

THE BIG PICTURE

The 'resources' sector or industry refers to all exploration, mining and production activities associated with minerals in the mining, oil and gas (or petrochemical) industries, including construction.

After a period of unprecedented growth - which saw Australia experience the highest level of investment projects, production and sales for minerals produced than ever before – we're now coming out of a period of downturn where projects were delayed or cancelled and jobs lost. With the approval of Chevron's Gorgon Project, together with more than 80 major projects in the development pipeline, the industry is now showing significant signs of recovery. However, like any other sector, the resources industry is cyclical and not immune to global market forces.

Up until the last quarter of 2008, about 136,000 people in Australia's workforce were employed in resources, up by 55,400 jobs over the last five years. This alone indicates the strong cyclical nature of the industry. Even with jobs losses across the industry now totalling some 20,000, these losses are coming off the back of unprecedented growth and still don't have the industry back at its original employment levels of five years ago.

In early 2009, the Western Australian Chamber of Minerals and Energy released an updated outlook based on three scenarios:

Scenario 1: Based on the original Survey Data obtained in July 2008 – prior to the downturn

The report says:

Minerals and Energy sector participants were surveyed on their anticipated labour demand through to 2020.

According to the survey findings, State-wide demand for labour from the minerals and energy sector is projected to grow significantly in the period 2008 – 2014. Labour demand is expected to grow at an annual average of 7% to 27,000 by 2014, with an expected peak in 2012 at 38,000.

Scenario 2: Anticipated Moderate Constrained Growth

The report says:

When a moderate constrained growth scenario is applied relatively slow growth in direct sector demand for the period 2008 – 2010 is forecast, followed by a sharp upturn in 2011. Incremental demand in 2012 under this scenario is 38,000.

Scenario 3: Severe Constrained Growth

The report says:

When a severe constrained growth scenario is applied, flat or negative growth in direct sector demand for the period 2008 – 2011 is forecast, followed by a sharp upturn in 2012. Incremental demand in 2012 under this scenario is 17,500.

Whilst the Chamber's report is focussed on Western Australia, it gives an indication that for that State alone, growth in new jobs is anticipated between 17,500 under a severe constrained growth scenario through to 38,000 under an anticipated (and probably more realistic) moderate constrained growth scenario. **The Chamber concludes that future labour demand driven by the minerals and energy industry will continue to create labour shortages.**

In addition, the Australian petroleum industry continues to generate more than \$15b each year in oil and natural gas production and contributes more than \$5b in taxes and royalties each year. Over 15,000 are employed directly and it is estimated that more than 30,000 jobs are created in suppliers, contracting and support companies.

Australia continues to see major projects in design and development phases – most in the oil and gas sector - including:

- ◆ **Chevron's Gorgon Project** in the North West Shelf of Western Australia; anticipated employment in excess of 6,000 during construction;
- ◆ **Woodside's Pluto Project**; already underway, employing thousands via awarded supply and labour contracts;
- ◆ **Queensland's Curtis LNG Project**;
- ◆ **Santos's Gladstone LNG Project**;
- ◆ **Inpex Itcthy's Project** in the Timor Sea and Darwin, Northern Territory;
- ◆ **Murchison Metals' Oakajee Port and Rail, Crosslands Resources and Rocklea Projects.**

INDUSTRY PROFILE as at 2008:

Employment	136,500 people
Employment change (last five years):	68% increase
Working part-time:	5%
Females working in the industry:	13%
Aged 45 and over:	35%
Employed outside capital cities:	64%
<i>Top three occupations:</i>	
Miners/Mining Technicians:	22,800
Metal Fitters and Machinists:	11,800
Truck Drivers:	7,800

Australia has mining activity in all of its states and territories. Particularly significant areas today include the Goldfields and Pilbarra regions of Western Australia, the Hunter Valley in New South Wales, Latrobe Valley in Victoria, the Townsville and Mount Isa regions in Queensland, the North West shelf in Western Australia for offshore petroleum production and various parts of the Outback. Operations are a combination of residential and/or Fly In, Fly Out.

Whilst the above overall official 2008 numbers have declined, it is anticipated that the percentages will remain somewhat consistent as a reflection of the total resource sector workforce.

Major active mines/sites in Australia include:

- ◆ **BHP Billiton's Olympic Dam Operation** in South Australia; a copper, silver and uranium mine boasting the world's largest known uranium source with a mine life of 100 years;
- ◆ **Super Pit Gold Mine**; a consolidation of a number of mines near Kalgoorlie, Western Australia and the largest open pit in the southern hemisphere;

- ♦ **North West Shelf** – major centre for offshore exploration, construction and drilling with production plants located on the North West coast of Western Australia.
- ♦ **Timor Sea** – becoming a major centre for new offshore exploration, construction and drilling with Inpex and others establishing major production centres in the region.

Major employers in the industry are:

- ♦ **BHP Billiton** – operating in nearly every state of Australia, employs more than 25,000 globally and the world's largest diversified resources company.
- ♦ **Rio Tinto** – significant operations in Western Australia (also Queensland and globally) with ten mines, three ports and a rail network in the Pilbara, and more than 5,000 employees and 6,000 contractors.
- ♦ **Kalgoorlie Consolidated Gold Mine** – operating the largest gold Superpit in the southern hemisphere.
- ♦ **Woodside** – operates a number of off and on shore oil and gas facilities and Australia's largest oil and gas producer.

MINING

Within the mining industry there are three significant activities - mine operation, mining support and mining construction. Over two thirds of workers in the mining sector are involved in the construction and extraction, production, or transportation and material moving occupations – essentially 'blue collar roles'; trades, operators and technicians.

Materials are extracted from the earth by means of either surface mining or underground mining; this is of course dependent on how close to the surface the desired substance is located.

Surface mining is used when the mineral is located close to the Earth's surface and is sometimes referred to as open-pit or strip mining. The method of extraction is quite simple and much more efficient than underground mining as it involves much fewer workers and is a less complex procedure. The process starts by blasting the surface with explosives and using earth-moving equipment to remove the top layers of rock and soil in order to expose the mineral bed. Once the mineral bed is visible smaller shovels are used to remove the material and place it in trucks to be removed from the site. The advantage of surface mining over underground mining is the increased safety and less complexity in process. However, both environments have unique challenges; the underground environment can be loud, damp, dark and hot with workers often working in isolated 'pockets'. Working on the surface means being exposed to all weather conditions, which may cause the mine to shut for periods over the winter months.

Underground mining is undertaken if minerals are located deep within the Earth's surface. In Australia, there are a number of new underground projects underway – several of which are employing very new mining techniques like block caving. The BHP Billiton Leinster Operation is example of this where block caving will be used to significantly extend the life of mine.

To access the area where the material is located it is necessary to construct at least two shafts; one is used for the transportation of employees, machinery and minerals the other is a ventilation shaft. The shafts can go in all directions depending on the location and directions of the mineral seams. Those looking to work in underground mines have to be able to work in dark, hot, noisy environments and be able to work in extremely confined spaces.

There are three methods used to extract minerals in underground mining:

Conventional Mining

This is the oldest method of the three and is slowly being phased out. A "Kerf" or strip is cut 1.8m to 4.5m in length underneath the seam and is designed to control the direction the ore falls once it has been blasted. Holes are drilled into the seam to allow explosives to be inserted; once the explosives have been inserted and detonated the ore is collected up and transported to the surface.

Continuous Mining

Ore is extracted using a continuous miner, which cuts out the ore and transfers it straight onto a conveyor belt to be transported away to the surface.

Longwall Mining

A machine similar to a continuous miner uses a rotating drum to cut the ore and transfer it to a conveyor belt and at the same time insert hydraulic pillars to support the tunnel roof.



OIL AND GAS

The oil and gas industry represents the most lucrative opportunities for those seeking employment, albeit is more difficult to gain entry and typically requires a trade qualification.

In the oil and gas industry, there are two main areas – Upstream and Downstream – comprising different process elements:

UPSTREAM

1. **Exploration;** includes predicting where oil or gas may be found and drilling activities on or offshore via Drill Rigs.
2. **Construction;** which either occurs through a pipelaying subsea vessel (pipe is laid on the seabed from the source to a processing facility on shore) or through surface construction if the source was located on land.
3. **Production;** extracting the oil and gas; developing fields and producing the oil and gas; well completions, including the installation of valves and pipes to control pressure and flows.
4. **Transporting** – moving oil and gas by sea and pipeline.

Off shore vessels include:

- **Drill rigs** used for exploration (eg Atwood Eagle operated by Atwood Oceanics).
- **Pipe laying barges** used for construction and specifically laying the pipe on the seabed which transports oil and gas from an FPSO to shore for further processing or refining (eg Semac1 operated by Saipem).
- **Floating Production Storage Offtake (FPSO)** facilities (ie Griffin Venture by BHP Billiton). An FPSO is an oil tanker that has been specifically built or converted to process oil and gas. Gas and oil comes from the seabed to the FPSO which will either re-inject it back into the seabed to create more pressure to keep the oil or gas flowing or will be directly piped to shore.
- **Fixed Production Platform** receives oil and gas from the seabed, separates and processes it, and either sends it to a processing facility on shore or directly to an oil tanker which transports directly to a customer (ie Rankin and Goodwin A operated by Woodside).



DOWNSTREAM

1. **Refining** – Distilling and blending oil products. This includes the distillation process to separate crude oil into useable 'fractions' for further processing into LPG, petrol, jet fuel, diesel and lubricating oils, cracking heavier products into more desirable lighter products such as LPG, petrol and diesel and producing feedstocks for petrochemical and plastics manufacture.
2. **Distribution** – Delivering Petroleum Products to consumers.

The word petroleum originates from the Greek word *petra*, for rock and the Latin *oleum*, for oil. This rock oil has its origins deep below the earth's surface where the ancient remains of plants and animals have decayed and have been compressed to form crude oil and natural gas.

Extracted and refined, this oil and gas provides 80% of the world's transport fuels and 50% of our energy needs. Petroleum is also used in pharmaceuticals, cosmetics. And fabrics and is a base ingredient in most plastics. Around 72% of energy consumed in Australia is oil and gas, or derived from oil and natural gas (APPEA – Facts about Oil and Gas, 2004).

The developed countries of the OECD are the largest consumers of petroleum products but only hold 10% of world petroleum reserves, while the producer countries of OPEC use far less but own 75%. Consequently, petroleum products are produced, shipped, traded and distributed across the globe.

The increasing demand for petroleum, along with a desire to diversify the sources of supply, is driving exploration into remote areas of the world, both on and off shore. Oil companies are making huge investments in exploration surveys, drilling programs, and new production facilities in central Europe, Asia and Australia. One exploration well can cost up to \$20m to drill.

This increasing demand is also driving investment in technical innovation. Recent advances in 3D seismic surveys and computer imaging are significantly improving the accuracy of exploration programs. Similar innovation in Directional Drilling techniques used on Australia's North West Shelf reached a reservoir 7.5 km away and 5 km below the Goodwin off shore platform.

Like many capital intensive, technologically advanced industries, the Australian petroleum industry does not employ large numbers of staff. Direct employment in producer companies probably numbers around 15,000 nationally. However, the industry is dependent on many suppliers, contactors and service companies. Consequently, the total number of jobs dependant on the petroleum industry is estimated to be in excess of 30,000. Generally this workforce is highly skilled, and consequently, receives above average wages and salaries.

There are many employers in the Australian petroleum industry. To spread the risk and share the expense, most oil and gas fields are developed by Joint Ventures formed of international oil companies, smaller local firms, and representatives of the major customers. The Joint Ventures will appoint one company to manage the field exploration program, the construction of facilities, and the operation of the production assets.

ROSTERS

Rosters in the industry vary and may depend on whether you live residentially or elsewhere and need to fly, drive or bus to site from another location. Some common terms you may see in advertising include:

FIFO	Fly in / Fly Out
BIBO	Bus in / Bus Out
DIDO	Drive in / Drive Out

Typical rosters include:

2:1	Two weeks on, one week off
3:1	Three weeks on, one week off (often construction)
4:1	Four weeks on, one week off (often construction)
6:6	Six weeks on, six weeks off (often oil and gas)
4:4	4 days on, 4 days off
8:6	8 days on, six days off
7:7	7 days on, 7 days off

Rosters can include a number of combinations of the above. For example, a roster of 3 weeks on, 3 weeks off, 3 weeks on, 6 weeks off is common for oil and gas operational roles.