

Under guard

WA's northern assets protected



PROTECT



The Western Australian economy grew by 6.7 per cent in the 2011-12 financial year, to \$239 billion, primarily due to an intense investment phase in iron ore and LNG production.

Western Australia now produces 26 per cent of the world's iron ore, up from 19 per cent four years ago. Our share of world LNG production is expected to grow substantially over the next four years, from 15 million tonnes in 2011-12 to almost 50 million tonnes in 2016-17.

After speaking with senior government and resources industry representatives in Beijing and Tokyo this month, the State Government is confident demand for natural gas will continue.

The desire for a cleaner environment in China in particular is expected to drive an increase in its reliance on natural gas from five per cent of the country's energy mix, to as much as 15 per cent by 2020. In Japan, the debate over reliance on nuclear power remains difficult and is also likely to lead to sustained reliance on other sources of clean energy. This presents huge opportunities for WA.

The record levels of business investment during the past few years means, while there are signs the resources economic cycle has peaked, there is still a significant amount of exploration, project construction and project expansions in the pipeline. In the first quarter of 2013 the Department of Mines and Petroleum received 676 exploration license applications.

The mining industry invested a record \$39 billion in Western Australia during 2012. Figures show the commitment to projects across the State remains strong, as evidenced by the list of major projects at the back of the magazine.

The long term dividends of the intense business investment phase are evident in the strong export growth projected to 2015-16 of between six per cent and seven per cent each year.

The substantial increase in the State's iron ore and LNG production capacity will drive economic growth for the next few years, with growth of more than four per cent a year forecast to 2015-16.

Colin Barnett
PREMIER OF WESTERN AUSTRALIA & MINISTER FOR STATE DEVELOPMENT

Bill Marmion
MINISTER FOR MINES AND PETROLEUM

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Cover photo: HMAS Ballarat sails past the gas platform, John Brookes, 110km off the WA coast, as the ship transits through the North West Shelf of Australia.
Photo: Royal Australian Navy

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In this issue



02 Shale gas myths debunked

The State Government's leading expert on natural gas from shale and tight rock dispels the myths and mistruths about this vast natural resource.

06 Under guard

Resources in Western Australia are coming under increasing protection from the Royal Australian Navy.

08 New Minister sets priorities

Recently-appointed Minister for Mines and Petroleum Bill Marmion aims to improve the business operating environment for companies in WA.

11 It's a gas at Gingin

The State's newest gas production plant is now operating in the relatively-untouched Perth Basin, just north of Perth.

12 Power project 'strung up'

Helicopters are being used to install 190km of power lines in the State's biggest infrastructure project in 25 years.

17 Waste energy to plug Pilbara power gap

The State Government's has just given environmental approval for WA's (and Australia's) first waste-to-energy plant.



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WA petroleum regulator sets record straight



Photo: Empire Oil and Gas NL

Western Australia's leading petroleum expert used a recent Australian Petroleum Production and Exploration Association (APPEA) Conference and Exhibition in Brisbane to address misinformation relating to the State's emerging natural gas from shale and tight rock sector.

Department of Mines and Petroleum (DMP) Petroleum Executive Director Bill Tinapple said the department would continue to provide correct and up-to-date information regarding the sector, following the ongoing circulation of inaccurate information by lobby groups.

"While we recognise the important contribution lobby groups make to public policy debates, it's disappointing some organisations do not always cite factual and reliable information in relation to this matter," Mr Tinapple said.

Some of the inaccurate claims include describing the fluid used in hydraulic fracturing (fracking) as a 'toxic chemical cocktail' kept hidden from the public, and that fracking causes health issues and contaminates water aquifers.

"There have been 780 wells which have safely undergone this gas extraction process since 1958 with no adverse effects on the environment, water sources or peoples' health," Mr Tinapple said.

"WA's rigorous regulatory framework for petroleum activities, including fracking, has the strongest chemical disclosure requirements of any Australian jurisdiction, as well as rigorous environmental and safety approval processes and international standards for well design and integrity.

"Despite what has been claimed, all the chemicals used in fracking in WA must be disclosed."

Currently, there are no applications for fracking projects submitted to the department, which expects the shale and tight sector to remain in

its early exploration and proof-of-concept phase for at least the next few years.

"This early exploration and proof of concept phase means we have time to learn from other jurisdictions, work with communities, incorporate latest information and technology and ensure our regulations are robust and leading practice," Mr Tinapple said.

"Looking to the future, we would expect any shale or tight gas project to operate in compliance with the law and with respect for the interests of Western Australian communities."

New information about shale and tight gas

DMP has developed a Gantt chart to assist companies wishing to undertake onshore oil and gas activities, including shale and tight gas exploration, and development activities in Western Australia.

The information in the Gantt chart will assist in scoping project approvals, including timelines, required from government before an activity can commence and is available at <http://www.dmp.wa.gov.au/17769.aspx>

For more information on shale and tight gas activity regulations, including up-to-date fact sheets, please visit www.dmp.wa.gov.au/shaleandtightgas

The fact sheets cover a range of topics including:

- Hydraulic fracture stimulation (fracking): the basics
- Shale and tight gas exploration in WA
- Shale and tight gas & WA's future energy security
- Shale and tight gas: DMP responses to misinformation

Community consultation key for emerging industry

The Department of Mines and Petroleum (DMP) has increased its community engagement efforts around the State's emerging natural gas from shale and tight rock (shale and tight gas) industry.

It comes as the department anticipates petroleum companies seeking government approvals to develop such gas.

In the past year, DMP has met with local shires, politicians, community members, land owners, environmental groups, traditional owners and industry to ensure interested parties are consulted about the regulation of natural gas from shale and tight rock in Western Australia (WA).

Most of the consultation with these groups has occurred in the Mid West and North West of WA, where the State's known shale and tight gas resources are located.

DMP Petroleum Director Jeff Haworth said being proactive with community consultation in these areas was an important step both the State Government and industry should be taking.

"Shale and tight gas is an emerging industry for WA which, if exploration proves successful, could see more proposals for onshore development in the coming decade," Mr Haworth said.

"The industry operators need to ensure community engagement is at the forefront of any planned onshore activities, particularly in light of the level of community interest in fracking and its impacts on the environment."

After a DMP visit to Queensland last year to meet with coal seam gas regulators, Mr Haworth believes community engagement is the key to ensuring the emerging shale and tight gas industry has a social licence to operate in WA.

"What the experiences in Queensland have taught me is that DMP as the State regulator needs to be more proactive

in providing open and transparent information," Mr Haworth said.

"Through meeting with communities in the past year, DMP has identified a number of common concerns which the public would like more information on.

"These include groundwater protection, the physical footprint of shale and tight gas activities, and land access rights.

"Community members are also interested in the potential benefits a shale and tight gas industry could bring to WA, including regional jobs, cheaper energy and other flow-on benefits."

Following community meetings in the Mid West last year, DMP will be delivering further community forums in the Kimberley this year.



DMP environment officers meeting with regional community groups to discuss petroleum activities.

To register your interest in future community engagement initiatives or for more information about shale and tight gas, please visit www.dmp.wa.gov.au/shaleandtightgas or contact Jason Medd on ph: 9222 0442 or Jason.medd@dmp.wa.gov.au.

Separating fact from fiction

In line with the myths and misinformation surrounding the extraction of shale and tight gas, the Department of Mines and Petroleum has produced an information guide.

The table on this page directly addresses recent claims made by some lobby groups and the media:

CLAIM	DMP RESPONSE
The fluid used during fraccing is a 'toxic chemical cocktail' kept hidden from the public.	In WA, companies are required to publically disclose all chemicals used in the fraccing process. Fluid placed down a well during fraccing is typically made up of 90 per cent water, 9.5 per cent sand and 0.5 per cent chemical additives. Most additives can be found in common household items such as ice cream, cosmetics, detergent and table salt. WA's environmental petroleum regulations have the strongest chemical disclosure requirements of any Australian jurisdiction.
A report in the United States revealed 6-7 per cent of wells fracced in the US leak in the first year.	Official US Ground Water Protection Council reports into the failure rates of onshore wells drilled in Ohio and Texas over a 20 year period found the true rate of failure to be 0.03 and 0.01 per cent respectively. Most of these leaks were not significant and occurred at the surface. Under Petroleum Resource Management regulations, all petroleum wells in WA must adhere to strict international well design and integrity standards as well as strict monitoring regimes, which significantly reduce the risk of well leakage occurring.
Fraccing causes health issues.	DMP is not aware of any publically confirmed cases of a medical illness being directly attributed to fraccing in Australia or the US (according to the US Environmental Protection Authority).
Fraccing contaminates water aquifers.	There is no evidence of water aquifers having been contaminated as a result of fraccing in WA. WA petroleum operators must adhere to strict international well design and integrity standards including the requirement for several layers of protective cement and steel casing in areas which pass through aquifers. Additionally, WA's shale and tight gas resources and aquifers are often separated by thousands of metres of dense rock formations, acting as a natural barrier.
Shale gas industry in WA intends to develop 130,000 onshore wells.	WA's shale and tight gas industry is currently in its early exploration phase with three wells having undergone fraccing in 2012 and seven since 2005. If shale and tight gas exploration does prove successful, any increase in activity would be subject to government approvals and is expected to be gradual.
The documentary <i>Gasland</i> shows US residents lighting their taps on fire, claiming gas development is to blame.	<i>Gasland</i> has been discredited by many recognised scientific and environmental expert bodies as inaccurate and unnecessarily alarmist. Due to unique geology in some areas of the US, naturally occurring methane has been present in aquifers long before gas development occurred. For members of the public who are interested in finding out more about this documentary, a recent public crowd-funded documentary, <i>Fracknation</i> , investigates the facts presented in <i>Gasland</i> .

Canning reserves a priority

Western Australia has taken another important step in ensuring the development of the Canning Basin's vast gas resources.

Premier and State Development Minister Colin Barnett said the vast onshore gas resources of the Canning Basin would be developed under the provisions of new legislation.

Mr Barnett said the Natural Gas (Canning Basin Joint Venture) Agreement Bill 2013 ratified the agreement signed by the State Government with joint venture partners, Buru Energy Limited and Mitsubishi Corporation.

"This legislation will bring about the continued exploration for natural gas in the remote Canning Basin and the development of a gas pipeline to ensure Western Australian consumers have first use of any gas discovered," he said.

The Premier said the US Energy Information Administration estimated the Canning Basin natural gas from shale rock resources at about 235 trillion cubic feet — about one and a half times WA's currently identified offshore resources.

The Canning Basin covers 530,000 km², stretching from the coast between Port Hedland and Broome, to the State's eastern border.

The gas resources in this arid area are located between two and five kilometres below the ground's surface.

"Tapping this vast resource will guarantee Western Australia's domestic gas supplies well into the future," Mr Barnett said.

"Because this gas is located onshore, it is also entirely owned by the State Government.

"This agreement ensures gas discoveries are rapidly brought into production, and that gas is delivered to the State's domestic gas network, before any is exported."

Once the domestic gas project is under development, the agreement provides for potential future gas supply for gas export.

Natural gas provides about 50 per cent of the State's domestic electricity generation, and contributes to the production of key resource exports including iron ore, alumina, base metals and gold.

"This will also ensure future energy-intensive mining opportunities and other manufacturing industries will benefit considerably from an expansion of WA's domestic gas supply sources," the Premier said.

"Natural gas is also an ideal partner for the State's growing renewable energy production as a back-up in times of adverse weather conditions and peak demand."

The Premier said the agreement provided additional security of tenure for 17,000 km² (1.7 million hectares)

covered by five exploration permits held by the joint venture. These permits anchor the joint venture's Canning Basin Domestic Gas Project, with the agreement facilitating further targeted gas exploration in these permits and the development of a pipeline to transport gas south to existing industrial areas.

If commercially-viable gas resources are discovered, by mid-2016 the partners will be required to submit a plan for construction of the domestic gas project, including a pipeline connecting to the existing State gas network.

Under the agreement, the partners are still required to obtain relevant State and Commonwealth environmental, safety, Aboriginal heritage and Native Title approvals for their exploration, development and infrastructure proposals.





HMAS Ballarat establishes communications with an offshore platform to inquire about any suspicious activity in the area.

North West rigs under close watch

Oil and gas platforms in Western Australia are coming under increased surveillance from the Royal Australian Navy (RAN).

The RAN has increased the tempo of patrols near platforms off the northwest coast as part of a plan to strengthen protection of \$350 billion worth of resources assets in the region.

Chief of Navy Vice-Admiral Ray Griggs ordered all navy ships transiting the region to conduct close patrols of the platforms, in addition to regular patrols by Border Protection Command.

The RAN said oil and gas facilities in the northwest were now under some form

of security surveillance “on an almost daily basis, by either Navy, Air Force or land-based Army capabilities, as well as Customs air surveillance and maritime patrols”.

The RAN has increased its frigate and patrol boat patrols in recognition that the platforms have become a central pillar of the nation’s economic security and require greater protection.

Collins-class submarines have also undertaken extra patrols of oil and gas platforms, although figures for these are classified.

This build-up has occurred steadily since Admiral Griggs issued a directive in July 2011, ordering all navy ships

transiting through the region, usually en route to or from HMAS Stirling base, south of Perth, to transit close to, patrol and make routine contact where appropriate, with oil and gas platforms in the northwest.

Defence said the extra patrols played “a key role in the navy’s effort to maintain security in the North West Shelf, which is of vital strategic and economic importance to Australia”.

As well as enforcing exclusion zones around the oil and gas facilities, the patrols test communications, procedures and protocols between Coast Watch and Defence, as well as with oil and gas platforms.



A Resolute operation

HMAS *Ballarat* used a transit from Fleet Base West south of Perth to Christmas Island to conduct an Augmented Security Patrol (ASP) of Australia's North West Shelf Venture.

Ballarat's visit to the North West Shelf Oil and Gas Infrastructure was part of the navy's vital contribution to Operation RESOLUTE, the military component of Australia's maritime border security effort.

Lieutenant Richard Farrelly, Assistant Officer of the Watch in *Ballarat* said the ASP added a bit of excitement to the journey north.

"We were kept busy plotting a course to get in close to the oil and gas platforms and sharing information on potential irregular activities in the area," Lieutenant Farrelly said.

"It was a good feeling to contribute, even in a small way, to protecting Australia's borders."

Commander Mark Massie, Operations Officer at Headquarters Northern Command, said *Ballarat*'s presence in the region offered some reassurance to the oil and gas installations.

"Armidale Class Patrol Boats visit the area frequently, but having an ANZAC Class frigate drop in would have given the patrol a whole new meaning," he said.

"It's important work and it sends a message that we're serious about protecting investment in the region."

According to the North West Shelf Gas Venture, the infrastructure constitutes Australia's largest oil and gas resource development area, which in turn represents an investment of \$27 billion.

The venture currently accounts for more than 40 per cent of Australia's oil and gas production.

DMP ramps up safety policing at WA mines

The State's resources safety watchdog has embarked on a major crackdown targeting injuries and 'near misses' in the Western Australian mining sector, following numerous serious incidents during the past couple of months.

Department of Mines and Petroleum (DMP) Resources Safety Executive Director Simon Ridge said while the State achieved a fatality-free year in 2012 – the first time in more than a century – he was concerned by recent incidents.

In June, two workers were injured at the same Goldfields operation – St Ives Gold Mine near Kambalda – during a four-day period.

A mining worker was injured in a road train accident, while a maintenance worker suffered broken bones and internal injuries.

In addition, a worker was seriously injured at Karara mine in the Midwest region in May.

The worker, who was one of three other workers performing the commissioning maintenance work, was allegedly struck in the face by a tool – causing mouth fractures, lip lacerations and a broken tooth.

There was also a serious 'near-miss' incident at Karara on 24 April, where an 80 tonne crane suffered a major structural collapse during load testing, dropping the load in the vicinity of four workers.

Mr Ridge said it was unsettling and disappointing that these incidents had occurred across WA.

"DMP safety inspectors are managing the incidents – for which full investigations have been launched," he said.

"As a regulator, the department believes every worker should return home to their family and friends at the end of their swings or shifts.

"I strongly urge all managers to ensure mining workers aren't placed in harm's way, and I urge mining workers to remain careful and vigilant at all times."

Mr Ridge said he wanted to point out that most companies and workers were doing the right thing.

"Attitudes to mines safety are improving across WA and this is represented by statistics that show WA's lost time injury frequency rate has decreased by 50 per cent in the past decade," he said.



New minister to focus on approvals process



Continuing to reduce overlap and duplication in the approvals process is a key priority over this term of government, according to newly-appointed Mines and Petroleum Minister Bill Marmion.

As a former Environment Minister, Mr Marmion said there were some obvious links between the two portfolios.

“While I have valuable experience on the environmental issues that are of interest to the resources industry, I know there is much to learn, and my first imperative is to engage with industry,” he said.

“Environment-based approvals are a tangled web that needs untangling, and I believe my experience in the practical difficulties of achieving this gives me a head start in this crucial area.

“In particular, it will be important to revive the negotiations with the Federal Government regarding accrediting State Approvals under the *Environment Protection and Biodiversity Conservation Act 1999*.”

While he was Environment and Water Minister, Mr Marmion made a number of key reforms aimed at streamlining approvals and improving the business operating environment in Western Australia.

He said since coming into office the Liberal National Government has determined more than 900 appeals more than 309 proposals.

This included the \$30 billion Wheatstone project in Onslow and the multi-billion Port Hedland outer harbour project.

“In addition, amendments to the *Environmental Protection Act 1986* saw a number of duplicative appeal points removed, and amendments to the Environmental Protection Regulations 1987 have also seen reductions in costs for small business,” he said.

Mr Marmion said he was committed to continuing the reform program initiated by his predecessor Norman Moore, with two critical areas of focus: reforming the

approval processes, and facilitating new resource development opportunities.

“The State Government will expand the successful Department of Mines and Petroleum’s online lodgement and approvals tracking system to other key approval agencies, including the Environmental Protection Authority, the Department of Water and the new Department of Environmental Regulation,” he said.

“Proponents will be able to track their progress across government, and the new system will build on the ‘in-house’ reforms already implemented by the agencies.”

Another reform will be the development of a publically-available online environmental database and library.

“Mining and petroleum companies have invested hundreds of millions of dollars over the years collecting data and undertaking surveys, and this information, along with data held

by government agencies and not for profit organisations, will be available in the future to companies, researchers, regulators and the community,” Mr Marmion said.

“Easy access to this information will reduce costs and timelines for industry. It will also strengthen our approval processes and help researchers and governments protect our unique environment assets.

“I am also confident the database will be an important consideration in future negotiations with the Federal Government regarding the *Environment*

Protection and Biodiversity Conservation Act and the way it interacts with State Approval processes.”

While still in the early days of his tenure as Mines and Petroleum Minister, Mr Marmion said he would also be focusing on facilitating and encouraging new development opportunities for Western Australia.

“While Western Australia’s mining and petroleum sector is heavily dependent on attracting overseas investment, there are also great prospects for our growing mining service sector exporting into international markets,” he said

“I have asked the Department of Mines and Petroleum to develop an international strategy that will take our State to new international audiences.”

DMP will undertake an immediate review of all policies and guidelines to ensure they are not adding to the cost of doing business in WA.

“I want my department to consult with industry stakeholders and report back to me within three months,” Mr Marmion said.

“It is essential that we create a regulatory environment that makes Australia and Western Australia in particular, an attractive place to invest in exploration.”

Basin project helps trim oil deficit

At \$490 million, it might not be the biggest project on Western Australia’s resources radar but the recently-commissioned Fletcher Finucane oil development is noteworthy for other reasons, not least that its output will help trim Australia’s petroleum liquids trade deficit.

Of most significance is the pace at which the project went from discovery to sanction and then first oil.

The Santos-operated Fletcher Finucane development is a three-well tie-back to the Mutineer Exeter oil project in the northern Carnarvon Basin, about 150km north of Dampier.

It began production in May, 16 months after being sanctioned and 24 months after the Finucane South discovery.

The fast turn-around reflects not only a calculated early commitment to

long lead items and good execution, but also the benefits of linking with existing infrastructure.

The Mutineer Exeter oil project was sanctioned a decade ago and began production in 2005 but, more recently, that output has declined.

The Fletcher Finucane tie-in to the Mutineer Exeter facility not only helped rein in capital expenditure and make the new project more attractive, it brought together three joint ventures and gave new life to an existing asset.

Santos has signalled it plans to tie-in other near-field discoveries and has identified the Vanuatu prospect as a drill target for later this year, early next.

Fletcher Finucane came on line on 20 May and, after completing the three-well ramp-up, it was flowing at a combined,

better than expected rate of 45,000 barrels of oil a day.

Notwithstanding the higher initial output, the project is expected to have an average rate of 15,000 barrels a day for the first year.

Around 1000 local jobs were engaged in the project, from rig and construction vessel workers through to project managers and engineering contractors.

Work awarded to local companies during development included the front-end engineering, pipeline surveys, pipeline design, offshore drilling and construction, as well as helicopter services, work and supply boats, remote-operated underwater vehicle services and various logistical support associated with the development drilling.



Photo: Santos

The Nan Hai VI was used to drill the three wells for the Fletcher Finucane oil project.

Offshore projects help seabed scientists chalk up record year

Understanding the seabed is crucial to the success of offshore oil and gas projects, especially those being developed in much deeper waters off the continental shelf, such as the Gorgon Project, Australia's largest single resources project.

Proposed oil and gas developments earmarked for Western Australia resulted in a bumper 2012 for seabed scientists working at the Centre for Offshore Foundation Systems (COFS) at the University of Western Australia (UWA).

The team of researchers at COFS's soils lab analysed soil samples submitted to it by many resources projects either underway or proposed. Last year, the lab undertook and completed a third more technical reports than in 2011.

The lab's findings virtually underpin the project's success.

"Engineering design and analyses for most of those projects are based on the information we generate in the soils lab here at UWA," said Professor Antonio Carraro, the laboratory's supervisor.

The seabed under much of WA's coastal waters consists of chalky, calcareous sediments – in effect, brittle shell fragments – that are vastly different to the seabeds in most other oil and gas regions around the world and present particular hazards.

"As engineers, we need to understand not only the materials used to build offshore structures, such as concrete and steel, but we also need to understand the underground materials that support these structures," Professor Carraro said.

"We look into quite a few aspects of what we call the mechanical behaviour of soils, such as its strength, stiffness and permeability, plus the capability of the material to consolidate or liquefy. These are two processes by which the strength can rise or fall as soil is loaded, and which need to be understood for efficient and safe design."

COFS is now involved in all of the major projects under development in WA, having performed studies to support the Pluto, Gorgon, Wheatstone, Browse, Ichthys, Sunrise, Julimar, Macedon, Equus and Scarborough projects.

Apart from its work in Australia, COFS researchers also assist the oil and gas industry in the US, Europe, Brazil, India, the Middle East and Southern Africa.

Not only is COFS attracting work from around world, it is also attracting researchers.

Professor Carraro is originally from Brazil, and more recently led a research lab at Colorado State University in the US, until he was attracted to Western Australia.

"COFS's research team is phenomenal and COFS is definitely one of the top centres in the world to do this type of research, which were the main reasons that made me want to come here," he said.

Rankin the platform for research centre

COFS's, and WA's, expertise in offshore foundations grew from studies needed to remediate the foundations of two giant gas platforms – North Rankin A and Goodwin – in the 1980s and 1990s.

According to Professor David White, from COFS, in those days all the original geotechnical design work for such developments was done overseas.

"With the recently-commissioned North Rankin B platform, the geotechnical work was done here in Perth, using COFS's soils lab, and by many COFS graduates working in local industry," he said.

"The geotechnical input to Australian projects is almost wholly performed in Perth, thanks partly to UWA's renowned facilities such as the soils lab, COFS's two centrifuges, and the award-winning O-tube facility, which simulates the effects of cyclones on underwater pipelines.

"All this local expertise means companies avoid the need to go to other oil and gas centres such as Norway or Houston to find geotechnical support for their projects.

"It also means COFS's geotechnical graduates populate the local consultancies, providing the expertise needed to perform the geotechnical design work in our local seabed materials."

There's a final, important consideration.

"At a time when the local content of these big oil and gas projects is under scrutiny, COFS's facilities are an important enabler behind one of the biggest elements of local content in the design of Australian oil and gas projects," says Professor White.



Senior soil technician Usha Mani checks seabed soils as part of the R&D for local oil and gas projects.



Gingin plant to boost State's gas supply

Photo: Empire Oil and Gas

The newly-commissioned gas processing plant at Gingin, just north of Perth.

WA oil and gas company Empire has just realised a 16-year dream with its newly-commissioned gas processing plant north of Perth.

The plant, 18km north of the rural town of Gingin, should enhance the State's gas supplies for more than 20 years.

Empire Oil and Gas NL's Red Gully gas and condensate processing plant is the first dedicated gas and condensate-rich processing facility in the onshore Perth Basin — an area long regarded as 'tight'.

The \$34 million plant will produce gas and condensate from the Red Gully-1 and Gingin West-1 wells and be separated into dry gas, condensate (light crude oil) and produced water.

Empire managing director Craig Marshall said the facility would help address the high demand for domestic gas in WA.

"The plant will make the gas suitable for sale into the Dampier to Bunbury Natural Gas Pipeline," said Mr Marshall, who has been with the project for all 16 years and faced many hurdles along the way.

"It is designed specifically for the condensate-rich gas and to meet the specification for entry into the pipeline, for which Empire has established a 20-year agreement," he said.

Mr Marshall said the secret to maintaining his focus since the company listed in 1997 was that he loved what he did.

"If you didn't love this business, you wouldn't be in it," he said.

"When the second well flowed at 12 million cubic feet a day it was very satisfying, after such a long time exploring."

Project manager Matt Biddle said the gas would be extracted from the two wells, processed at the plant and piped 3.2km to the DBNGP tie-in point located near the Brand Highway for sale to Alcoa of Australia.

The condensate will be processed and temporarily stored onsite in two 150,000 litre tanks, before being trucked to the BP refinery at Kwinana.

He said there would be ongoing drilling operations for more wells.

The company is also the first in WA to use 3D heliseismic investigations over the Wannamal and Gingin Gas Field Areas to help identify future drilling prospects. Wannamal and Wannamal Deeps are estimated to hold 66bcf of gas and 2.3MMbbl of condensate.

"The application of 3D seismic has been the key to understanding the reservoirs and how they work," Mr Marshall said.

"We have unlocked the secret of success in this part of the Perth Basin, for sure. We know it's pretty 'faulted-up', because it's a break-up basin, formed when India and Australia split."

Helicopters are used to drop seismic drilling equipment in to ground crew to minimise the environmental 'footprint' on the land, in particular within the Boonanarring Nature Reserve.

Long term, the potential seems positive. The company has obtained independent studies by RPS Energy from which Empire estimates five of its Perth Basin permits contain an estimated 14 billion barrels of oil and more than 92 trillion cubic feet (Tcf) of gas in unconventional reservoirs.

The RPS report covers only those permits with sufficient seismic coverage.

"We believe the potential of the Perth Basin is immense," Mr Marshall said.

"There could be anything up to 92 trillion cubic feet of gas, and 14 billion barrels of oil in five of our 11 permits.

"If the reserves are there, the Perth Basin has a tremendous advantage due to the proximity to the market and existing pipeline infrastructure."

Shire of Gingin President Michael Aspinall said the facility would give locals an opportunity to be trained in the oil and gas industry as the project expands in the coming decades.



Photo: Empire Oil and Gas

Flowline from the wellheads which travel into the facility delivering gas and condensate for processing.

High-flying power project takes shape

Helicopters are being used to string the first power lines for Western Australia's biggest electricity infrastructure project in 25 years.

The Mid West Energy Project (MWE) is building a 190km transmission line from Neerabup, north of Perth, to Eneabba at a cost of \$443million.

Helicopters are threading power lines through the 388 transmission towers, which are more than 60m tall.

Inspecting the aerial work, Energy Minister Dr Mike Nahan said the project was a vital investment in opening the resources-rich Mid-West region.

"The transmission line will supply industry and help drive economic growth in the region," Dr Nahan said. "It will facilitate the bulk transfer of electricity to and from the Mid-West.

"The Mid West Energy Project is one of the most important infrastructure projects in WA. The transmission lines will have the capacity to feed new resources projects and help tap the economic opportunities in this region.

"This project itself is creating jobs for West Australians, employing just over 300 people, but it will create more in the long run by powering growth in the Mid-West.

"This mineral-rich region contributes about \$2.5 billion to the total value of WA's exports and demand for electricity for more new mining sites is expected to grow in the coming years."

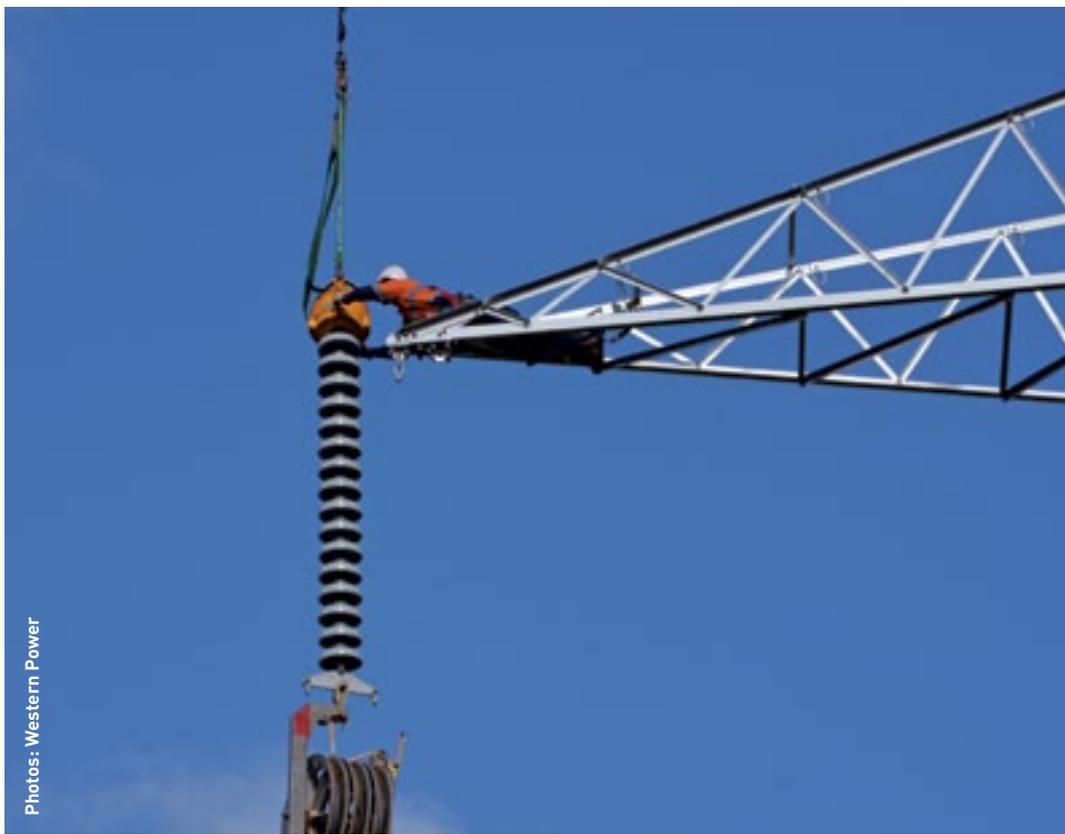
The Minister said the MWE would use more steel than the Eiffel Tower. It will also support renewable energy generators in the Mid-West corridor.

"This State Government is working towards a clean energy future and are building the infrastructure that will be able to support renewable generation feeding into the grid for decades to come," Dr Nahan said.

The transmission line will ultimately terminate at the recently-constructed Three Springs Terminal, which was energised last year, with power now flowing to Gindalbie and Ansteel's Karara iron ore mine.

"Karara contributed significant funding towards the construction of this transmission line, Dr Nahan said. "This project is symbolic as an example of the mining sector contributing to the building of critical infrastructure for the State."

The southern section of the project is being built by Downer EDI Engineering Power. The MWE project is scheduled for completion by mid-2014.



Photos: Western Power

A Western Power technician guides the insulator string to its installation location on the transmission tower, while (inset) Minister Mike Nahan watches a helicopter assist in threading a power line.

Latest WA gold mine boosts investor confidence

Photo: Norton Gold Fields Limited



Enterprise panorama with Cullum Winn (GM Paddington Operations), Jinghe Chen (Chairman) and Dianmin Chen (CEO).

Mines and Petroleum Minister Bill Marmion commended the opening of a new gold mine near Kalgoorlie-Boulder by a Chinese-controlled miner, saying it demonstrated continued confidence in the sector.

One of Australia's largest domestic gold producers, Norton Gold Fields, opened its \$110 million Enterprise Mine in Ora Banda in May.

"From November, the mine will begin producing approximately 110,000 ounces of gold a year and employ 80 staff for the next five years, which is great for

the Goldfields and the broader Western Australian economy," Mr Marmion said.

The fact the company was majority controlled by China's largest gold producer, Zijin Mining, showed continued confidence in the sector, he added.

"This move solidifies Western Australia's reputation as a global mining investment destination, and I welcome Norton Gold Field's position as a long-term WA gold miner," Mr Marmion said.

"While the price of gold has taken a modest drop during the past year, the current price is still around 60 per cent higher than

the 10-year average, something that is certainly driving development like this from Norton Gold Fields."

The Enterprise Mine will supply the bulk of the ore to the company's 3.3 million tonne per annum Paddington Mill.

Gold remained WA's second most valuable mineral sector in 2012, reaching \$9.4 billion in sales — a six per cent increase from 2011.

Last year, Norton Gold Fields, which is 89 per cent owned by Zijin Mining Group, produced more than 150,000 ounces of gold in WA.

Gas projects lift local content spending



Australian businesses supporting the development of the Chevron-operated Gorgon and Wheatstone Projects have now received commitments of a massive \$30 billion in local-content spending.

The two natural gas projects have also created 14,000 direct and indirect jobs across Australia – 10,000 on the Gorgon Project and 4,000 on Wheatstone.

"Chevron and its partners are investing billions of dollars in Australian goods and services as well as creating thousands of local jobs," said Chevron Australia managing director Roy Krzywosinski.

"The Chevron-operated Gorgon Project has now committed \$20 billion to local companies, while the Wheatstone

Project has committed close to \$10 billion.

"Chevron works closely with local industry to maximise opportunities for work on these projects and has awarded more than 600 contracts with local companies to date."

Mr Krzywosinski said Gorgon and Wheatstone were well placed to take advantage of a rapidly increasing demand for cleaner-burning natural gas.

"Global LNG demand is expected to increase significantly by 2025, at which point there is a potential supply shortfall estimated at almost 150 million tonnes," Mr Krzywosinski said. "This equates to 10 Gorgon projects and about half a trillion dollars in investment."



Photo: Rio Tinto

The launch of the Hamersley Agricultural Project, as featured in *Prospect*, December 2012.

Used mine water agricultural project boosts production

Rio Tinto's innovative use of surplus water from the recent commencement of large scale mining operations below the water table has resulted in an inaugural bumper hay crop from its pastoral leases in the Pilbara.

As reported in the December 2012 issue of *Prospect*, the Hamersley Agricultural Project (HAP) covers 835 hectares of land and takes advantage of surplus water supply generated from nearby Marandoo mining operations to grow pasture for cattle stations operated by Rio Tinto across the Pilbara.

The remainder is used to support mine operations, provide water supply for the Tom Price township, or is re-injected in to the Southern Fortescue Borefield.

The HAP is the first project of its kind in the Pilbara, relying on 35km of mild steel pipe, 22 pumps and large-scale associated pumping infrastructure. The completed project uses large centre pivots, each able to irrigate 40 to 50 hectares of pasture land.

Most pivots are now operating, with 15 of the total 17 pivots irrigating around 750

hectares. One small seven hectare pivot is reserved for growing native seeds for future minesite rehabilitation.

The trial cut of the Rhodes grass crop was in January 2013, and the first quarter's operations resulted in approximately 3,000 bales — equating to more than 2,000 tonnes of hay, with a revised annual estimate of about 25,000 tonnes.

Rio Tinto general manager for Climate Change, Water and Environment, Allan Jackson, said the launch had been a great success and remained on track to produce hay to project expectations.

"We have already started supplying our pastoral operations in the Pilbara and are presently refining the process by which we could sell any surplus externally," he said.

"This project will produce hay all year round at a consistent quality, and we expect to cut the crops up to eight times per year.

"Rio Tinto is committed to responsible water management across its operations. That means not only limiting use wherever possible, but also enabling innovative

solutions, such as the agricultural project, to put that water to good use.

"This expertise will prove increasingly important as more of our sites produce surplus water due to increased mining below the water table."

Rio Tinto holds six pastoral stations in the Pilbara and manages five covering 1.5 million hectares of land in total.

The five managed stations of Karratha, Hamersley, Rocklea, Juna and Yarraloola can jointly run up to approximately 25,000 head of cattle.

Pastoral lease and rangeland management brings a number of obligations including; the maintenance of a commercial cattle herd, management of environmental aspects including rangeland pasture cover, water and fence facilities and fire risk, and interaction with Traditional Owners.

Property management strategies for each station encompass all company policies with emphasis on safety, local heritage values, and natural resource conservation.

WA resources industry remains a 'revolving door'

Western Australia's resources industry continues to ensure the long-term growth of the State's economy.

When one project ceases operations, another begins.

The cornerstone of growth in the WA mining industry is private sector investment, and according to the Australian Bureau of Statistics (ABS) the mining industry invested a record \$39 billion in WA during 2012.

This represents a 12 per cent increase from the previous year and highlights the level of resource construction activity in WA, which continues to be a major driver of the economy — fuelled by strong demand from Asia.

Department of Mines and Petroleum (DMP) Deputy Director General Tim Griffin said the figures showed investment in committed projects across WA remained strong.

"However, early indications are that the previous high levels of high-risk exploration expenditure — sitting at around \$2 billion each for petroleum and minerals — is softening," he said.

"This is reflected in the difficulty junior explorers are having in attracting investment to support their projects.

"Expenditure on exploration is critical in ensuring new mines are coming on stream as the current mines run out of ore.

"Demands on government remain high and this is demonstrated through the number of applications for both exploration and production activities the department processes each year, usually around 7000."

Each application is subject to a rigorous approvals process, which may often include other government agencies such as the Environmental Protection Agency, Department of Water, Department of Aboriginal Affairs and the Department of Environment and Conservation.

In the first quarter of 2013, DMP received 676 exploration licence

applications and finalised 98 per cent within the 65 business day target.

While some projects have been shelved or postponed during the past year due to falls in global commodity prices, there is still an estimated \$177 billion worth of resource projects under construction in WA, with a further \$120 billion earmarked for major future projects.

For the petroleum sector, the \$52 billion Gorgon LNG project is a major development well advanced, while the \$29 billion Wheatstone LNG project and \$5 billion North Rankin natural gas redevelopment are also in full swing.

Major iron ore mines under construction include Hancock Prospecting's \$9.5 billion Roy Hill mine, BHP Billiton's \$3.3 billion Jumblebar mine expansion and CITIC Pacific's \$7.7 billion Sino Iron project.

Continued expansion of the iron ore industry is also supporting high levels of major infrastructure construction.

This includes Rio Tinto's \$9.5 billion expansion of Pilbara mines, ports and railways to 290 million tonnes per annum (Mtpa), with further expansion to 360 Mtpa by 2015.

Additional major infrastructure developments include BHP Billiton's \$1.6 billion Port Blending and Rail Yard facilities, and Fortescue Metals Group's resumption of its Pilbara mines and infrastructure expansion plans.

With 975 operating mine sites, 523 commercial mineral projects, 32 petroleum fields, and a wealth of untested mineral occurrences throughout the State, Western Australia's resources sector will remain strong for a long time to come," Dr Griffin concluded.



Deputy Director General Approvals, Dr Tim Griffin.

New shiploader boosts Cape Lambert



Photos: Rio Tinto

Aerial view of the port at Cape Lambert.

Rio Tinto has taken a major step forward in its expansion of its Pilbara operations, with the installation of the new shiploader with a nominal 55 million tonne annual capacity on the new wharf at Cape Lambert.

The shiploader was swung from the 'BigLift' vessel and placed directly on to its rails on the wharf, which will eventually extend 1.4 kilometres from shore.

The shiploader was manufactured offshore and transported to the Pilbara in modular form by the specialist heavy-lift ship. The modular design meant a narrow timeframe was necessary to transfer the 1000-tonne shiploader from the vessel to its position, minimising the safety hazard in the works and improving the construction time. Unloading and erection was completed within a few days.

Rio Tinto Pilbara Projects chief operating officer Michael Gollschewski said the shiploader was a major component of infrastructure in the expansion programme and it was exciting to see it secured in place.

"The last time we received a new shiploader was in 2007, also at Cape Lambert, on the existing wharf as part of the capacity expansion to 220 million tonnes a year," he said.

"This is a powerful visible reminder that we are progressing rapidly towards the reaching our interim target of achieving

290 million tonne annual capacity for the Pilbara operations."

The shiploader joins two new stackers, two reclaimers and a new car dumper in the newly-constructed stockyard for the Cape Lambert expansion.

The company says all major coastal infrastructure for the 290 Mt/a project is now safely on site and in place.

The new Cape Lambert wharf is being constructed in two stages, with the first stage to be completed in the third quarter of 2013, consisting of a

two-sided berth that will provide facilities and loading for two large ore carriers with the capacity to deliver up to 250,000 tonnes of iron ore to each.

Work on the second stage (phase B), will add a 400-metre wharf extension with another two berths, this second stage is already well advanced, with all dredging requirements and majority of piling now completed. Once all works have been completed the Cape Lambert port will have the largest export capacity of the three iron ore port assets owned by Rio Tinto.



Photo: Rio Tinto

A systems officer monitors movements at Cape Lambert Port Control.

Energy from waste to plug power gap

Plans to use household rubbish to produce electricity could be a reality within two years, with Western Australia's environmental watchdog approving the State's first waste-to-energy plant.

The recommendation by the Environmental Protection Authority (EPA) will allow Perth company New Energy to plug a looming shortage in Pilbara electricity supplies, with its proposal to build a \$180 million power station at Port Hedland fuelled by gas from waste.

Under the plan, the company would take about 100,000 tonnes of municipal waste a year from across the Pilbara and turn it into enough electricity to power up to 21,000 homes and businesses.

The project is an Australian first, and will convert waste, which would otherwise have gone to landfill, into a clean energy source.

The group would use a process called low-temperature gasification, which extracts gas from decomposing waste before using it to generate heat and electricity. It would then be fed into the electricity grid.

The approval comes at a time plans for other similar projects are taking shape.

New Energy wants to build another plant, at Kwinana, while a Melbourne-based company backed by Janet Holmes a Court has plans for a \$400 million, 60MW station in the same precinct.

Enzo Gullotti, New Energy's chairman, welcomed the EPA's endorsement.

"We are passionate about delivering this solution and providing a world-class environmental outcome for the Pilbara," Mr Gullotti said.

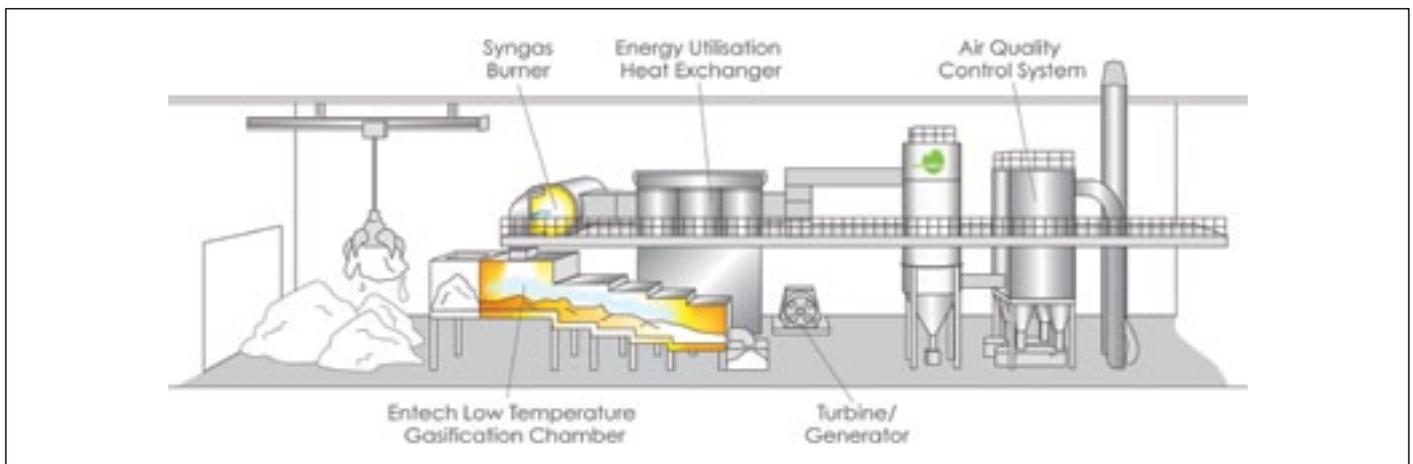
"The project has many benefits. It will ensure recycling initiatives can be realised

on a large scale, that landfill diversion rates will be among the highest in Western Australia, and clean renewable power generation is established."

New Energy Chief Executive David Sneddon said Port Hedland was selected due to the pressure on the waste management and power generation infrastructure in the region, and to play a key role in assisting to deliver the State Government's 'Pilbara Cities' vision.

"In order to achieve the State Government's objective of building the population of Karratha and Port Hedland into cities of 50,000 people, sustainable waste and power generation infrastructure is critical," Mr Sneddon said.

"New Energy's solution is well placed to assist the Pilbara in keeping pace with its unprecedented growth."



Top: A simplified diagram of the waste-to-energy conversion process.
Bottom: An artist's impression of the proposed waste-to-energy plant at Port Hedland.



Fund to enhance mine rehabilitation

The new Mining Rehabilitation Fund (MRF) started accepting contributions on a voluntary basis from 1 July.

Department of Mines and Petroleum (DMP) Environment Division Executive Director Dr Phil Gorey said the fund was established following extensive consultation with industry, government, conservation and community stakeholders.

“Under the current bonds system, all *Mining Act 1978* tenement holders are required to provide bonds as security to ensure that they fulfill their environmental obligations,” Dr Gorey said.

“The bonds do not cover the true cost of rehabilitating abandoned mines and

increasing bonds to cover full rehabilitation costs would be financially unsustainable for most mining companies.”

Dr Gorey said bonds also discouraged investment by tying up significant funds that could be used for developing a mining project.

“The MRF will overcome these issues by providing a pooled fund, levied on mine site operators according to the environmental disturbance on a tenement,” he said.

The fund addresses another important issue.

“Under the current system bonds can only be used for specific mine sites,” Dr Gorey said.

“They cannot be used to address the problem of existing abandoned mines, otherwise known as legacy sites.”

Under the MRF, one of the uses for the interest generated by the fund will be rehabilitating legacy sites.

“So not only does the MRF address the issue of having insufficient bonds to cover the State’s liability, it also enhances the State’s ongoing capacity to manage and rehabilitate abandoned mines,” Dr Gorey said.

“This will lead to better environmental and community safety outcomes.”

Senior staff start environmental reforms

The Department of Mines and Petroleum (DMP) has wasted no time in implementing the Reforming Environmental Regulation (RER) program, hiring two new senior staff members.

Dr Marnie Leybourne and Steve Tantala joined DMP earlier this year in the Environmental Division.

Dr Leybourne, who has worked for the State Government for 17 years and was previously an Executive Director at the Department of Water, has been appointed General Manager Administration and Reform, while Mr Tantala comes to the department with 12 years’ experience working for the Commonwealth Government, and has been appointed Director of Operations.

“I’m looking forward to successfully combining the new risk-based and outcomes focused approach to environmental

regulations with the traditional approaches that both industry and DMP have to date,” Dr Leybourne said.

Mr Tantala moved to Perth from his home city of Canberra in January, just before taking up his new position at the department.

He previously worked for the Commonwealth in the regulation division of the resources, energy and tourism department.

The RER program will help deliver greater certainty, confidence and clarity surrounding the department’s environmental regulatory system for all stakeholders.

Importantly, the reforms will strengthen the enforcement capacity of the department.

For more information on the RER initiative, visit: www.dmp.wa.gov.au/RER

Royalty incentive for magnetite producers



Special day ... (from left) George Jones, Premier Colin Barnett and Tim Netscher, Managing Director of Gindalbie.

A magnetite royalty rebate, to be considered on a project-by-project basis, will provide a major boost for a developing Western Australian iron ore industry sector, says the Premier and Minister for State Development Colin Barnett.

Mr Barnett was speaking at the opening of the State's first producing magnetite iron ore mine, the Karara Iron Ore Project.

"Western Australia has vast magnetite resources and this ore is preferred by many Chinese steel mills," the Premier said.

"This industry has the potential to stimulate new investment and construction activity throughout the State.

"However, bringing magnetite ore to grades suitable for export is capital and energy intensive, so this royalty rebate will assist in recovering the massive investment required to achieve production.

"This means a rebate of up to 50 per cent of royalties paid will apply for the first 12 months of magnetite production, before returning to the full royalty rate of 5 per cent."

The policy will apply for a three-year period from now.

Mr Barnett said the Karara project was a major step forward for the State and for the Mid-West region.

He congratulated Karara Mining Limited partners, Gindalbie Metals and the Anshan Iron and Steel Group Corporation (AnSteel), on their success.

"The State Government has worked closely with the proponents to get this project up and running and I congratulate them on getting to the production stage," Mr Barnett said.

"Karara is an outstanding example of the positive impact Chinese investment is having in WA.

"It is a significant achievement in terms of Chinese investment and a major example of Chinese confidence in Western Australia."

Mines and Petroleum Minister Bill Marmion said the \$2.57 billion Karara project would produce many benefits for local communities, the region and the State over its expected 35-year life.

"In addition to creating important new employment and business opportunities, Karara has made a significant investment in community projects, in Morawa and the Mid-West," Mr Marmion said.

The Minister said the project employed more than 2,400 people at peak construction and had generated 500 direct permanent jobs.

Fact File

- Under the Magnetite Royalty Rebate up to 50 per cent of the 5 per cent royalty on magnetite will be returned to the producer.
- There are 29 potential magnetite mines at different stages of planning and development in WA.
- In 2011, Deloitte Access Economics estimated that a magnetite industry could add \$4.5 billion and 4,000 jobs to Australia's economy — mostly in Western Australia.
- The five per cent royalty rate for magnetite, compares with a 7.5 per cent rate for hematite, the ore currently exported from Western Australia.
- The Karara Iron Ore Project minesite is 320km north-east of Perth, and 200km east of Geraldton.
- In addition to the mine and processing facilities, project infrastructure includes 85km of new railway, plus upgrades to the existing network; 180km of 330 kV power line from Eneabba to Karara; 140km water pipeline from Mingenew to Karara; and train unloader, storage and handling facilities and berth at Geraldton port.

He said the mine would initially produce eight million tonnes per annum (mtpa) of magnetite, with the potential to expand to 16mtpa or more.

AnSteel's integrated steelworks at Bayuquan, China will take all the project's iron products.

Mr Barnett said the Western Australian Government had worked closely with the Karara partners to secure the project, including upgrading the Pinjar to Eneabba electricity transmission line from 132kV to 330kV, and facilitating regulatory approvals.

The Premier said as the Mid-West's largest iron ore exporter, Karara would also have a role in securing a deep water port for the region at Oakajee.

Resources contractors get financial boost

Continued growth in Western Australia's resource sector projects has created many opportunities for small and medium enterprises (SMEs) in WA that supply goods and/or services. However, gaining access to finance to take on these opportunities can sometimes be a challenge. *Prospect* takes a look at one government agency that is providing solutions.

The Export Finance and Insurance Corporation (EFIC) is a Federal Government-backed (AAA-rated) provider of financial solutions for contractors working in the supply chain for resource projects.

These are contracts where the ultimate goods produced, such as oil, gas, iron ore and gold, are exported from Australia, but the contractors themselves may not be exporters.

EFIC works directly with eligible contractors and their banks to provide tailored financial solutions, including working capital and bank guarantees.

EFIC recently assisted WA pipe suspension designer and manufacturer Binder Group Pty Ltd. Binder is one of WA's largest designers and manufacturers of proprietary and custom-built pipe suspension solutions for the oil and gas, power generation, petrochemical, mining and mineral processing industries. It also supplies Woodside Petroleum's Pluto LNG project and the Worsley Alumina refinery, both in WA, as well as other Australian and international projects.

The company needed to provide a warranty bond for the supply of pipe supports for the Gorgon liquefied natural gas (LNG) project, Australia's largest single resource project and one of the world's largest natural gas projects.

EFIC provided a warranty bond for \$547,000 to cover Binder's warranty obligations for the Gorgon project. Warranty bonds are a common contractual obligation for construction projects involving the supply of goods and/or services for export and export-related purposes.

The bond also enabled this SME to use its existing bank guarantee lines to fund additional LNG export projects.

"EFIC's support was crucial in helping us protect our obligations as a supplier to this landmark LNG project and also helps us secure future LNG deals, thereby supporting our future revenue and profit growth," said Binder managing director Paul Bennett.

Leela Hanson, EFIC's Director, SME & Mid Market, WA, said Binder's case was a prime example of how EFIC can help contractors and subcontractors involved in export-related deals win more business.

"We can assist eligible Western Australian companies working on major export-related resource projects with financing solutions to supplement what their banks offer," Ms Hanson said.

An EFIC bond facility also enabled WA dewatering infrastructure supply and pipeline installation SME, Innotech Site Services Pty Ltd, to fulfil its contractual obligations and free up cashflow.

Based in Kewdale, WA, Innotech provides specialised services in the installation of pipeline components and the provision of dewatering infrastructure for mine site operations.

Dewatering is the process of removing water from mines which constitutes an essential part of extracting resources, helping to optimise mine production and reduce operational costs.

The company needed to supply performance and warranty bonds for its contracting services to export projects of mostly blue-chip mining clients.

However, Innotech's bank, St George (a division of Westpac Group), recognised its cash collateral requirements would have constrained the company's cashflow and hence its ability to tender for new contracts and approached EFIC for support.



Photo: Innotech

Bonding assistance of \$1 million to pipeline specialist Innotech enabled the company to progress de-watering services in the Pilbara and at the same time bid for export contracts.

EFIC provided Innotech with a \$1 million bonding facility to be utilised for export-related contracts approved by EFIC.

It is anticipated the \$1 million in bonds issued by EFIC, by way of guarantees to St George, will be primarily used in connection with Innotech's provision of dewatering services at Rio Tinto's Yandicoogina iron ore mine in WA's Pilbara region.

Any bonds issued by EFIC should also enable Innotech to free up its cashflow and allow it to bid for more export-related projects.

"The issuing of performance and warranty bonds through EFIC and St George Bank has been instrumental in ensuring Innotech's current and future cash flow levels remains stable and consistent, thus allowing Innotech to confidently tender for further export-related projects," Matt Reese, director of Innotech Site Services said.

Fact File

To be eligible for assistance your company should:

- Be financially stable, with annual turnover of circa \$5 million or more.
- Have at least three years' trading experience.
- Require finance for the growth of your export supply chain contract and your bank is not able to provide all of the financial support required

Contact Leela Hanson, EFIC Director, SME & Mid Market, WA, on: 0408 974 215, or lhanson@efic.gov.au

LNG projects in the spotlight



During March WA's petroleum regulation boss put the State's petroleum sector on the national stage at a key industry event.

DMP Petroleum Executive Director Bill Tinapple (pictured) highlighted WA's oil and gas exploration and development opportunities during a keynote address at the Excellence in Oil and Gas Conference in Sydney.

The conference, which attracted 600 delegates, provided an invaluable insight into where investors are looking to commence new projects.

Mr Tinapple said he used the opportunity to promote Western Australia's rich

petroleum exploration history, to reinforce potential and current investors' confidence.

"I also spoke about how WA's off-shore LNG industry is expected to increase significantly in the next five years, with the construction of five new projects valued around \$120 billion," Mr Tinapple said.

"This increase will provide an excellent opportunity for companies to invest, particularly for farm-in and equipment companies."

Western Australian shale oil and gas resources were also touted as potential investment opportunities, Mr Tinapple added.

"With crude oil and condensate supply expected to decrease significantly during the next few years, shale oil and liquids rich in shale gas could offer an alternative solution for domestic demand," he said.

"Additionally, Western Australia also has an estimated 280 trillion cubic feet of untouched natural gas from shale and tight rock resources in the Canning and northern Perth basins.

"While these resources are currently in the exploration stage, they could potentially form part of WA's long-term resources development and provide secure energy supplies."

US gas industry a learning opportunity for Western Australia

As Western Australia's emerging natural gas from shale and tight rock sector gains momentum, a leading petroleum expert from DMP recently toured key shale gas sites in the United States.

DMP Petroleum Director Jeff Haworth visited a number of West Texas sites including BHP Billiton and ConocoPhillips — where advanced drilling technologies and hydraulic fracturing was being used to safely and effectively extract shale gas.

Mr Haworth said the visit was an invaluable opportunity to learn from an advanced jurisdiction like the US, as WA's shale and tight gas industry was currently in the early exploration phase.

"At the moment there isn't any shale gas exploration in WA and the

department hasn't received any applications for future activities — so this tour was really about getting up close and personal with the activity," he said.

"After all, with WA's domestic gas supply anticipated to fall below demand by as early as 2016, it is important we explore alternative energy solutions to ensure WA's energy security for future generations.

"If exploration for shale gas proves successful, DMP is committed to ensuring the responsible and safe development of this emerging industry."

Mr Haworth also presented to the 18,000-strong crowd at the 2013 Winter North American Petroleum Expo in Houston Texas and attended the Fifth Energy Conference in the same State.

"The events allowed me to promote Western Australia's shale gas resources and gain an understanding of the experienced operators that are interested in investing in our petroleum industry," he said.

"I was also able to have some discussions with U.S manufacturers and service providers, to encourage investment."

The US is ranked second in the world for shale gas, with an estimated resource of 862 trillion cubic feet.

Australia is ranked sixth in the world, with the majority of shale gas resources, totalling 268 trillion cubic feet, found in Western Australia.

Global technology developed in Western Australia

As the oldest refinery in Australia, the WA-based operation of leading global bauxite miner and aluminium producer Alcoa is the centre for the company's cutting-edge development of technology. With the company celebrating 50 years in Australia in 2013, it's timely to take a look at the technology driving the industry.

Alcoa Australia represents the largest vertically integrated bauxite mining, alumina refining, aluminium smelting and aluminium rolling system in the world.

Alcoa's WA operations are impressive: its mine sites produce more than 75 million tonnes (Mt) of bauxite and its three refineries a combined output of 9.1 Mt of alumina, or more than 50 per cent of all alumina exported from Australia.

Employing more than 4000 workers in WA, from a total Australian workforce of 6000, the company contributes significantly to the national economy, with \$5 billion in exports per annum.

It is also engaging many and varied SMEs and engineering groups which are part of

its operational supply chain, and assisting them to access the global market place.

However, a critical factor which sets Alcoa Australia apart from its national and global mining peers is the extent to which technology and innovation is nurtured, developed and adopted across the global organisation. And it all stems from its R&D division, the Technical Delivery Group (TDG), located at the Kwinana refinery, just south of Fremantle.

Alcoa has invested in technology and research and development (R&D) since the industry began more than 120 years ago.

In 1996 the TDG team was given global responsibility for all of Alcoa's refining systems, including the transference of R&D carried out in Pittsburgh to Western Australia.

Examples of technologies developed by TDG in Australia include:

- **Mud Level Gauge:** The world's first process for accurately measuring solids' levels in Alcoa's major processing vessels. The instrument is manufactured in WA and exported to all Alcoa refineries globally, with more than 150 installed. Parts are still provided by the WA manufacturer.
- **On-Line Liquor Analyser:** World's only on-line Bayer liquor analyser, manufactured by a local WA company and exported to Alcoa's global system.
- **Carbon Capture in Residue:** Primarily designed to reduce causticity of bauxite residue, the process captures CO₂ and sequesters it in inert mineral form. In full scale operation at the Kwinana refinery (waste CO₂ from a neighbouring industry).
- **Continuous Biological Oxalate Destruction:** World first technology to destroy waste from alumina refining (by utilising naturally occurring microorganisms to consume oxalate, an impurity in the refining process). Replaces combustion, reduces CO₂ emissions, is less costly and allows recovery of sodium hydroxide. Implemented at Kwinana, now being

rolled out to Alcoa's other two WA refineries and its USA refinery.

- **FTIR Bauxite Analyser:** New method for measuring main constituents in bauxite using a five minute test to replace days for laboratory analyses. The breakthrough enables Alcoa to maximise its bauxite resource through advanced mine planning, thereby reducing environmental footprints for given production levels. Alcoa estimates the innovation has increased mine life of WA operations by more than a decade. It is a fully automated robotic system, delivered by a small local robotics company in WA. The technology has since been exported to three refineries outside Australia.
- **'Bright Hydrate' process:** Creation of a new export product for the Kwinana refinery which produces in volume a very white aluminium hydroxide product, resulting in a high margin product.
- **Ready Grit:** At an advanced stage of research and market development, this will be the world's first large scale product made from bauxite residue. It is targeted at large scale industrial fill usage as well as niche applications to reduce phosphate fertiliser usage and reduce algae growth (eutrophication).
- **Residue Dry Stacking Technology:** State of the art safe bauxite residue area construction and operation developed using world class rheological research carried out by the University of Melbourne. It is openly shared with industry because of its environmental benefits, is manufactured in WA and exported globally.

The importance of the TDG is manyfold. It hosts 80 scientific, engineering and support staff representing WA's largest employer of PhDs outside the CSIRO and academia, and has an annual budget of \$20-\$35 million (50 per cent of which comes from outside of Australia).

It has also won prestigious innovation awards and is one of the few truly global industrial research centres based in Australia, with a long history of delivery of new and improved technologies.



Construction coordinator Steve Saunders and WA Residue Operations Manager Jamie Muir inspect the carbon capture plant at Alcoa Kwinana refinery.



Alcoa research chemist Amanda Tilbury at the pilot bioreactor in Kwinana refinery's oxalate removal facility.

State's first uranium mine given environmental approval

Photos: Toro Energy



Aircore drilling at Wiluna.



Toro's Wiluna uranium pilot test plant.

Mines and Petroleum Minister Bill Marmion has welcomed the Federal Government's environmental approval of Toro Energy's Wiluna uranium project.

"As former Environment Minister, I gave State environmental approval to the project five months ago, so I certainly welcome the Federal Government's endorsement," Mr Marmion said.

"Opening up uranium mining in Western Australia was a central plank of the State Government's 2008 election commitments.

"This announcement is hugely significant, as it's the first uranium project to receive State and Federal

environmental approval in WA and paves the way for a new industry in this State."

Before construction works can begin, a range of further approvals are required, including assessment of a detailed Mining Proposal and Closure Plan by the Department of Mines and Petroleum (DMP).

The Minister said he wanted to reassure Western Australians that the State Government was committed to ensuring that the uranium mining industry was safe and environmentally responsible.

"Western Australia has been mining, processing, transporting and exporting radioactive minerals, including mineral sands, for more than 40 years," he said.

"All WA uranium mines are required through strict legislation and regulation, to ensure the safety of employees and the broader community.

"Uranium mines in WA would also meet all the relevant international safeguards in relation to the safe and peaceful use of uranium resources, and obtain environmental approvals for mining and transport."

Fact File

- WA currently has known uranium oxide reserves of 211,000 tonnes across around 26 deposits
- WA radiation safety legislation has been in place since 1970s, to protect the public, workers and the environment

Wiluna Uranium Project

Toro's flagship and wholly-owned Wiluna Uranium Project which has a regional resource base of 54 million lbs, is situated 30 kilometres south of Wiluna in Central Western Australia.

The project is the most advanced of the new generation of uranium mines in Australia with State and Federal Government approvals well advanced.

Based on this timetable, it is anticipated the project will produce 1.8 million lbs of U_3O_8 per year with first uranium sales in early 2014. Project life is expected to be in excess of 14 years.

Wiluna consists of a series of shallow calcrete deposits, with the largest of these deposits, Lake Way and Centipede, being subject to approvals and a definitive feasibility study.

The project assessment to date includes the successful completion of a pilot processing plant and trail mining.

The Theseus Uranium Project in Western Australia (100% Toro) is a significant greenfield discovery made in 2009. Toro has identified an exploration target range of 22 to 44 million lbs U_3O_8 at 400 to 500 ppm.

Early studies indicate that the sandstone hosted deposit is amenable to In Situ Recovery ("ISR") extraction methods. There remains significant 'blue sky' with the mineralisation open to the south, east and west and other positive regional drill results yet to be followed up.

Japanese garden symbol of enduring friendship

Just before leaving for China and Japan, Premier Colin Barnett was presented with the Hyogo Friendship Garden by the Vice Governor of Hyogo Prefecture in Japan, Tomoyuki Yoshimoto.

The garden, which is located on the grounds of Dumas House, is a gift to the people of Western Australia from Hyogo to mark the 30th anniversary of the State's oldest Sister State relationship in 2011.

The Hyogo Friendship Garden was designed by Professor Yue Shen from the University of Hyogo and features

speciality tiles from Awaji Island in Hyogo. Awaji Island is home to the koalas which were a 30th anniversary gift from Western Australia.

Japanese gardens are abstract and stylised representations of nature which serve to aid meditation. These gardens are considered works of art in Japan.

Other living works of art were featured at the presentation ceremony. Models, who braved a bitter cold morning, showcased the 2013 Banshu Fashion Textile Program designs.

Premier Barnett said the garden symbolised the ties between the two regions, and acknowledged Japan as one of Western Australia's most important trading and investment partners. Japan's role in the State's pioneering iron ore and natural gas projects have brought great benefits to Western Australia.

"Japan was my first overseas visit when I was elected in 2008, so it is pleasing my first overseas visit on being re-elected is also to Japan and China," he said.



The Hyogo Friendship Garden, accepted by Premier Colin Barnett.



Walking with the Vice Governor of Hyogo Prefecture, Tomoyuki Yoshimoto.

Risk training improved

Continuing its efforts to improve safety procedures, 14 staff members from the Department of Mines and Petroleum (DMP) have undergone training to test and further develop their risk management skills and processes.

It's the same training that will be rolled out to 60 industry safety professionals and 64 mining safety inspectors throughout the year, in an intense four-and-a-half-day course.

The risk management training puts staff in real-life mining-related situations, testing their knowledge of processes and procedures.

DMP Resources Safety Executive Director Simon Ridge said people need to understand the hazards in their work place and how to handle them.

The training gave the department a good look at its own risk and crisis management.

"Changes will come out of it," DMP Senior Education and Training Officer Barry Healy said.

"Most importantly it brought to the surface a lot of issues in the industry. It focused our minds on how to bring about changing the culture of the Western Australian mining industry and on safety management.

"Last year we recorded our first fatality-free year since records began in 1896. That's a heck of an achievement and we want to build on that."

Future sessions will run in Kalgoorlie from 12 to 16 August and in Bunbury from 14 to 18 October.

Inquiries regarding attendance should be directed to JKtech on (07) 3365 5842.





(Left to right) WA Government representative Hon Phil Edman MLC, Ms Kellie-Jane Pritchard A/Regional Director Indonesia DSD, Mr Brian Wood, A/Executive Director Strategic Projects DSD and Dr Tim Griffin DDG DMP.

Indonesian conference strengthens Asian ties

In the mid-2000s, the Australian Government's Austrade identified a need to provide Australian mining and Mining Engineering Technology Services (METS) companies with extra exposure in the fast-growing Indonesian mining sector. The first Ozmine conference and exhibition was held in 2007. Since then, Ozmine has become the premier Australian mining event in Southeast Asia. Western Australia is one of two State governments to back the conference.

With a theme of *Australia and ASEAN: Partnering for Performance*, Omine 2013, held in Jakarta, brought together key Indonesian, Australian and ASEAN industry and government players, including Thailand, Malaysia, The Phillipines and Vietnam, to discuss major trends, opportunities and challenges of the mining industry.

With a focus on how ASEAN businesses are linking with Australian expertise to improve efficiency and boost productivity, this year's exhibition and conference provided an opportunity for the more than 2600 visitors (460 registered delegates) to promote the mining services sector and expand activities in Indonesia and ASEAN more generally.

An important part of Ozmine 2013 was the ASEAN-Australia Mining Workshop for government officials, which aimed to encourage greater co-operation and assistance between mining industries across the region.

The exhibition also featured networking events, with the final session hosted by the Indonesian-Australian Business Council and Austrade.

The event is backed by the WA and Victorian State governments, Austmine, and other Australian Government departments such as Foreign Affairs and Trade, and Resources and Energy.

This was the fifth Ozmine conference for the Department of State Development, which was represented by Brian Wood, A/Executive Director Strategic Projects, and Ms Kellie-Jane Pritchard, A/Regional Director Indonesia. The Department of Mines and Petroleum was represented by Dr Tim Griffin, Deputy Director General, who also presented on the role of government in delivering a successful mining sector.

"Our main focus was to support WA-based METS companies in promoting their expertise to the Indonesian and ASEAN markets," said Mr Wood.

"The message we had was that WA mining is the most efficient in the world and that WA companies have the knowledge and the experience that Asian companies can benefit from."

For DMP, oil and gas was a hot topic.

"Although our visit was not focussed on attracting direct investment, there were

some discussions around shortages of oil and gas as the Indonesia economy expands, and the failure of recent exploration efforts," DMP's Tim Griffin said.

"It also enabled us to discuss challenging issues and impart some of our experience in WA with the Indonesian authorities. We covered many topics, including security of title and avoiding changing conditions effecting rights, through to understanding and meeting approval requirements for the different levels of government, to community and environmental management issues."

The significance of the location is something Jakarta-based Ms Pritchard recognises.

"Indonesia remains the most significant player in ASEAN's mining sector, boasting significant production levels of coal, copper, gold, tin and nickel, so our focus was to promote the WA Trade and Investment Office in Jakarta," she said.

"It's vital to develop and further strengthen relationships with leading business and government stakeholders in Indonesia, while promoting investment opportunities in WA."

Browse gas precinct acquisition to proceed

The State Government will press ahead with the acquisition of the land for a gas precinct near James Price Point to encourage the development of nearby gas fields.

Premier and State Development Minister Colin Barnett said the acquisition of the land was necessary to establish the precinct as a project-ready site to foster the efficient development of the offshore Browse Basin and onshore Canning Basin gas fields.

"This region contains world-class gas resources, and there is interest in a suitable site to support the development of LNG or domestic gas projects in the Kimberley," Mr Barnett said.

Under native title agreements reached with the Goolarabooloo Jabirr Jabirr native title claimant group in June 2011, the traditional owners of the site will receive payments of more than \$30 million from the State Government to benefit indigenous people across the Kimberley region.

"The Aboriginal people of this region entered into an agreement with the State to ensure that the benefits of development in the Kimberley would, first and foremost, flow to them," the Premier said.

"The decision by Woodside and its joint venture partners not to proceed with their original proposal for the development of Browse was disappointing, but this move will ensure the benefits from the State Government will still flow to the people of the Kimberley."

The land acquisition will trigger a \$10 million economic development fund and \$20 million for an indigenous housing fund.

Mr Barnett said the traditional owners would have an ongoing role in managing the environmental, social and heritage outcomes of the precinct, which would be central to the future development of the Browse Basin.

"The precinct does not rely upon any single proponent. We are taking a long-term

approach to developing the area for the future processing and export of natural gas," he said.

The agreement covering the site also ensures its use is limited to supporting the development and processing of gas, and not for other industrial purposes.

"If the Government doesn't act now to secure the area, it could face substantial costs when re-negotiating approvals and create a disincentive for any new entrant," the Premier said.

"The gas is there and it is just a matter of time before it is used. We are being prudent about its development and aiming to ensure the maximum benefit will flow through to the people of Broome, the Kimberley and right across Western Australia.

"The development of these projects will provide a major boost to the regional economy through jobs, training and business opportunities across the wider community."

New local officer for the Kimberley



The Department of Mines and Petroleum (DMP) will once again have a regional presence in the Kimberley with the announcement of a new Broome office and new liaison officer, Brian Lloyd.

Mr Lloyd, who has spent many years working for government agencies in regional areas, said he was looking forward to being the local point of contact for resource exploration and development enquiries.

"Having lived in Broome for a number of years now, I have a genuine empathy for the challenges regional communities face," Mr Lloyd said.

"Through my new role I hope to assist with some of those challenges by providing local advice and departmental services to a wide variety of resource industry stakeholders including land users, the community, industry and other government agencies.

Mr Lloyd's key responsibilities will include facilitating communication and dispute resolution, providing advice on legislation, assisting with Native Title enquires and coordinating heritage surveys.

"Being based in Broome, I will also represent the department at regional working groups and committees," Mr Lloyd said.

Before joining DMP, Mr Lloyd worked out of Broome as a liaison officer for the Department of Regional Development and Lands assisting the pastoral industry in the Kimberley and Pilbara.

Mr Lloyd has also previously worked for the Department of Agriculture in Katanning.

DMP Mineral Titles Executive Director, Ivor Roberts said Mr Lloyd will be an invaluable contact for the Kimberley region.

"As the regulator, it is important the department has a presence in the Kimberley to ensure current and future resource development proposals are undertaken responsibly and in consultation with the community," Dr Roberts said.

"We are confident Brian can fulfill this role successfully given his vast liaison experience and commitment to servicing regional areas."

Mr Lloyd commenced his new role on 2 April and is based at the newly co-located Department of Planning / Department of Mines and Petroleum Broome office off Shiba Lane.

If you have any queries regarding land access in relation to resources in the Kimberley region, please contact Brian on 0428 714 402

Major LNG conference to attract 5000 to WA

Newly appointed Mines and Petroleum Minister Bill Marmion recently addressed 10,000 delegates in Texas, US as Western Australia (WA) prepares to host the largest resources event in its history — anticipated to inject more than \$50 million into the State's economy.

In April, Minister Marmion presented at the world's largest Liquefied Natural Gas conference, LNG17, where this year's event organisers, Houston, passed the hosting duties for the 2016 conference to WA.

Mr Marmion used his closing ceremony address to invite thousands of international delegates, exhibitors and petroleum industry representatives from more than 80 countries to attend the next conference, LNG18, in Perth.

"LNG18 is expected to attract 5,000 delegates and exhibitors and inject more than \$50 million into the State's economy, the largest such event in WA's history," Mr Marmion said.

"It will be an unparalleled opportunity to promote Western Australia's petroleum resources and role as a global energy supplier, and Perth as a major centre for expertise and services

to the petroleum industry in Australia and Asia."

While in Houston, Mr Marmion met with senior executives from exploration, production and services companies from the USA, Europe and Asia.

"This interaction is crucial, as Western Australia is becoming a world leader in LNG," he said.

"By 2016, WA is expected to have an annual LNG production capacity of more than 50 million tonnes — up from the current level of 20 million tonnes."

Minister Marmion was accompanied by Department of Mines and Petroleum (DMP) Director General Richard Sellers.

"The Houston visit provided an invaluable opportunity for WA to engage with the international LNG industry at the highest level," Mr Sellers said.

"Our meetings with several major oil and gas companies, including Chevron and Hess, included discussions relating to emerging LNG trends and WA's role as a global energy supplier for the Asian market.

"With Australia positioned to become the world's largest LNG exporter by 2017,

many of the companies already had a strong knowledge of WA and expressed interest in future business opportunities."

The trip also saw Mr Sellers visit Halliburton to discuss the technologies used in the US for natural gas from shale and tight rock extraction.

"At the moment WA's natural gas from shale and tight rock industry is in the early exploration phase so the meeting with Halliburton provided a great opportunity to get up close and personal with the production activity in the US," Mr Sellers said.

Already showing strong interest, 60 per cent of the delegates who attended LNG17 in Texas have signed up to attend the Perth LNG18 event in 2016.

Minister Marmion said Perth was no stranger to catering for significant, large events, having successfully hosted the 5000-delegate Commonwealth Heads of Government Meeting (CHOGM) in 2011.

"Planning has been underway for some time and will ramp up considerably as we move forward," Mr Marmion said.

"We are working with industry and government agencies Australia-wide to make sure we are conference-ready."



The Minister for Mines and Petroleum Bill Marmion (centre) and State Development's Giles Nunis (second from left) led WA's delegation to LNG17.

AGRICULTURE

East Kimberley – Ord – Ord/East Kimberley Expansion Project

WA STATE GOVERNMENT

The Ord East Kimberley Expansion Project is a good example of the Commonwealth and State Government working closely together to deliver economic and Indigenous participation opportunities and much-needed infrastructure to a regional community of Western Australia. The State Government has committed \$322m to increase the existing amount of irrigated land in the Kununurra region by releasing approximately 15,000ha of additional Ord farm lands. 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. On 20 November 2012 the State Government announced that Kimberley Agricultural Investment (KAI) was the preferred proponent to lease and develop 13,400ha of irrigation land in the Goomig and Knox Plain areas. KAI, a subsidiary of China's Shanghai Zhongfu Group, proposes to establish a sugar industry in the Kununurra region. To achieve a diverse agricultural mix for the region and to support local enterprise, an additional 1,700ha of newly developed land in the Ord West Bank will be available for the development of up to 25 new farms. The Commonwealth Government has committed \$195m of funding for social and common use infrastructure in the East Kimberley region through the East Kimberley Development Package (EKDP) National Partnership Agreement (NPA). Construction of the 21 State Coordinated projects is almost complete with the remaining three projects currently underway. The Kununurra Education Precinct and the Out of School Hours Care Facility are the most recent project completions. The Package will be fully implemented by June 2013.

Expenditure: \$517m.

Employment: Construction: 761

GOLD

Boddington – Gold Mine

NEWMONT BODDINGTON GOLD PTY LTD

Newmont Boddington Gold (NBG), a major gold and copper mine in the south east of Western Australia, 120km from Perth, commenced operations in 2009 after a \$3b expansion of the original Boddington Gold Mine, a joint venture which had been in care and maintenance for several years. NGB is now 100 per cent owned and operated by United States global miner Newmont Mining Corporation. First gold was poured in September 2009 and 18 months later the operation achieved its first one-million-ounce milestone. An estimated 700,000-750,000 ounces of gold per annum is expected to be produced for the life of the mine, officially more than 24 years, but it is possible the mine life could be further extended. NBG also produced 67Mlbs of copper in 2012 and this amount is expected to increase to between 70-80Mlbs in 2013.

Employment: Operation: 650

INFRASTRUCTURE

South West Region – Kemerton (HUILS – Heavy Use Industrial Land Strategy)

WA STATE GOVERNMENT

Kemerton Industrial Park, located 17km north of Bunbury, is the main strategic industrial area in the South West region and the nearest regional heavy industrial site to Perth. It is designed to supplement the Kwinana Industrial Area, only 90 minutes away by road. The estate comprises 7,543ha of land, including 2,019ha of industrial core, 293ha support industry area and 5,231ha buffer areas. It is accessible to the Port of Bunbury by road and a rail link is being planned. The estate is serviced by major road links to the metropolitan area. Under the Heavy Use Industrial Land Strategy, the Government is progressing Kemerton towards project ready status by undertaking environmental, heritage and planning approvals for the estate. Work towards progressing approvals commenced in 2009 and is anticipated to be completed in 2014/15, by which time the structure plan and zoning adjustments will also have been completed.

IRON ORE

Mid West Region – Karara Iron Ore

KARARA MINING LTD (GINDALBIE METALS LTD / ANSTEEL JOINT VENTURE)

The Karara Iron Ore Project is Karara Mining's cornerstone production project in the Mid West region. Karara is exporting 10Mtpa of iron products, comprising 8Mtpa of high grade magnetite concentrate and 2Mtpa of Direct Shipping Ore hematite through Geraldton Port. The Project is underpinned by a JORC-compliant resource base, comprising a 977Mt magnetite reserve, a 2.518Bt magnetite resource, a 10.9Mt hematite reserve and a 16.2Mt hematite resource.

Expenditure: \$1.975b.

Employment: Construction: 1500; Operation: 500

Pilbara – Hope Downs 4 Iron Ore Mine

RIO TINTO IRON ORE

Rio Tinto and Hope Downs Iron Ore Pty Ltd, as equal Joint Venture participants, are developing the Rio Tinto-operated Hope Downs 4 iron ore mine at an estimated capital cost of US\$1.2b. The open-cut mine will have a production rate of 15Mtpa of iron ore. The development of Hope Downs 4 involved the construction of a 53km railway line to connect to the existing Hope Downs 1 rail spur and the construction of a 220kV electricity transmission line to connect to the existing Rio Tinto power network. First ore left the Hope Downs 4 mine on 22 April 2013.

Expenditure: \$1.556b.

Employment: Construction: 2100; Operation: 720

Pilbara – Port Hedland – Atlas Iron

ATLAS IRON LTD

Atlas Iron Ltd is an iron ore explorer and miner focused on a developing a number of projects in the Pilbara region of Western Australia with exports commencing in December 2008 from its Pardoo Project, east of Port Hedland. Atlas' second mine, Wodgina, commenced operations in 2010. Production has recently commenced at its third mine, Mt Dove, located 65km south of Port Hedland. The company plans to bring five mines into production in five years, with the addition of Abydos Mine in June 2013, and the first phase of the Mt Webber Mine in December 2013. Atlas aims to export between 7.2Mt and 7.7Mt in the 2013 financial year. Atlas plans to progressively expand its exports, targeting 15Mtpa by 2015 and 46Mtpa during the 2017 calendar year. In April 2013 Atlas announced the completion of the first phase of the rail Alliance study with Aurizon Operations Limited and Brockman Mining Limited. The parties have extended the existing Alliance Study Agreement to 1 July 2013, to examine the integration of the East Pilbara rail development and the proposed North West Infrastructure port development in South West Creek in Port Hedland.

Expenditure: \$500m.

Employment: Operation: 570

RARE EARTHS

Mt Weld – Rare Earths Mine

LYNAS CORPORATION LTD

The Mt Weld deposit is located about 35km south of Laverton and contains an estimated resource of 23.9Mt at an average grade of 7.9% for 1.9Mt rare earth oxides (REO). The development includes an open pit mine and a concentration plant, located 1.5km from the open pit mine. The first feed of ore into the 33,000tpa concentration plant occurred in May 2011 and the plant was officially opened in August 2011. The concentrate is bagged and containerised on site, and trucked to the Port of Fremantle for export. The first feed of concentrate from Mt Weld to Lynas' processing plant in Malaysia occurred in late 2012. Ramp up of production at the Malaysian plant is currently underway, with initial production capacity of 11,000tpa REO expected to be reached by the end of Q2 2013. Construction of the Phase 2 expansion of the Mt Weld concentration plant to 66,000tpa was completed in Q1 2013. The Malaysian processing plant's expanded production capacity of 22,000tpa REO is expected to be reached in late 2013.

Expenditure: \$135m.

Employment: Construction: 120; Operation: 110

Committed Projects

AMMONIUM NITRATE

Kwinana – Ammonium Nitrate Facility Expansion CSBP LTD

In December 2011, the Wesfarmers Board gave final approval to proceed with the expansion of CSBP's ammonium nitrate production facility at Kwinana from its current capacity of 520,000tpa to 780,000tpa. CSBP received environmental approval for the expansion in October 2011. The expansion involves the construction of an additional nitric acid plant and ammonium nitrate plant, together with an upgrade of the existing prilling plant and other infrastructure work. Construction is progressing well and the expansion is on track to be operational in the first half of 2014.

Expenditure: \$550m.

Employment: Construction: 300; Operation: 10

Pilbara – Burrup Industrial Estate Site D – Yara Pilbara Nitrates YARA INTERNATIONAL ASA

Yara, Orica and Apache have formed a joint venture, Yara Pilbara Nitrates Pty Ltd (YPNPL). YPNPL has executed an Engineering, Procurement and Construction (EPC) contract for the construction of a circa 350,000tpa Technical Ammonium Nitrate (TAN) plant to be located on the Burrup Peninsula. Ammonia feedstock will be supplied from Yara Pilbara Fertilisers Pty Ltd (YPFPL), which operates its facility directly adjacent to the proposed location for the new TAN plant. YPFPL will be the operator of the TAN plant and Orica will manage the product sales and distribution. Yara and Orica each have a 45 per cent interest in the joint venture and Apache the remaining 10 per cent. It is expected all manufactured product will be sold into the Pilbara region. Work on the project has commenced and it is expected that the new plant will be commissioned during the first quarter of 2015.

Expenditure: \$600m.

Employment: Construction: 600; Operation: 65

GOLD

Kalgoorlie – Tropicana Gold ANGLOGOLD ASHANTI/INDEPENDENCE GROUP JOINT VENTURE

AngloGold Ashanti, as Joint Venture Manager, has continued to progress development of the Tropicana Joint Venture gold mining project proposal, 330km north east of Kalgoorlie. Following State and Commonwealth Environmental approvals in the second half of 2010, key State and local government approvals required for construction of a 225km road, bore field, pipelines, airstrip, accommodation village, power station and mine plant are either in place or in the final stages. Road construction is complete and a sealed 2.1km airstrip is operational. Engineering design and procurement activities were finalised at the end of 2012. Construction at 31 Dec 2012 was estimated as 56 per cent complete. The project is on track for first gold production in Q4 2013.

Expenditure: \$700m.

Employment: Construction: 700; Operation: 400

HEAVY MINERAL SANDS

Keysbrook – Heavy Mineral Sands Mine MZI RESOURCES LTD

MZI is proceeding to develop a mineral sands mine located near the township of Keysbrook, approximately 70km south of Perth. The project has received environmental approval from the Minister for Environment, as well as development approvals and extractive industry licences from the Shires of Murray and Serpentine-Jarrahdale. Keysbrook has a mineral resource of 78.9Mt at an average grade of 2.5 per cent total heavy mineral (THM) and an ore reserve of 670,000t THM, which underpins the first 5.5 years of operations. The Feasibility Study, which was completed in October 2012, indicated a mine life of 7.2 years based on accessible mineral resources plus shire approvals. Based on the total mineral resource estimate, the potential mine life could be more than 15 years. Approximately 110,000tpa of heavy mineral concentrate from Keysbrook will be trucked 120km south to Doral's mineral separation plant in Picton, near Bunbury, where it will be toll treated under a processing agreement. MZI plans to start site construction in Q2 2013, with first production expected in Q1 2014. The project is expected to produce 62,200tpa of leucoxene products and 28,700tpa of zircon concentrate, which will be exported from the Bunbury Port.

Expenditure: \$64m.

Employment: Construction: 35; Operation: 30

INFRASTRUCTURE

Pilbara – Ashburton North Strategic Industrial Area WA STATE GOVERNMENT

The State Government is developing the Ashburton North Strategic Industrial Area (ANSIA) as a hydrocarbon precinct in the Shire of Ashburton, 11km south west of Onslow, to enable the development of natural gas projects and associated industries to exploit the gas reserves in the Carnarvon Basin and Exmouth Gulf. The ANSIA includes three larger sites for major gas processing proponents, secondary processing sites, areas for general support industries and supply base operations, a port with common user facilities to be managed by the Dampier Port Authority and common user access and infrastructure corridors. Two foundation proponents, BHP Billiton Petroleum and Chevron Australia have been allocated land within the ANSIA. Chevron Australia commenced construction in late 2011 with first LNG exports scheduled for 2016. BHP Billiton Petroleum is nearing completion of the construction of its domestic gas plant, with gas production scheduled for mid-2013.

IRON ORE

Pilbara – BHPB – Inner Harbour Expansion – Port Hedland BHP BILLITON IRON ORE PTY LTD

In March 2011, BHP Billiton announced approval of US\$7.4b (BHP Billiton's share US\$6.6b) of capital investment to continue production growth in the company's Western Australian iron ore operations. It will deliver an integrated operation with capacity in excess of 220Mtpa. The investment includes US\$1.9b (BHP Billiton's share) to increase total inner harbour installed capacity to 220Mtpa. First production was achieved in Q4 2012. The overall project is 85 per cent complete. Further debottlenecking opportunities are being evaluated.

Expenditure: \$2b.

Pilbara – BHPB – Port Blending and Rail Yard Facilities BHP BILLITON IRON ORE PTY LTD

In March 2011, BHP Billiton announced approval of US\$7.4b (BHP Billiton's share US\$6.6b) of capital investment to continue production growth in the company's Western Australian iron ore operations. It will deliver an integrated operation with capacity in excess of 220Mtpa. The investment includes US\$1.4b (BHP Billiton's share) to optimise resource and enhance efficiency across the BHP Billiton WA iron ore operation supply chain. The project is currently on schedule (overall project is 65% complete) and on budget.

Expenditure: \$1.5b.

Employment: Construction: 2100; Operation: 720

Pilbara – Jimblebar Iron Ore Mine Expansion BHP BILLITON IRON ORE PTY LTD

In March 2011, BHP Billiton announced approval of US\$7.4b (BHP Billiton's share US\$6.6b) of capital investment to continue production growth in the company's Western Australian iron ore operations. It will deliver an integrated operation with capacity in excess of 220Mtpa. The investment includes US\$3.3b (BHP Billiton's share) to increase installed mining and processing capacity at Jimblebar mine to 35Mtpa with incremental debottlenecking opportunities to 55Mtpa. The project is currently on schedule (overall project is 75% complete) and on budget.

Expenditure: \$3.2b.

Pilbara – Solomon – Chichester expansion and Solomon Mine Project FORTESCUE METALS GROUP LTD

Fortescue has recently completed the expansion of its existing mines at Cloudbreak and Christmas Creek to 95Mtpa (including 5Mtpa from BC Iron). The existing rail and port facilities have been expanded by the duplication of 120km of railway south of Port Hedland, installation of two new train unloaders, and construction of two additional berths and associated infrastructure resulting in a rail and port capacity of 120Mtpa. Construction of infrastructure in support of the Solomon Hub, which includes the new 20Mtpa Firetail iron ore mine at Solomon and the 127km railway spur to Fortescue's existing Christmas Creek to Port Hedland rail line, has been recently completed. The Solomon Hub is planned to involve at least two mining areas and two processing plants. First production from the Firetail deposit at Solomon was achieved in November 2012. FMG recently announced that it is resuming construction of its 40Mtpa Kings mine at Solomon with first production expected late 2013.

Expenditure: \$9b.

Employment: Construction: 7000; Operation: 6000

IRON ORE PROCESSING

Pilbara – Cape Preston – Sino Iron CITIC PACIFIC

The Sino Iron project is located at Cape Preston, 100km south west of Karratha. Construction of the largest magnetite mining and processing project in Australia is at an advanced stage, with production from the first and second of six scheduled lines to commence in 2013. On completion, the project will comprise of in-pit crushers, six autogenous and six ball mills, concentrators, 6Mtpa pellet plant, 25km slurry pipeline, combined cycle 450MW power station, new port and trans-shipment facilities, and a 51GL desalination plant. At full production the project will export up to 21.6Mtpa of magnetite concentrate and 6 Mtpa of high grade pellets.

Expenditure: \$5.2b.

Employment: Construction: 4000; Operation: 500

OIL & GAS DEVELOPMENTS

Carnarvon Basin – Greater Western Flank Phase 1**WOODSIDE ENERGY**

The broader Greater Western Flank (GWF) area consists of 16 fields located to the south west of the Goodwyn A (GWA) platform, which lies off the north-west coast of Australia and is estimated to hold up to 3Tcf of recoverable gas and up to 100MMbbl of recoverable condensate. On 8 December 2011, Woodside, as Operator, announced the North West Shelf Project participants had approved the development of the first phase of the GWF Project. The GWF Phase 1 Project will develop the Goodwyn GH and Tidepole fields, via a subsea tie-back to the existing GWA platform and represents the next major development for the North West Shelf Project. Project start-up is expected early in 2016.

Expenditure: \$2.5b.

Carnarvon Offshore Basin – Barrow Island – Gorgon Project**GORGON JOINT VENTURE**

The Gorgon Joint Venture (GJV) made its final investment decision on the Gorgon Project in mid September 2009. The GJV's foundation project on Barrow Island includes a three-train LNG development capable of exporting 15.6Mtpa and a domestic gas project capable of delivering at least 300TJ/d of gas to the mainland. Cost estimates for the foundation were increased from \$43b to \$52b following a cost and schedule review conducted by Chevron in December 2012. The development on Barrow Island 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. On-island activity commenced in late 2009 and the major construction work for the processing plant commenced in 2011. The GJV is undertaking environmental investigations (PER level) for a fourth LNG train.

Expenditure: \$52b.

Employment: Construction: 5554; Operation: 300

Carnarvon Offshore Basin – North Rankin – North Rankin Redevelopment**WOODSIDE ENERGY**

In March 2008 the North West Shelf Project participants approved funding of the \$5b North Rankin Redevelopment 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 two 100m bridges to the existing North Rankin A platform and 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 Project's onshore gas requirements to supply future customer commitments.

Expenditure: \$5b.

Pilbara – Macedon Domestic Gas Project**BHP BILLITON PETROLEUM (AUSTRALIA) PTY LTD**

BHP Billiton Petroleum (Australia) Pty Ltd and Apache Energy Limited are currently constructing a domestic gas plant for Western Australia at the Ashburton North Strategic Industrial Area near Onslow. The development involves a number of sub-sea gas wells connected to the gas field, offshore and onshore wet gas pipelines, an onshore gas processing plant 11km southwest of Onslow and a sales gas pipeline connected to the Dampier-to-Bunbury Natural Gas Pipeline. Daily production is expected to be in the order of 200TJ/d. Gas production is expected to commence in mid 2013.

Expenditure: \$1.5b.

Employment: Construction: 700; Operation: 14

Pilbara – Wheatstone LNG Development**CHEVRON AUSTRALIA PTY LTD**

Chevron Australia Pty Ltd is currently constructing a LNG plant, domestic gas plant and port facilities at the Ashburton North Strategic Industrial Area near Onslow for its Wheatstone project. The project will initially have two LNG trains with a combined capacity of 8.9Mtpa, expandable to five or six trains with a total capacity of 25Mtpa, and a 250Mcf per day domestic gas plant connected to the Dampier-to-Bunbury Natural Gas Pipeline. The first export of LNG is scheduled for 2016.

Expenditure: \$29b.

Employment: Construction: 5500; Operation: 400

SILICON METAL

Kemerton – Silicon Metal Plant Expansion**SIMCOA OPERATIONS PTY LTD**

Simcoa announced in October 2009 its decision to expand the company's 32,000tpa capacity silicon metal plant at Kemerton. The first stage expansion, involving installation of a third furnace, will increase the plant capacity to 48,000tpa and came online in Q3 2012. Providing world demand for silicon continues to increase strongly, a second stage expansion, involving installation of a fourth furnace is under consideration and could take place by 2014 and increase plant capacity to 64,000tpa.

Expenditure: \$100m.

Employment: Construction: 120; Operation: 40

AMMONIA/UREA

Shotts Industrial Park – Collie Coal to Urea**PERDAMAN CHEMICALS AND FERTILISERS PTY LTD**

Perdaman Chemical and Fertilisers Pty Ltd is proposing a \$3.5b coal to urea plant at the new Shotts Industrial Park, near Collie. The plant will use proven coal gasification and fertiliser production technologies. Around 2.7Mtpa of coal will be used to produce approximately 2Mtpa of urea, primarily for export. The urea will be transported to Bunbury Port by rail. A 20-year off take agreement has been signed with Incitec Pivot. The coal supply contract is yet to be finalised. The company has received all its environmental and all other approvals from both the Western Australian and Commonwealth governments. Construction is expected to commence Q2 2014, with the first shipment of urea planned for Q4 2017.

Expenditure: \$3.5b.

Employment: Construction: 2000; Operation: 200

HEAVY MINERAL SANDS

Happy Valley – Heavy Mineral Sands Mine**CRISTAL MINING AUSTRALIA LTD**

Located adjacent to Cristal's Gwindinup deposits south of Bunbury, the company proposes to mine the Happy Valley North and South mineral sands deposits situated on private land and in State Forest. The two deposits contain over 750,000t of recoverable heavy mineral concentrate, with average production expected to be around 150,000tpa over a combined mine life of eight years. The concentrate will then be trucked to Cristal's Bunbury Mineral Separation Plant for final processing. The Company is awaiting the outcome of its environmental approvals process.

Expenditure: \$35m.

Employment: Construction: 100; Operation: 30

Shark Bay – Coburn Zircon Project**GUNSON RESOURCES LTD**

Gunson proposes to develop the Coburn zircon project, located south of Shark Bay and approximately 250km north of Geraldton. It contains total ore reserves of 308Mt at an average grade of 1.2% heavy minerals, all of which lie within the portion of the project area that has received government environmental approvals for mining. The Optimisation Study was completed in February 2013 which indicates a mining rate of 23.4Mtpa and a mine life of 19 years. As a result of the Optimisation Study, the project is expected to increase average annual production to 49,500t of zircon, 109,000t of chloride ilmenite and 23,500t of a mixed rutile-leucoxene HiTi90 product.

Expenditure: \$202m.

Employment: Construction: 170; Operation: 110

INFRASTRUCTURE

Dampier Peninsula – Browse LNG Precinct**WA STATE GOVERNMENT**

The State Government is developing the Browse Liquefied Natural Gas (LNG) Precinct approximately 60km north of Broome. By focussing development at a suitable location the Precinct will minimise the environmental footprint of gas processing and any social impacts in the region, while maximising opportunities for the local community to benefit from development of the Browse Basin gas fields. The Precinct will have the capacity to accommodate at least two LNG processing operations, with a combined capacity of up to 50Mtpa. Woodside Energy Ltd, as the operator of the Browse Joint Venture, remains a potential foundation proponent of the Precinct.

Expenditure: \$30b.

Employment: Construction: 6000; Operation: 400

Oakajee – Oakajee Midwest Development WA STATE GOVERNMENT

The Oakajee Port proposal includes common user infrastructure (channel, breakwater, turning basin, navigational aids, provision for tug and pilot boat pens, port administration offices and roads and utilities) funded by the State and Commonwealth Governments and private use infrastructure (at least one Cape Class iron ore berth, as well as associated materials handling equipment and rail infrastructure) developed by Oakajee Port and Rail Pty Ltd. The Port proposal also includes provision for a non iron ore berth in the future to provide import/export capability for value-adding industries in the Oakajee Industrial Estate. A northern railway is planned to link the port to mines to the north-east of Geraldton and a southern railway will link to the mines in the south-east. The northern rail line is proposed to be operated by Oakajee Port and Rail through an open access regime.

Expenditure: \$4b.

Employment: Construction: 2000; Operation: 300

Pilbara – Anketell – Anketell Port and SIA (Strategic Industrial Area) WA STATE GOVERNMENT

The Anketell project involves the establishment of a multi-user, multi-commodity, deep-water port and associated strategic industrial area (SIA) at Anketell, located 30km east of Karratha on the Pilbara coast. The port and associated infrastructure will be a proponent-funded but State owned Port which will be managed and operated under the Port Authorities Act 1999. The strategic industrial land will fall under the jurisdiction of the Western Australian Land Authority (LandCorp). During its initial phase, it is expected that Anketell will be an iron ore export facility and that, at its peak capacity, at least 350Mtpa will be exported to customers, mainly in Asia. A number of iron ore producers with mining assets in the Pilbara have expressed interest in using the planned facilities at Anketell. It is likely that the Port will be developed in stages to accord with the development of the various mining operations which are spread throughout the Pilbara.

IRON ORE

Great Southern Region – Southdown Magnetite Mine GRANGE RESOURCES LTD/SRT AUSTRALIA JOINT VENTURE

The Southdown Magnetite deposit is situated 90km north east of Albany, near Wellstead. Southdown is an advanced development project. Work completed includes engineering feasibility studies, an extensive drilling program, land acquisition and most major approvals. Results of the Definitive Feasibility Study were announced in Q2 2012. Grange Resources (70%) recently announced a significant reduction in 2013 project expenditure as it continues to seek a new equity investor for the project.

Expenditure: \$2.88b.

Employment: Construction: 2000; Operation: 600

Mid West Region – Extension Hill Magnetite Mine ASIA IRON

Asia Iron has primary environmental approval to produce up to 10Mtpa of magnetite concentrate, which will be transported by slurry pipeline to the port of Geraldton for export. The company is currently seeking secondary approvals and undertaking an implementation study for the project.

Expenditure: \$2b.

Employment: Construction: 1000; Operation: 350

Mid West Region – Jack Hills Expansion CROSSLANDS RESOURCES

The Jack Hills Expansion Project will involve the development of a 20Mtpa magnetite mine. The magnetite concentrate is proposed to be transported by a new railway to a new deepwater port at Oakajee.

Expenditure: \$2b.

Employment: Construction: 450; Operation: 350

Mid West Region – Weld Range Iron Ore Mine SINOSTEEL MIDWEST CORPORATION LTD

Sinosteel Midwest Corporation proposes to develop a 15Mtpa iron ore mine at Weld Range 65km southwest of Meekatharra, producing a mix of hematite lump and fines. The project is expected to utilise a proposed new rail line and deepwater port facility at Oakajee. The company finalised a bankable feasibility study in July 2010.

Expenditure: \$1b.

Employment: Construction: 1000; Operation: 500

Pilbara – Cape Lambert Iron Ore Project MCC AUSTRALIA SANJIN MINING PTY LTD

MCC Australia Sanjin Mining Pty Ltd is developing a 15Mtpa magnetite iron ore mine in the Pilbara and aims to ship its first ore in 2016 via the proposed multi-user 350Mtpa plus port at Anketell. The Project comprises a proven JORC compliant 1.9Bt iron ore resource, a beneficiation plant, power plant, desalination plant, port facilities for exporting concentrate and other related infrastructure. MCC has completed feasibility studies for the port, power supply, water supply, accommodation and general site infrastructure. The mine and processing studies are progressing. A native title agreement was reached with the Ngarluma Aboriginal Corporation in June 2011. A draft PER document has been submitted to the EPA.

Expenditure: \$3.7b.

Employment: Construction: 3000; Operation: 1000

Pilbara – Roy Hill Iron Ore Mine & Infrastructure ROY HILL HOLDINGS PTY LTD

Roy Hill Holdings is a private company which is majority-owned by Hancock Prospecting Pty Ltd, and has key international investment partners with strategic steel-making interests. They are developing the Roy Hill iron ore project located 115km north of Newman. This project is expected to come into production in 2015 and will produce 55Mtpa of iron ore for 20 years following ramp-up. The project includes mine development, mine processing infrastructure, a new heavy-haul railway, and significant new port facilities at Port Hedland's inner harbour. Environmental approval for Roy Hill mine Stage 1 was received in December 2009 and environmental approval for Stage 2 was received in March 2010. In July 2011, Roy Hill Infrastructure was granted a Special Railway Licence to develop a 344km railway from its mine in the eastern Pilbara to Port Hedland. All primary approvals have been secured and major project works commenced in late 2012. Dredging of the new berth areas at South West Creek was finished ahead of schedule, the airstrip and internal mine roads have been completed, the rail construction villages are completed and works are well advanced on the construction of mine and port accommodation villages. In addition, the new Corporate HQ and Remote Operations Centre at the Perth International Airport business precinct is under construction.

Expenditure: \$9.9b.

Employment: Construction: 3600; Operation: 2000

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 30Mtpa of direct shipping iron ore from its Red Hill and Mt Stuart mine sites located 35-80km south west of Pannawonica. The ore will be transported by a new heavy haul railway for export via the proposed multi-user 350Mtpa port at Anketell. Subject to the successful completion of feasibility and environmental studies, and receipt of government regulatory approvals, the company anticipates that the first shipment of ore will occur in 2014. Environmental approval for the mine and rail elements of the project was received in December 2011.

Expenditure: \$7b.

Employment: Construction: 3500; Operation: 1000

Yilgarn – Deception Iron Ore Deposit CLIFFS ASIA PACIFIC IRON ORE PTY LTD

Cliffs proposes to expand its Koolyanobbing Operation to include an additional iron ore mining area at the Deception Deposit, located approximately 150km north of Southern Cross. The Deception Deposit contains an estimated 7.1Mt of iron ore and is expected to have a mine life of around five years. The Deception Deposit received environmental approval in June 2012 and first production is expected in first half of 2015.

Expenditure: \$35m.

NICKEL

Mt Windarra – Windarra Nickel POSEIDON NICKEL NL

Poseidon Nickel Ltd has submitted a project development proposal for the redevelopment of the Mt Windarra underground nickel mine, the development of the new Cerberus underground nickel mine, the construction and commissioning of a nickel sulphide concentrator, a gold tailings re-treatment plant and associated project infrastructure at Mt Windarra, the historic site of previous mining and processing operations. Subject to obtaining all relevant approvals and project funding, Poseidon is forecast to commence construction in 2013.

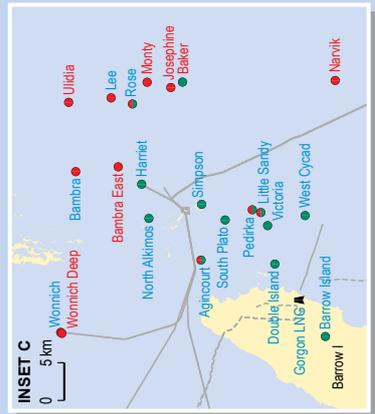
Expenditure: \$250m.

Employment: Construction: 80; Operation: 180

Major Resource Projects — June 2013

Northwest Shelf / Pilbara Region

INSET B



MINERAL SYMBOLS

- Precious metal (Au, Ag, Pt, Pd, Rh, Ru, Ir, Os, Ni, Cu, Zn, Pb, Sn, Bi, Mo, W, U, Th, Pa, Np, Pu, Am, Cm, Bk, Cf, Fm, Md, No, Lr)
- Steel alloy metal (Ni, Ti, Nb, Ta, Zr, Hf, Y, Al, Si, Mn, Cr, Co, Ni, Cu, Zn, Pb, Sn, Bi, Mo, W, U, Th, Pa, Np, Pu, Am, Cm, Bk, Cf, Fm, Md, No, Lr)
- Speciality metal (Ni, Ti, Nb, Ta, Zr, Hf, Y, Al, Si, Mn, Cr, Co, Ni, Cu, Zn, Pb, Sn, Bi, Mo, W, U, Th, Pa, Np, Pu, Am, Cm, Bk, Cf, Fm, Md, No, Lr)
- Base metal (Ni, Ti, Nb, Ta, Zr, Hf, Y, Al, Si, Mn, Cr, Co, Ni, Cu, Zn, Pb, Sn, Bi, Mo, W, U, Th, Pa, Np, Pu, Am, Cm, Bk, Cf, Fm, Md, No, Lr)
- Uranium
- Industrial mineral

PETROLEUM SYMBOLS

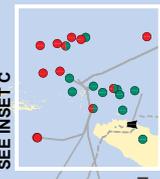
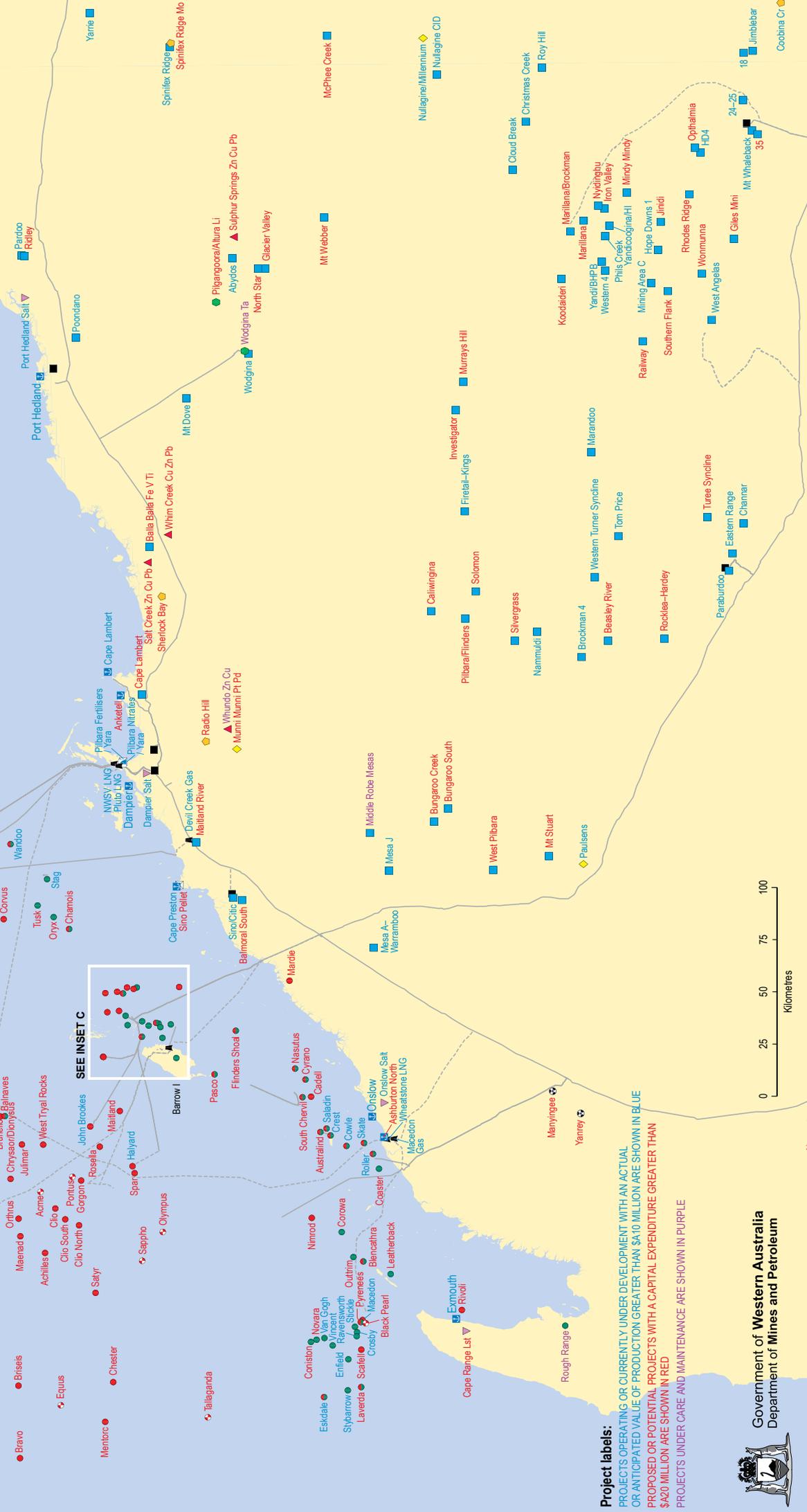
- Gas field
- Oil field
- Oil and gas field
- Significant gas discovery
- Processing plant
- Oil / gas pipeline, operating
- Oil / gas pipeline, proposed

INFRASTRUCTURE

- Power plant
- Processing plant
- Irrigation / water / desalination
- Port

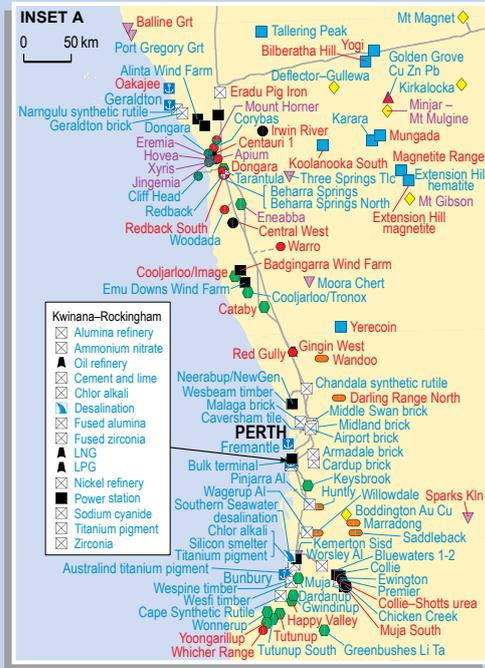
COMMODITIES

- Alu..... Aluminium
- Cr..... Chromium
- Cu..... Copper
- Fe..... Iron
- Li..... Lithium
- LNG..... Liquefied natural gas
- Mo..... Molybdenum
- Ni..... Nickel
- Pb..... Lead
- Pd..... Palladium
- Pl..... Platinum
- Ta..... Tantalum
- Ti..... Titanium
- U..... Uranium
- Van..... Vanadium
- Zn..... Zinc
- Zr..... Zirconium



Project labels:
 PROJECTS OPERATING OR CURRENTLY UNDER DEVELOPMENT WITH AN ACTUAL OR ANTICIPATED VALUE OF PRODUCTION GREATER THAN \$A10 MILLION ARE SHOWN IN BLUE
 PROPOSED OR POTENTIAL PROJECTS WITH A CAPITAL EXPENDITURE GREATER THAN \$A20 MILLION ARE SHOWN IN RED
 PROJECTS UNDER CARE AND MAINTENANCE ARE SHOWN IN PURPLE

Major Resource Projects — June 2013



Project labels:

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