of the EIS.

“Western Australia’s share of the national expenditure on mineral

exploration has reduced significantly over the past decade and resulted in a serious reduction in new mineral discoveries,” Mr Buck said.

“These factors, together with the State’s past complex approval system and increased competition from other jurisdictions, would have had a negative impact on Western Australia’s future royalties’ stream.

“However, the new State Government’s commitment to streamline the approvals process and to allocate A\$20.5 million over four years to increase exploration will stimulate activity and re-energise investor confidence in the State’s mining sector.”

For more information on the Exploration Incentive Scheme visit <http://www.dmp.wa.gov.au/EIS> ■

Finding sand from space



Diatreme Resources is exploring for mineral sands in the isolated region on the border of Western Australia and South Australia.

Sometimes when you can't see the forest for the trees, it pays to take a few steps back.

Diatreme Resources adopted a more distant than usual view point when looking at the Eucla Basin, on the Western Australian and South Australian border.

The company went all the way to space, in fact.

Diatreme viewed images of the basin's margins produced by space shuttle altimetry, and according to Chairman Tony Fawdon, they were remarkable.

"No-one was interested in the Eucla Basin (at the time)," he said.

"We were stunned to see that we were looking at strandlines (fossil shorelines) and paleovalleys (ancient rivers).

"What you can do to the altimetry data is to wind up the 'gain', which means you can make a molehill look like a mountain.

"Areas were pegged by Diatreme soon after, and it was not long after that Iluka Resources approached us looking for a deal.

"They stole a march on us by pegging around our tenements.

"I wish we'd pegged more, but they beat us to the punch."

Diatreme currently has about 30,000sq. km of tenements in Western Australia and South Australia, but it is the western side of the border that is revealing a promising mineral sand deposit that the company has named Cyclone.

Diatreme started exploring in the Eucla Basin in late 2006 and announced the discovery of this deposit in July 2007.

The results to date have been very encouraging.

"We've cleared a few hundred kilometres of track which are progressively being rehabilitated once we finish exploring areas," Mr Fawdon said.

"We've probably got close to 70,000 metres of drilling in the region".

"The mineral assemblage is probably one of the highest dollar-in-ground values per tonne anywhere."

He said indications were the 5km long resource currently contained 600,000 tonnes of zircon, 200,000 tonnes of rutile, 500,000 tonnes of leucoxene and 300,000 tonnes of altered ilmenite.

"We don't know as yet how much we've increased the resource," Mr Fawdon said.

"By mid-September we plan to issue an updated independent JORC (Joint Ore Reserves Committee) resource for Cyclone.

"We'll expect to have a good idea about whether to go to the next level and into feasibility."

Exploring and developing the mineral sands deposit is challenging because of its remoteness and extreme conditions.

It has also been challenging for the local indigenous people.

The Pila Nguru, or Spinifex people, who have determined native title, have had few dealings with strangers to their lands.

"We were amongst the earliest mineral exploration people to deal with the indigenous people there," Mr Fawdon said.

Adjacent to Diatreme's eastern tenements are the operations of Image Resources, whose tenements appears to cover a portion of the Cyclone deposit.

The news on that side of the fence also seems good.

Image Resources Executive Director George Sakalidis said after one drilling campaign they were impressed with the assemblage.

"The assemblies that we've found are up to 45 per cent zircon and 35 per cent leucoxene," he said.

"So it's a very high value assembly.

"And our slime content is extremely low at 3 per cent, which is very favourable."

Image Resources, like Diatreme, is extending its drilling program, and hopes to identify if its four mineralised zones join up.

"If they're at the same relative level then the implication is that they somehow join up," Mr Sakalidis said.

Image and Diatreme are also looking at combining some infrastructure if a project becomes feasible. ■

Book unlocks secrets of ancient reef

The Devonian reef complexes of northern Western Australia are among the best preserved in the world.

Pioneering Western Australian research into one of the world's best preserved ancient reef systems is attracting significant international interest.

The book, *Devonian Reef Complexes of the Canning Basin, Western Australia*, is the culmination of more than 50 years of research and mapping of the rugged limestone formations in the Napier Range, West Kimberley.

Stretching across 350 kilometres from near Derby to east of Fitzroy Crossing in the State's north-west, the magnificent exposed reef complexes have yielded significant economic resource discoveries.

The book's principal author Phil Playford and co-authors Roger Hocking and Tony Cockbain collaborated in mapping and researching the complexes.

All three authors have worked for the Geological Survey of Western Australia (GSWA), within the Department of Mines and Petroleum.

DMP Director General Richard Sellers said their research was regarded as a model for understanding the geology and mineralisation in similar but less well preserved reefs in other parts of the world.

"Also known as the Devonian Great Barrier Reef, the ranges have hosted some significant resource discoveries and hosts five zinc-lead mines and one producing oil field," he said.

"The work by these authors and others within the Geological Survey of Western Australia is not only significant in providing us with in-depth knowledge on our State's geology, but will also encourage exploration investment by the world's mining and petroleum industries."

Phil's geological studies were carried out periodically over more than half a century.

His work began in 1956 when he participated in a study led by West Australian Petroleum.

He has since worked with many international experts and supervised eight PhD students as part of the work to understand the mineralisation of the complexes.

Phil joined GSWA in 1962.

His earlier work was published, but in subsequent years he worked closely with

the two co-authors of the book, field mapping with Tony before 1993, and later with Roger when Phil retired from the GSWA in 1992.

Phil believes the reef holds significant potential for further deposits of oil, zinc and lead to be found, but concedes it's time for others to take up that work.

"This work has been a very big part of my life. I took all of my children up there over the years, but I am very pleased that others will now be able to follow-up with further study," he said.

Despite his 'retirement' and being in his 80s, Phil now plans to start work on his next book documenting research of his 1964 exploration into the Great Sandy Desert, when he met and studied the last Aboriginal community unchanged by European influences.

"Geology has been such a great adventure for me, I don't think I'll ever retire while I am able to write," he said. ■



*Phil Playford (left) and Tony Cockbain launched *Devonian Reef Complexes of the Canning Basin, Western Australia*, in August at the Department of Mines and Petroleum.*

COAL

Collie - Collie Coal Mine (Ewington I)

THE GRIFFIN COAL MINING COMPANY PTY LIMITED

Griffin Coal commenced mining its Ewington I coal deposit in April 2009, approximately 2km east of Collie. The coal mine, which has estimated coal resources of 408Mt, will produce approximately 3.4Mt/a of coal for private sector customers and Griffin Energy's recently commissioned and nearby Bluewaters I power station. The Ewington I coal mine will be an extension of the currently operating Ewington II mine, and will also supply coal to the Bluewaters II power station, which is currently under construction.

Expenditure: \$20m.

ELECTRICITY

Collie - Bluewaters I Coal-fired Power Station

GRIFFIN ENERGY PTY LTD

In June 2009 Griffin Energy completed construction of the first of possibly four 208MW coal-fired power stations at Coolangatta Industrial Estate, 4.5km north-east of Collie.

Expenditure: \$400m.

Employment: Construction: 600; Operation: 50

IRON ORE

Pilbara - Pardoo Hematite Direct Shipping Ore Mine

ATLAS IRON LTD

Atlas Iron Ltd is an active explorer and developer focused on iron ore projects. The company started exporting in December 2008. With a growing number of iron ore projects and large landholdings in the Pilbara (9,600km²) located close to existing infrastructure, the company is effectively defining resources and reserves capable of being mined with relatively low capital expenditure. Production commenced with its Pardoo Project, located 75km east of Port Hedland. The company has exploration programs underway across its tenement portfolio, with an exploration target of 160 to 220 million tonnes grading 57-60% iron. This will underpin an expanded long-term production business.

Pilbara - Iron Ore Mine Rail and Port Development

FORTESCUE METALS GROUP LTD

FMG Chichester operates a 45Mt/a iron ore mine at Cloudbreak in the Chichester Ranges of the eastern Pilbara, serviced by a multi-user railway and port facilities at Port Hedland. FMG Chichester is investigating increasing its production to 120 Mt/a in the Chichester Range.

Employment: Operation: 1600

AGRICULTURE

Ord - Ord East Kimberley Expansion Project

GOVERNMENT OF WESTERN AUSTRALIA

The State Government has committed \$220 million to increase the existing amount of irrigated land in the Kununurra region by adding 8000 hectares at Weaber Plains. This funding will provide the construction of irrigation channels, roads and off-farm infrastructure to service the future needs of the region's growing population and sustain economic growth. Construction will commence in early 2010. Expenditure: \$415m.

BAUXITE

Boddington - Alumina Refinery Expansion

BHP BILLITON WORSLEY ALUMINA PTY LTD

BHP Billiton announced in May 2008 the go-ahead for the \$2.5 billion Efficiency and Growth expansion project at its Worsley alumina refinery. The expansion project will lift capacity of the refinery from 3.5 Mt/a to 4.7 Mt/a through expanded mining

operations, additional refining capacity and upgraded port facilities. Construction has commenced and first production is expected in the first half of 2011.

Expenditure: \$2.5b.

Employment: Construction: 1500; Operation: 200

CHAR

Collie - Premier Mine Char Plant

WESFARMERS PREMIER COAL LIMITED

In December 2006 Wesfarmers Premier Coal commissioned a demonstration scale char plant at its Premier Coal Mine near Collie with a full production capacity of 50,000t/a. The char plant is providing sufficient volume to allow potential customers to fully assess the product. Char has applications in steelmaking, ferro alloy production, mineral sands processing, smelting and chemical plant processes.

Expenditure: \$8m.

Employment: Operation: 10

DIAMONDS

Kimberley - Argyle Diamond Mine

ARGYLE DIAMOND MINES PTY LIMITED

Development of the Argyle Diamond Mine commenced in 1982 and mining commenced in the main ore body in 1985. The mine is operational and in order to extend the life of the mine to around 2024 the company has committed to an underground mine expansion. Commencement of underground operations occurred in Q4 2008 with the first blast of the undercut having been achieved. Due to current global market conditions Argyle Diamonds has slowed down its underground development resulting in a workforce reduction. The company also announced a three month diamond processing stoppage from March 2009 in response to market conditions. The production stoppage provided an opportunity to perform maintenance and improvement activities and the process plant has now been fully recommissioned and is processing at a full and sustainably improved rate. The company remains committed to the underground expansion and continuing as a local business with 40% indigenous employment by the time the underground mine is in full production.

Expenditure: \$1.2b.

Employment: Construction: 250; Operation: 500

ELECTRICITY

Collie - Bluewaters II Coal-fired Power Station

GRIFFIN ENERGY PTY LTD

Griffin Energy is constructing the second of possibly four 208MW coal-fired power stations at the Coolangatta Industrial Estate near Collie. Commissioning of the Bluewaters II coal-fired base load power station is expected by late 2011.

Expenditure: \$400m.

Employment: Construction: 600; Operation: 50

Karratha - 7 Mile Power Station

HAMERSLEY IRON PTY LIMITED

Rio Tinto has proposed a power infrastructure rationalisation program and upgrade for its mining and port operations in the Pilbara region. Hamersley Iron Pty Limited is constructing a new power generating facility at 7 Mile near Karratha. Robe River Mining Company Pty Limited is constructing a 220kV transmission line and a sub-station at Cape Lambert. The Cape Lambert sub-station will be linked to the 7 Mile main power generator via the new transmission line. Hamersley and Robe will share the generation capacity created by the new power station. This new single station will replace the two ageing plants at Dampier and Cape Lambert. Construction of the power station commenced in late 2008 and is targeted for completion in 2010.

Expenditure: \$700m.

GOLD

Boddington - Gold Mine

BGM MANAGEMENT COMPANY PTY LTD

BGM Management Company, on behalf of Newmont Boddington (66.67%) and Saddleback Investments (33.33%), is developing the Boddington Gold Mine based on mining the extensive bedrock resource that underlies the mined-out oxide resource. Early in 2009, Newmont announced that it intended purchasing then joint venture partner AngloGold Ashanti's 33% interest in the project and this was finalised in June 2009. The mine has been in the construction phase since 2006 and initial production is expected in Q3 2009. Production will be around 800,000oz/a of gold and about 30,000t/a copper in concentrates over a 24-year mine life.

Expenditure: \$2b.

Employment: Construction: 1500; Operation: 650

HEAVY MINERAL SANDS

Narngulu - Processing Facility Expansion

ILUKA RESOURCES LIMITED

Iluka has commenced an upgrade of its Narngulu processing facility to treat ore from South Australia to supplement a diminishing supply from its Eneabba mining operations. Iluka will treat up to 600,000 t/a of heavy mineral concentrate from its Jacinth-Ambrosia deposit in South Australia at Narngulu starting in early 2010. Up to 350,000 t/a of zircon will be produced at the plant.

Expenditure: \$63m.

Employment: Construction: 100; Operation: 8

IRON ORE

Mid West Region - Extension Hill Hematite Mine

MT GIBSON IRON LTD

Mount Gibson Iron has environmental approval for a 3Mt/a hematite mining operation at Extension Hill, 260km south-east of Geraldton. The ore will be trucked to a railhead near Perenjori then railed to the port of Geraldton for export. Mount Gibson expects to have initial shipments in Q2 2010.

Expenditure: \$73m.

Employment: Construction: 150; Operation: 100

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

SINOSTEEL MIDWEST CORPORATION LIMITED

Midwest Corporation commenced transporting iron ore fines from stockpiles at Koolanooka, about 160km south-east of Geraldton, in January 2006, with the first exports shipped in February 2006. Sinosteel Midwest Corporation 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 currently awaiting environmental approval.

Expenditure: \$26m.

Employment: Construction: 40; Operation: 60

Pilbara - Rapid Growth Project 4

BHP BILLITON IRON ORE PTY LTD

BHP Billiton Iron Ore has obtained all relevant government approvals and is currently expanding the production capacity of its Western Australian iron ore operations from 129Mt/a to 155Mt/a to operate from 2010. The increased production will be achieved through infrastructure upgrades and the creation of a Newman hub. The company is also undertaking a parallel expansion of Rapid Growth Project 5.

Expenditure: \$2.597b.

Employment: Construction: 3500

Pilbara - Rapid Growth Project 5

BHP BILLITON IRON ORE PTY LTD

BHP Billiton Iron Ore is currently in the final stages of obtaining all relevant government approvals for a further production capacity expansion of its Western Australian iron ore operations to 205Mt/a in 2011.

Construction activities for the increased production, which involves mine expansions, railway duplication and additional berths at Port Hedland, have commenced. The company is in the study phases for future potential expansions.

Expenditure: \$6.74b.

Pilbara - Brockman Syncline 4 Iron Ore Mine HAMERSLEY IRON PTY LIMITED

In mid 2008 Hamersley Iron commenced construction of the mine for the Brockman Syncline 4 iron ore deposit, located approximately 60 km north-west of Tom Price. The planned full production capacity of the mine is 22Mt/a. Completion of construction is targeted for 2010.

Expenditure: \$2b.

Employment: Operation: 1500

Pilbara - Mesa A/Warrambo Iron Ore Mine ROBE RIVER MINING CO PTY LTD

Robe River Iron Associates is developing the Mesa A mine in the Western Pilbara. Production is planned to be approximately 20Mt/a. Construction commenced in January 2008 and is targeted for completion in early 2010.

Expenditure: \$1.2b.

IRON ORE PROCESSING

Pilbara - Sino Iron Project CITIC PACIFIC

CITIC Pacific Mining, a Chinese company, has approval for the development of a magnetite iron ore mine and pellet plant with a capacity of 6Mt/a. Approval was granted in June 2009 for the production and export of 13.6Mt/a of iron ore concentrates. A bulk sample has been completed and construction has commenced on a concentrator, pellet plant, slurry pipeline, port facilities, 640MW power station and 44GL/a desalination plant to be built at Cape Preston, as well as accommodation facilities. The company plans to export the first high-grade pellets to China in 2010.

Expenditure: \$5.2b.

Employment: Construction: 4000; Operation: 500

OIL & GAS DEVELOPMENTS

Carnarvon Offshore Basin - Pluto LNG WOODSIDE ENERGY

Woodside approved the Pluto LNG project in Q3 2007. Construction has commenced on Sites A and B on the Burrup Industrial Estate for export of LNG in Q4 2010.

Expenditure: \$11.2b.

Employment: Construction: 3000; Operation: 200

Carnarvon Offshore Basin - North Rankin Redevelopment WOODSIDE ENERGY LTD

In March 2008 the North West Shelf Venture participants approved funding of the \$5 billion North Rankin Redevelopment Project, which will recover remaining low pressure gas from the North Rankin and Perseus gas fields, and extend the field life to around 2040. The project involves the installation of a new second platform - North Rankin B - with gas compression facilities, low pressure separators, utilities and accommodation. North Rankin B will be connected by a 100m bridge to the existing North Rankin A platform. On completion both platforms will be operated as a single integrated facility known as the North Rankin hub. The North Rankin Redevelopment project also includes the necessary connections to North Rankin A and some refurbishment of the North Rankin A platform. North Rankin B is scheduled for start-up in 2013 and will support the North West Shelf Venture's onshore gas requirements to supply future customer commitments.

Expenditure: \$5b.

Carnarvon Offshore Basin - Pyrenees Development Oil Fields

BHP BILLITON PETROLEUM AUSTRALIA PTY LIMITED

In July 2007, BHPB Petroleum announced approval of the Pyrenees oil development, located 45km 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 Floating Production Storage and Offloading vessel, which will be capable of producing about 96,000bbl/d of oil. First production is expected during the first half of 2010.

Expenditure: \$2b.

Carnarvon Offshore Basin - Van Gogh Oil Field APACHE ENERGY LIMITED

The Van Gogh oil development, located around 50km northwest of Exmouth, will utilise a Floating Production Storage and Offloading (FPSO) vessel with a processing capacity of 63,000 bbl/d of oil and storage capacity of 540,000 barrels. It will be linked to two subsea drill centres with 10 production wells. Development drilling and sub-sea production equipment installation is completed awaiting the arrival of the FPSO, with first oil production expected late 2009. Additional exploration drilling is currently underway north of the field.

Expenditure: \$600m.

Carnarvon Offshore Basin - Gorgon Gas Processing Project

GORGON JOINT VENTURE

The Gorgon Joint Venture (GJV) made a final investment decision on the \$43 billion Gorgon Project on 14 September 2009. The GJV's foundation project on Barrow Island includes a three train LNG development capable of exporting 15Mt/a and a domestic gas project capable of delivering at least 300 terajoules per day of gas to the mainland. The development on Barrow Island also includes potentially the largest commercial geosequestration project in the world. The project obtained State and Commonwealth environmental approval in August 2009. The project is based on gas from both the offshore Gorgon and Jansz/lo gas fields. Preliminary construction is expected to commence by the end of 2009 with major construction commencing in early 2010.

Expenditure: \$43 billion

Employment: Construction: 3500; Operation: 300

Pilbara - Devil Creek Development Project APACHE ENERGY LIMITED

Apache Northwest and Santos Offshore are investigating the development of the Devil Creek Development Project (DCDP), a greenfield gas project comprised of an unmanned offshore gas production platform over the Reindeer gas field, 80km northwest of Dampier; offshore and onshore gas pipelines; an onshore gas processing plant site located near Devil Creek, 65km southwest of Karratha; and a sales gas export pipeline connected to the Dampier-to-Bunbury Natural Gas Pipeline (DBNGP). The DCDP is designed to provide up to 200TJ per day of dry natural gas and between 80kl to 160kl per day of gas condensate. All gas from the DCDP will service the domestic gas market in Western Australia. Construction is scheduled to start by Q3 2009, with first gas delivered into the DBNGP Q3 2011, subject to receiving all the required statutory approvals.

Expenditure: \$800m.

Employment: Construction: 200; Operation: 20

TITANIUM DIOXIDE PIGMENT

Kwinana - Titanium Dioxide Pigment Plant Expansion

TIWEST JOINT VENTURE

The Tiwest Joint Venture partners, Tronox Incorporated subsidiary Tronox Western Australia

and Exxaro Resources subsidiary Yalgoo Minerals, have approved an expansion at their Titanium Dioxide Pigment Plant in Kwinana that will see production capacity increase from 110,000t/a to around 150,000t/a. Construction has commenced, with the additional capacity expected to come online in early 2010.

Expenditure: \$100m.

Employment: Construction: 150; Operation: 12

AMMONIA/UREA

Collie - Coal-to-Urea Plant PERDAMAN CHEMICALS AND FERTILISERS PTY LTD

Perdaman Chemical and Fertilisers, formerly North West Chemicals and Fertilisers, is developing a coal-to-urea plant at Shotts Industrial Park, being development near Collie. The plant will use proven 'best-in-class' coal gasification and fertiliser production technologies. Around 2.7Mt/a of coal will be used to produce approximately 2Mt/a of urea, primarily for export to India. The urea will be transported to Bunbury Port by rail. The company has commenced environmental approval processes and has Government approval to obtain land in the Shotts Industrial Park. Supply and off-take arrangements are agreed and will be finalised by early 2010. Construction is expected to commence in Q2-3 2010 with the first shipment of urea planned for Q3 2013.

Expenditure: \$3.7b.

Employment: Construction: 1500; Operation: 200

AMMONIUM NITRATE

Burrup Peninsula - Ammonium Nitrate Plant BURRUP NITRATES PTY LTD

Burrup Nitrates, a joint venture between Burrup Holdings of Australia and Yara International of Norway, is conducting a feasibility study into the construction of a 350,000t/a Technical Ammonium Nitrate (TAN) plant to be located on the Burrup Peninsula. Ammonia feedstock will be supplied from Burrup Holdings; subsidiary company Burrup Fertilisers, which operates its facility directly adjacent to the proposed location for the new TAN plant. It is expected that all manufactured product will be sold into the Pilbara region. Regulatory approval has been requested with construction targeted to commence in the last quarter 2009 and commissioning during the first quarter 2012.

Expenditure: \$600m.

Employment: Construction: 600; Operation: 65

ELECTRICITY

Collie - Bluewaters III and IV Coal-fired Power Stations

GRIFFIN ENERGY PTY LTD

Griffin Energy Pty Limited is planning to expand the Bluewaters Power Station Project with two additional 208MW coal-fired power stations at the Coolongatta Industrial Estate, near Collie. Commissioning of the Bluewaters III base-load power station is expected by late 2013 and commissioning of Bluewaters IV by late 2015.

Expenditure: \$400m.

Employment: Construction: 600; Operation: 50

Neerabup - Bioenergy Power Station SPIRITWEST BIOENERGY PTY LTD

SpiritWest is developing a 30MW base load power station at Neerabup, 33km 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 in 2009.

Expenditure: \$115m.

Employment: Construction: 110; Operation: 50

Mid West Region - Centauri 1 Power Project ENEABBA GAS LIMITED

Eneabba Gas Limited, via its wholly-owned subsidiary Eneabba Energy, is planning to develop the 168MW Centauri 1 gas-fired turbine power station 8km east of Dongara. Generation capacity can be increased to 365MW. The project will be capable of supplying power into the South West Interconnected System network but will be focused on supplying additional volumes of energy for the developing Mid West iron ore industries. As soon as take or pay contracts for Mid West iron ore customers are confirmed, construction can commence on-site and the plant can be operational in approximately 14 months. Besides sourcing gas from the Dampier-to-Bunbury Natural Gas Pipeline, the company is working to develop an underground coal gasification gas supply for the facility.

Expenditure: \$200m.

Employment: Construction: 100; Operation: 4

Mid West Region - Central West Coal & Coolimba Power Projects

AVIVA CORPORATION LTD

Aviva Corporation Ltd is progressing the development of the Coolimba Power Project, a 2 x 200MW base load coal-fired power station and an associated coal mine located 15km south of Eneabba. Coolimba will be the first power station in Western Australia to deploy leading edge emissions technology for carbon capture. Upon commissioning, the power station will constitute 8% of the installed capacity in the South West Inter-connected System and have an operating life of 30 years. Subject to government approvals, construction is planned to commence in 2010.

Expenditure: \$1b.

Employment: Construction: 600; Operation: 100

GOLD

Goldfields - Tropicana Gold Project

ANGLOGOLD ASHANTI/INDEPENDENCE GROUP JOINT VENTURE

AngloGold Ashanti, as joint venture manager, has undertaken an intensive exploration and resource development program approximately 330km north east of Kalgoorlie. Plans for the project are to develop an open-cut gold mine and nearby processing plant. So far, a resource estimate of 5 million ounces of gold has been identified, with a mine life of at least 10 years. The feasibility study is planned to be completed in mid-2010. Commissioning is expected to be around the first quarter in 2013 with production of up to 410,000oz/a.

Expenditure: \$500m.

Employment: Construction: 700; Operation: 600

HEAVY MINERAL SANDS

Happy Valley - Heavy Mineral Sands Mine

BEMAX CABLE SANDS PTY LTD

Located adjacent to the Bemax 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 State Forest. The level of assessment for the project has been set at Environmental Review and Management Program. Environmental impact studies for the proposed mine development have been completed. Happy Valley contains a reserve of around 6Mt of ore at a heavy mineral grade of 11.3%.

Expenditure: \$35m.

Employment: Construction: 100; Operation: 30

Jangardup South - Heavy Mineral Sands Mine

BEMAX CABLE SANDS PTY LTD

The Jangardup South minerals deposit is situated 54km south of the Nannup township and adjacent to the D'Entrecasteaux National Park. Cable Sands estimates that the deposit would provide 2Mt of minerals. Feasibility and environmental studies are

well advanced. An environmental impact statement for the project is being prepared.

Expenditure: \$60m.

Employment: Construction: 100; Operation: 50

Keysbrook - Heavy Mineral Sands Mine

MATILDA ZIRCON LIMITED

Matilda Zircon proposes to develop a mineral sands mine located near the township of Keysbrook, approximately 70km south of Perth. The project has ore reserves of 43Mt, containing 1.2Mt of zircon, ilmenite and leucocoxe (40%). The concentrate will be processed at Bemax Cable Sands' plant at Bunbury over the mine's eight year life. In late October 2007, the Environmental Protection Authority recommended approval of the project subject to the company meeting a number of conditions in the development and operation of the mine. The finalisation of the environmental impact assessment process is currently progressing.

Expenditure: \$18m.

Employment: Construction: 35; Operation: 30

Shark Bay - Coburn Heavy Mineral Sands Mine

GUNSON RESOURCES LIMITED

Gunson proposes to develop the Coburn mineral sands project, located south of Shark Bay, which contains total ore reserves of 306Mt at an average grade of 1.2% heavy minerals. All of these reserves lie within the portion of the project area that has received government environmental approvals for mining. At the proposed mining rate of 17.5Mt/a, the Coburn mine life is estimated to be 17.5 years. In June 2009, Sedgman Metals Intermet Engineering was chosen as the preferred engineering contractor for the project. It has commenced a four month design definition study, including the dry mineral separation plant, the location of which was changed from China to the mine site. Discussions with potential investors and off-take partners in China and the Middle East are continuing.

Expenditure: \$100m.

Employment: Construction: 170; Operation: 110

Tutunup South - Heavy Mineral Sands Mine

ILUKA RESOURCES LIMITED

Iluka proposes to develop the Tutunup South mineral sands mine, located approximately 15km south-east of Busselton. The project will include the construction of mine pits, solar drying dams, ore concentrator and associated mine infrastructure. The mine is expected to produce over 1.2Mt of heavy mineral concentrate over its five-to-six year life, which will be transported to Capel for further processing. Tutunup South is scheduled to commence mining operations in Q4 2009, subject to obtaining necessary government approvals, and will replace Iluka's Wagerup mine site.

Expenditure: \$25m.

Employment: Construction: 150; Operation: 40

INFRASTRUCTURE

James Price Point - Kimberley LNG Precinct Project

GOVERNMENT OF WESTERN AUSTRALIA

The State Government is developing a Liquid Natural Gas (LNG) precinct in the Kimberley region to enable processing of natural gas from the offshore Browse Basin. The precinct will be capable of accommodating LNG processing and shipping facilities for multiple proponents currently exploring for and developing these resources. This approach will minimise the environmental footprint of gas processing in the region while maximising opportunities for local people and businesses to participate in, and benefit from, employment and business opportunities.

Expenditure: \$20b.

Employment: Construction: 3500; Operation: 360

Oakajee - Oakajee Industrial Estate & Port Project

GOVERNMENT OF WESTERN AUSTRALIA

The Oakajee Port will include common user infrastructure (channel, breakwater, turning basin, navigational aids, provision for tug and pilot boat pens, port administration offices, and roads and utilities) and private use infrastructure (at least one Cape Class iron ore berth, as well as associated materials handling equipment and rail infrastructure). The port will also include provision for a Panamax berth to provide import/export capability for value-adding industries in the Oakajee Industrial Estate. The 500km railway will link the port to mining tenements north-east of Geraldton. The new rail line will be operated on an open access regime.

Expenditure: \$4b.

Employment: Construction: 2000; Operation: 400

IRON ORE

Cape Lambert - Cape Lambert Iron Ore Project

MCC MINING PTY LTD

MCC Mining is developing a 15Mt/a iron ore (magnetite) concentrate project at Cape Lambert and aims to ship its first ore by 2013-15. The project comprises a 1.56Bt iron ore resource, covering 369sq.km. The project would consist of a beneficiation plant (A\$1b), 300MW power plant, a port for exporting concentrate (A\$1b) and other related infrastructure.

Expenditure: \$3.7b.

Employment: Construction: 1000; Operation: 800

Cape Preston Balmoral South - Iron Ore Project

AUSTRALASIAN RESOURCES LTD

Australasian Resources, through its 100% owned subsidiary International Minerals, is developing a 12Mt/a magnetite iron ore mine with associated infrastructure and processing facilities to produce iron ore concentrate and pellets for export using shared port facilities at Cape Preston. International Minerals has a right to mine 1Bt of magnetite ore from the Mineralogy-owned South Balmoral magnetite iron ore deposit located approximately 30km south of Cape Preston. A bankable feasibility study for the project was completed in 2008. The company expects to commission the project in 2011, with first shipment in 2012.

Expenditure: \$2.7b.

Employment: Construction: 2500; Operation: 800

Great Southern Region - Southdown Magnetite Mine

GRANGE RESOURCES LTD

The company plans to produce an initial 3.3 Mt/a magnetite concentrate, stepping up to 6.8 Mt/a from 2012. The concentrate will be transported via a slurry pipeline to the Port of Albany for export and pelletising in Malaysia. The recent merger with Australian Bulk Minerals now brings significant magnetite mining and pelletising experience to the Southdown project.

Expenditure: \$839m.

Employment: Construction: 700; Operation: 250

Mid West Region - Extension Hill Magnetite Mine

ASIA IRON

Asia Iron has primary environmental approval to produce up to 10Mt/a of magnetite concentrate, which will be transported by slurry pipeline to the Port of Geraldton for export. The company is currently seeking secondary approvals.

Expenditure: \$715m.

Employment: Construction: 1000; Operation: 350

Projects Under Consideration

Mid West Region - Jack Hills Hematite Mine Stage 2

CROSSLANDS RESOURCES

Murchison Metals commenced trucking 1.5Mt/a hematite from its Jack Hills operations to the Port of Geraldton in December 2006. Jack Hills Stage 2 would involve a further increase to 15-25 Mt/a of hematite and beneficiated ore. 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 the Stage 2 project is progressing.

Expenditure: \$750m.

Employment: Construction: 450; Operation: 350

Mid West Region - Karara Iron Ore Project

KARARA MINING LTD

The Karara Iron Ore Project is Karara Mining Limited's (Gindalbie Metals/Ansteel Joint Venture) cornerstone production project in the Mid West region. Karara will deliver some 10Mt/a of iron products, comprising 8Mt/a of high grade magnetite concentrate and blast furnace quality pellets before the end of 2011 and 2Mt/a of Direct Shipping Ore hematite before the end of 2011. The project is underpinned by a world-class JORC-code compliant resource base comprising a 522Mt magnetite reserve, a 1.853Bt magnetite resource, a 10.9Mt hematite reserve and a 16.2Mt hematite resource. The project is currently awaiting final development approval.

Expenditure: \$1.8b.

Employment: Construction: 1500; Operation: 500

Mid West Region - Weld Range Iron Ore Mine

SINOSTEEL MIDWEST CORPORATION LIMITED

Sinosteel Midwest Corporation proposes to develop a 15Mt/a iron ore mine at Weld Range, 65km south-west of Meekatharra, producing a mix of hematite lump and fines. The project is expected to utilise a new rail line and a new deepwater port facility at Oakajee. The company commenced an extensive drilling program in June 2006 and has completed a pre-feasibility study.

Expenditure: \$800m.

Employment: Construction: 1000; Operation: 500

Pilbara - Balla Balla

AUROX RESOURCES LIMITED

Aurox Resources Limited is a Perth-based metals developer with its primary asset the 100%-owned Balla Balla iron ore concentrate project. The project is located west of Port Hedland, in the Pilbara region of Western Australia. Aurox is well advanced in the development of Balla Balla with detailed engineering nearly complete and all long lead items such as crusher and mills secured. The company has in place two 15 year sales contracts for a total of 6Mt/a increasing to 10Mt/a concentrate production in year five with major Chinese steel companies. Balla Balla is based on a large homogenous magnetite ore body, which will be developed as one of the lowest cost magnetite operations in Australia. The project also has significant vanadium, titanium and phosphate potential, and is located near major ports, gas and grid power with main highway access. The Balla Balla Feasibility Study demonstrates strong project economics with magnetite iron ore shipments to China scheduled to commence in 2011.

Pilbara - Roy Hill Iron Ore Mine

HANCOCK PROSPECTING PTY LTD

Hancock Prospecting Pty Ltd has completed a pre-feasibility assessment of the development of the Roy Hill iron ore deposit, possibly Australia's largest undeveloped Marra Mamba iron ore deposit. The deposit is located about 80km north of Newman. In 2007, the company invested \$38 million on a major drilling program to more closely define the iron ore resource. Further infill drilling is continuing. The development program is to move to a bankable feasibility study by the end of 2009 for a decision on the project. The project includes the development of mines, a new railway or third party use of an existing

railway, and port facilities at Port Hedland. The Roy Hill Stage 1 Public Environmental Review document was released by the Environmental Protection Authority for public comment.

Pilbara - West Pilbara Iron Ore Project

API MANAGEMENT PTY LTD

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 30Mt/a of direct shipping iron ore from its Red Hill and Mt Stuart mine sites, located approximately 50km south west of Pannawonica. The ore will be exported via a new heavy haul railway to a new port facility at Mount Anketell. 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 mid-2013.

Expenditure: \$4b.

Employment: Construction: 2000; Operation: 700

LITHIUM

Ravensthorpe - Mount Cattlin Lithium Project

GALAXY RESOURCES LIMITED

Galaxy Resources Limited is developing a 1Mt/a lithium and tantalum (over a 15 year mine life) project at Mt Cattlin, north of Ravensthorpe. Galaxy plans to commence mine development and plant construction in Q3 2009 with first production of concentrates during Q3 2010. Lithium (spodumene) and Tantalum concentrate is expected to be shipped through Esperance. Galaxy's initial fast track project schedule aims to meet the growing demand for lithium-ion batteries currently being fuelled by the rapidly expanding international hybrid and electric vehicle market. Scoping studies for processing of lithium carbonate are due for completion by September 2009.

Expenditure: \$75m.

Employment: Construction: 100; Operation: 75

Pilbara - Spinifex Ridge Molybdenum/Copper mine

MOLY MINES LIMITED

The Spinifex Ridge Project is located 50km north-east of Marble Bar in the Pilbara region of Western Australia. It is based on a resource of 469Mt at 0.06% molybdenum and 0.09% copper. Moly Mines has completed a definitive feasibility study which has forecast 240 million pounds of molybdenum concentrate and 270 million pounds of copper concentrate will be produced in the first 10 years of the operation. The project's processing plant design capacity is 20Mt/a. The project is undergoing environmental assessment.

Expenditure: \$1.084b.

Employment: Construction: 400; Operation: 375

OIL & GAS DEVELOPMENTS

Carnarvon Offshore Basin - Macedon Gas Field

BHP BILLITON PETROLEUM PTY LIMITED

The Macedon gas field, located about 90km west of Onslow, was discovered in 1992 during drilling of the West Muiron-3 well, with a follow-up appraisal campaign in 1994. Macedon is 71% owned by BHP Billiton Petroleum and 29% owned by Apache Energy, with BHPB being the operator. BHPB is currently investigating the Macedon field, which is estimated to contain a gas resource of up to 690Bcf, as the basis for a domestic gas project for Western Australia at a site 15km southwest of Onslow. In November 2008, the company submitted both Federal and State environmental referrals to the relevant agencies, and a final investment decision is expected in mid 2010 with gas production to commence in late 2012.

Expenditure: \$1b.

Employment: Construction: 300

Pilbara - Wheatstone LNG Development

CHEVRON AUSTRALIA PTY LTD

Chevron is investigating the feasibility of an LNG project based on the Wheatstone and Iago gas fields in the Carnarvon Basin. Chevron announced that it entered Front End Engineering Design in July 2009 with a final investment decision planned for 2011 and gas to market in 2015. The project is to have an initial capacity of two 5Mt/a LNG production trains and a 200 Tj/d domestic gas plant.

Employment: Construction: 3000; Operation: 300

RARE EARTHS

Mt Weld - Rare Earths Mine

LYNAS CORPORATION LTD

The Mt Weld deposit, located about 35km south of Laverton, contains an estimated resource of 12.2Mt at 9.7% grade for 1.18Mt rare earth oxides. The development involves an open pit mine and concentrator at Mt Weld. The concentrate will be containerised on site then trucked to Leonora and railed to a container port for export. The ore will be shipped to a US\$214 million processing plant in Malaysia, which will have an initial production capacity of 10,500t/a REO and then expanding to 21,000t/a. In May 2009, Lynas and China Nonferrous Metal Mining Group (CNMC) signed a binding Heads of Agreement for CNMC to become a new majority shareholder in Lynas and to arrange provision of full funding for the project. Subject to approvals, the agreement shall enable Lynas to lift the suspension of the project and complete construction and commissioning of both plants. First production is anticipated approximately 12 months from receipt of funds.

Expenditure: \$135m.

Employment: Construction: 200; Operation: 90

SALT

Exmouth Gulf - Yannarie Solar Salt Project

STRAITS RESOURCES LTD

Straits Salt is proposing to develop Yannarie Solar Salt, a 4Mt/a salt operation in the east coast of Exmouth Gulf. It has exploration licences over the area and has applied for a mining lease. The proposal was assessed at the Environmental Review and Management Program level by the Environmental Protection Authority (EPA). In a statement released on 23 July 2008, EPA Report 1295 recommended against approval for the Yannarie Solar Salt proposal. Straits has appealed against the EPA's recommendation and the matter is currently under investigation by the Office of the Appeals Convenor.

Expenditure: \$200m.

Employment: Construction: 100; Operation: 75

TIMBER

Great Southern - Engineered Strand Lumber

LIGNOR LTD

Lignor Ltd is proposing the development of an Engineered Strand Lumber/Board plant 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 companies Siempelkamp or Dieffenbacher. The company has nearly completed its feasibility study. Further project development has been put on hold pending more favourable global financial market conditions.

Expenditure: \$350m.

Employment: Construction: 400; Operation: 125

Major Resource Projects – August 2009



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

