AUSTRALIA

Australian Government

Department of Industry, Tourism and Resources
&
Department of the Environment and Heritage

METHANE TO MARKETS PARTNERSHIP

COAL MINE METHANE TECHNICAL SUBCOMMITTEE

COUNTRY SPECIFIC PROFILE

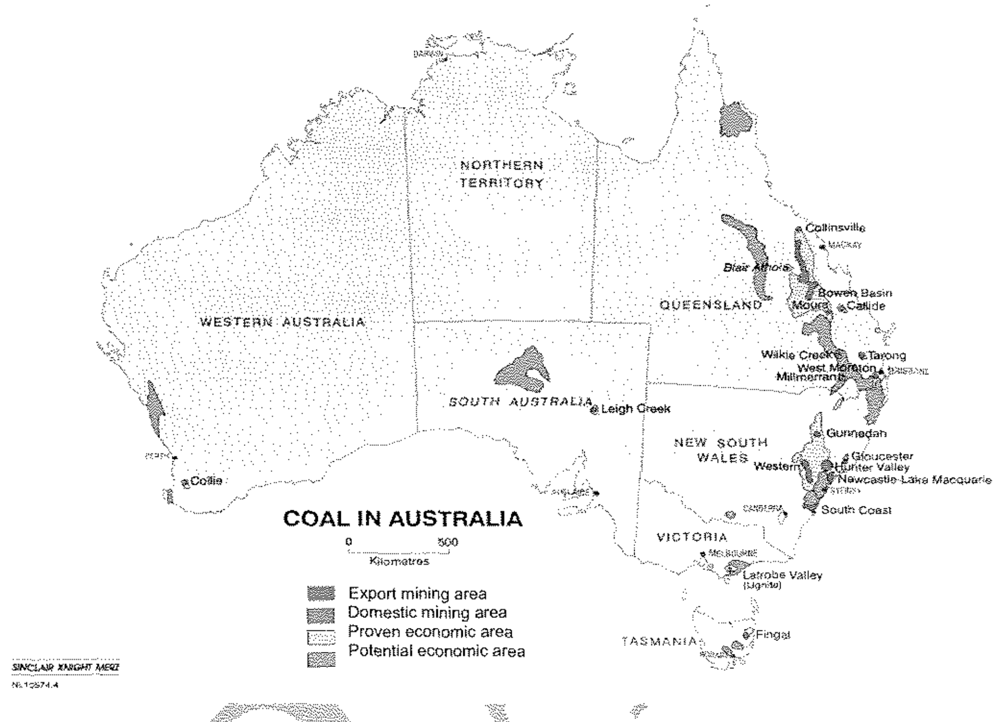
AUSTRALIA

This document has been prepared jointly by the Australian Government Department of Industry, Tourism and Resources and Department of Environment and Heritage with contributions from the Commonwealth Science and Industrial Research Organisation (CSIRO), Geoscience Australia, Queensland State Government Department of Natural Resources and Mines and New South Wales State Government Department of Mineral Resources.

This Australian Country Profile is an "evolving" document and will be updated as new information becomes available.

AUSTRALIA

1. AUSTRALIAN COAL INDUSTRY: SUMMARY



Australia has large deposits of both brown and black coals, located predominantly on the east coast in the states of Queensland, New South Wales and Victoria. Current economic reserves of black coal are sufficient to sustain production for 200 years. Australia also has several centuries of brown coal (lignite) reserves.

Australia is the world's largest exporter of black coal and the fourth largest producer of coal behind China, USA and India. Australia generally produces high quality coking and steaming coals that are high in energy content, low in sulphur, ash and other contaminants. In terms of the size of its black coal reserves, Australia has the world's fourth largest resource base.

Coal plays a central role in the Australian economy, accounting for 10% of total export income and providing the fuel for coal-fired power stations, which currently generate 85% of all electricity produced in Australia. During 2003-04 Australian black coal production was around 286 Mt of which 218 Mt or 77% was exported to earn A$10.9 billion. Forecasts are for production to increase to almost 300 Mt in 2004-05.

The Australian coal industry incorporates over 100 mines. In 2003, there were 63 black coal open cut mines and 38 black coal underground mines. The majority of the underground mines are longwall or room and pillar operations. The open cut mines use either drag line or trucks for production operations.

Australian annual brown coal production is over 65 million tonnes, all from Victoria and with over 98% sourced from the La Trobe Valley. Australia produces about 8% of the world's brown coal and is ranked third after Germany (20%) and USA (10%).

The La Trobe Valley mines extract brown coal from large open-cut mines utilising giant bucket-wheel excavators, or dredgers. The coal is loaded onto conveyor belts for delivery to power stations. However, in a recent development dredgers are progressively being replaced at some mines by large dozers. Exploration for brown coalbed methane is also occurring in Victoria.

The four major global coal suppliers, BHP-Billiton, Rio Tinto (Coal & Allied and Pacific Coal), Xstrata, and Anglo Coal have a major presence in Australia, representing the majority of Australian coal production.

CMM recovery/use

Australia is ranked sixth globally in terms of fugitive methane emissions from coal mining activities with coal mine methane emissions reaching 18.4 million metric tons carbon dioxide equivalent in 2000.

Major sources of coal mine methane (CMM) emissions in Australia come from active mine sites both underground and open cut (ventilation systems 27PJ per year), abandoned mines and post-mining emissions. Safety has been the key driver for the further development of coal mine methane technologies in the coal mining industry, especially with regard to coal mine methane ventilation practices in underground mining.

Australia has the second largest (outside the United States) commercially advanced coal mine methane and coal bed methane (CBM) industry and is home to the largest CMM power project in the world – at the Moura mine in Queensland. Details of this and other projects are included below.

2. OVERVIEW OF CMM POTENTIAL

In Australia, there is no clear delineation between CBM and coal seam methane (CSM) which is also referred to as coal seam gas (CSG) and the terms are used interchangeably.

The common use of the term CBM is applied to all the gases contained in, or produced, from coal seams and should be referred to as coal bed gas, but the term is taken from the name of its key component, methane (CH_4), which has important implications for mine safety, environmental considerations as a greenhouse gas – and also commercial opportunities (World Coal Institute).

CBM and coal seam methane (CSM) are the same gas. It is generated within coal seams and adsorbed onto the grain faces and micro pores of the coal during the geological thermal maturation process of coalification. The gas is held by hydrostatic water pressure to the coal. Chemically, coal seam gas is a mixture of methane, other hydrocarbon gases and inert gases such as carbon dioxide.

Coal seam gas that arises from coal mining operations is traditionally referred to as CMM. Its concentration generally increases with coal seam depth. CMM is methane released from coal seams during the mining of coal and has long been regarded as the most hazardous and explosive gas in underground collieries.

Drained CMM is sometimes used as either pipeline gas or fuel for on-site electric power generation with surplus electricity is supplied to regional distributors. In Queensland, a quarter of the gas supplied to the market is sourced from CSM. Many of the existing or planned projects included below are a combination of both CMM and CSM projects.

Existing and planned projects

The Australian Government has actively supported the development of a coal mine methane industry through a considerable investment through the Greenhouse Gas Abatement Programme (GGAP). In total, the GGAP is providing up to $43.47 million to support the development of power stations using coal mine methane. The objective of the GGAP is to reduce Australia's net greenhouse gas emissions by supporting activities that are likely to result in substantial emissions reductions, particularly in the period 2008 - 2012.

The Australian Government is funding four projects (for seven individual power stations) in Queensland and New South Wales related to coal mine methane capture and use for power generation under the GGAP. Details of the four projects are as follows.

1. **BHP Billiton** was awarded up to $6 million to construct a coal mine methane power station (**Westcliff Colliery**, near Wollongong, New South Wales) to allow the combustion of very dilute methane contained in coal mine ventilation air. Burning methane contained in waste coal mine gas to produce electricity will result in the reduction of methane emissions and the displacement of coal-fired electricity generation and is estimated to deliver a reduction in greenhouse gas emissions of up to 1.04 million tonnes of carbon dioxide equivalent (CO_2-e) in 2008-2012.

   - This project uses VOCSIDIZER™ technology, developed by Swedish emission control specialist MEGTEC Systems AB, and used by BHP Billiton Minerals Pty Ltd. This technology was designed to combust low concentrations of methane and other hydrocarbons contained in air streams, and is used to abate methane emissions from mine ventilation air exhaust. The oxidation process in the VOCSIDIZER super-heats steam and drives a standard steam turbine that generates electricity. The construction of this power station is progressing well.

   - This project builds on the pilot plant at BHP Billiton's Appin Colliery that was successfully operated between 2001 and 2002. This plant was awarded the Australian Coal Association's award for Best Greenhouse Gas Research Project on 5 April 2005.

2. **Energy Developments Limited** (EDL) was awarded up to $15.47 million to construct a coal mine methane power station (**Anglo Coal Mine** near German Creek, South-Western Queensland). This project is estimated to reduce greenhouse gas emissions of up to 6.1 million tonnes of CO^2-e in 2008-2012.

   - This project will use reciprocating gas engine technology utilizing coal mine methane, probably Caterpillar engines from the USA. Electricity generated by the plant will be exported to the local distribution network or purchased by Capcoal for on-site use. The construction of the EDL power station is progressing well in its initial stages.

3. **Envirogen** was awarded up to $13 million to construct or modify three coal mine methane gas power stations (Oceanic Coal Australia Ltd, near **Teralba**, New South Wales; **Tahmoor** Coal Pty Ltd near Wollongong, New South Wales; and **Oaky Creek**, Mt Isa Mines Ltd near German Creek, South-Western Queensland). This project is estimated to deliver a reduction in greenhouse gas emissions of up to 2.25 million tonnes of CO2-e in 2008-2012.

   - Envirogen uses engine/generator units (Jenbacher 320 series from Germany) utilizing waste coal mine gas. The Jenbacher 320 is a purpose-designed V20, 50 litre turbocharged, spark ignition gas engine, which is similar in nature to an equivalent diesel engine. They are each directly coupled to a synchronous generator, which nominally produces 1 MW of electricity.

- The 5 MW Tahmoor power station was upgraded by 2 MW under the GGAP, with construction completed in 2003. Construction of the Teralba power station was completed in 2004. Both the Tahmoor and Teralba power stations are currently operating commercially. The construction of the Oaky Creek power station is progressing well in its early stages.

4. **Envirogen** was also awarded up to $9 million to construct two additional coal mine methane power stations (proposed for **United Coal Mine** Ltd in the Hunter Valley, New South Wales; and **Glennies Coal Mine** Ltd in the Hunter Valley, New South Wales).

    - This project is estimated to deliver a reduction in greenhouse gas emissions of up to 3.61 million tonnes of CO2-e in 2008-2012. Construction of these power stations has not yet commenced.

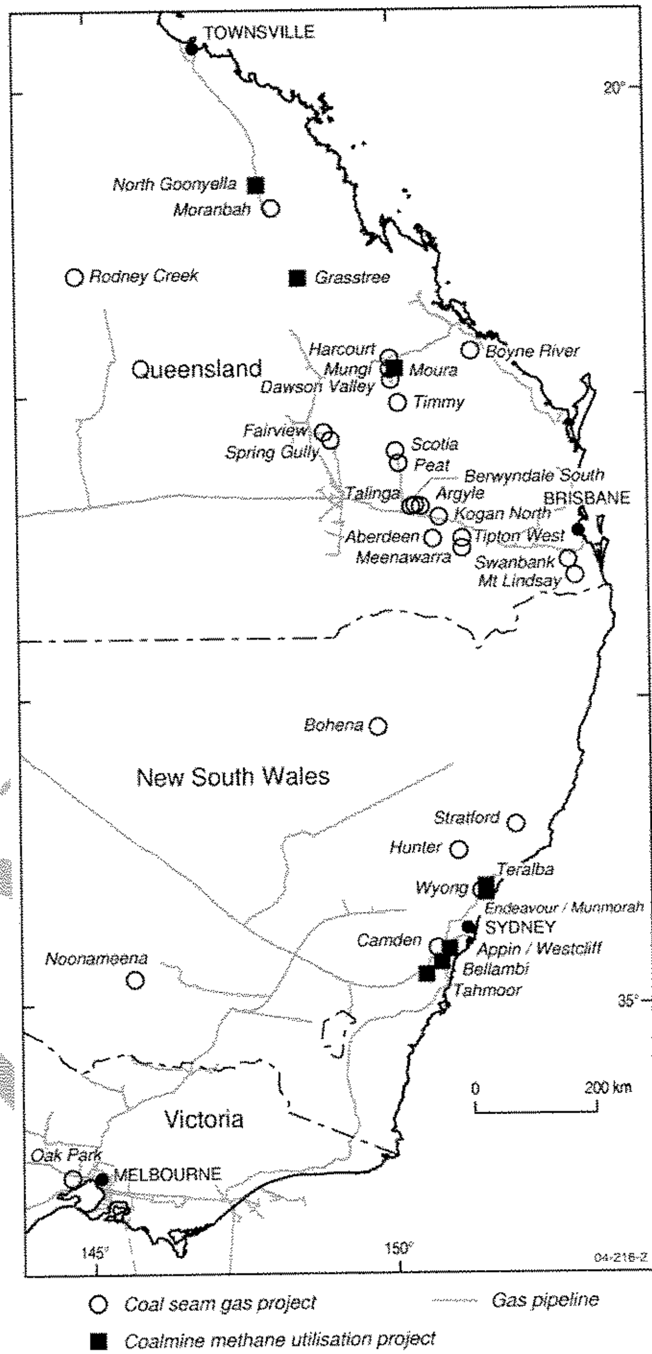
In addition to these GGAP funded projects, the following activities are also underway in Australia:

Moura Colliery – coal seam methane is drained from exposed high walls with a series of horizontal wells into both highwall and underground seams several years in advance of coal mining. Approximately 3 PJ of coal mine methane per year is supplied from this colliery to the regional transmission line. A gas processing plant located on site dehydrates and compresses the gas before delivering it to the pipeline. The operator is in the process of increasing production up to 6.9 PJ of coal mine methane per year.

Appin-Tower Collieries – BHP Billiton operates the 100 MW power plant at the Appin-Tower collieries where a low cost process has been developed to generate electricity using 1 MW diesel engines. This technology has also been successfully applied to utilise methane emissions from waste landfill sites.

Of mines currently in production, the Tahmoor and Teralba power stations are currently operating commercially. The German Creek (Anglo), Oaky Creek (Xstrata) and North Goonyella (Peabody) are the next closest to moving to fully commercial CMM exploitation, with the German Creek and Oaky Creek CMM projects scheduled to be operational in 2006.

Chart 1: Location of existing and planned projects



In relation to new mines, Xstrata's Newlands Northern underground mine, currently under final stages of development, is classified as "gassy" (replaces production from the Southern Underground, also "gassy") and will be required to conduct pre-drainage operations. In-situ gas content and potential for CMM production is unknown at this stage.

Anglo are also now progressing with plans for the development of the Grosvenor project adjacent to their Moranbah North project (and Moranbah township), and it is likely that this project will also require an amount of pre-production gas drainage.

Upstream/Downstream technologies

Australia has developed a range of leading edge technologies for extracting, capturing and utilising coal seam gases. An important breakthrough is the ability to accurately control from surface drilling rigs the horizontal drilling in deep underground coal seams. The ongoing development of surface-initiated directional drilling technologies is replacing the need for underground long hole in-seam drilling, although this is still practiced.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is also developing new hydraulically driven down hole motors for tight radius drilling applications, which will prove to be invaluable in CMM pre-drainage applications.

These technologies have been important in overcoming a range of major challenges including the need to reduce the cost of recovering methane from deep coal seams. There are also environmental issues that need to be carefully managed, particularly in relation to the disposal of waste waters and the cross contamination of underground aquifers.

The need to reduce greenhouse emissions has also driven the development of technologies which are now successfully using low concentrations of methane in mine ventilation air.

<u>Drainage gas</u>

Drainage gas with over 30% methane can be utilised in a number of industrial production processes such as gas engines or gas turbines to generate power, or feeding materials for chemical processes provided there is no problem with supply continuity. It is fairly easy to set up a stable combustion when the heating value of the drainage gas is approximately $10MJ/m^3$ (i.e. about 30% methane if the gas is used for combustion).

In terms of the purposes of drainage gas utilisation, technologies for the drainage gas can be divided into: (1) purification for pipeline gas, (2) power generation/co-generation, and (3) chemical feedstocks. **Table 1** summarises the mechanisms, principles and application status of these technologies.

Table 1 Technologies for drainage gas

Technology	Mechanism	Principle	Application status
Purification			
Purification for town gas	Gas Separation	Gas purification process	Demonstrated in full-scale units providing pipeline gas
Power generation/cogeneration			
Reciprocating gas engine	Combustion	Combustion in engine combustor	Demonstrated
Conventional gas turbine	Combustion	Combustion in conventional gas turbine/engine combustor	Demonstrated in 2 power stations in commercial operation

Co-firing in power stations	Combustion	Combustion inside boilers	Demonstrated
Fuel cell power generation	Electro-chemical reaction	Electrochemical process	Being proposed as a concept
Chemical feedstocks			
Chemical feedstocks: methanol & carbon black	Synthetic	Synthetic processes	Being trialled in a pilot-scale unit, and demonstrated for coal seam methane

Continuous operation of power generation units using these technologies is impacted by variations in the drainage gas supply rate, and therefore not maintaining the minimum 30% methane concentration that is required for the internal combustion gas engines, conventional gas turbines and fuel cells causing a significant limitation.

The limitation is that the minimum methane concentration for methanol production is 89%, so it appears that methanol production is unlikely to be feasible at most mine sites. The carbon black production plant uses coal bed methane with a minimum methane concentration of 84%. This has similar application problems to the methanol production process. The oxygen-enriched air carbon black production technology could lower the minimum methane concentration to 50%, but this needs to be demonstrated in pilot-scale.

Ventilation air methane

Ventilation air methane (VAM), contributes nearly 64% of coal mine methane emissions in most of the gassy underground coal mines, and it would be expected that the percentage of ventilation air methane could be somehow reduced due to the application of effective recovery technology in the future. VAM is most difficult to use as an energy source as the air volume is large and the methane resource is dilute and variable in concentration and flow rate. For example, a typical gassy mine in Australia produces ventilation air at a rate of approximately 150 to 300m^3/s.

Utilisation requires either treatment in its dilute state, or concentrating up to levels that can be used in conventional methane fuelled engines. Effective technology for increasing the concentration of methane is not available but it is being developed, and most work has focussed on the oxidation of very low concentration methane.

Table 2 details ventilation air methane utilisation technologies in terms of fundamental mechanisms, technical principles and applicability. The thermal flow reverse reactor (TFFR), catalytic flow reverse reactor (CFRR) and catalytic monolith combustor (CMR) technologies can be implemented for the mitigation of VAM with minimum methane concentrations of 0.2%, 0.1% and 0.4%, respectively.

The main limitation of CFRR systems is that it is difficult to extract useful energy for power generation, so they generally only mitigate most of the greenhouse impact of the methane. The TFRR plant being constructed at the BHP Billitons Westcliff Colliery will generate power in conjunction with a steam turbine that generates electricity. By turning 100% of methane into carbon dioxide, the TFRR has the potential to mitigate an extremely high proportion of the greenhouse impact of coal mine emissions.

If the BHP Billiton Westcliff Colliery Coal Mine Methane full scale power station is a commercial and technical success, then this technology has the potential to address VAM issues and reduce greenhouse gas impacts, increase energy supplies and contribute to mine safety.

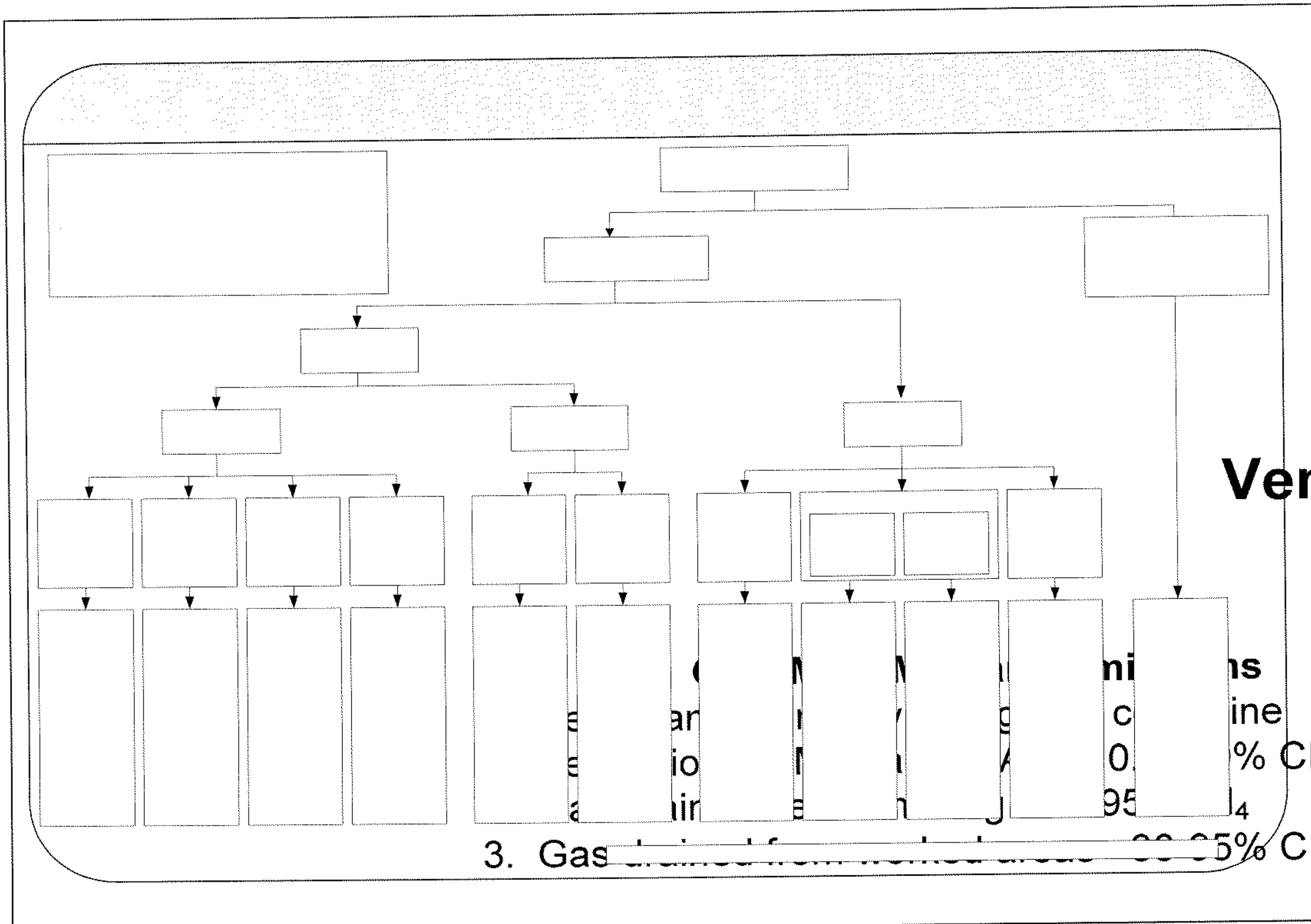
Table 2 Technologies for ventilation air methane

Technology	Oxidation mechanism	Principle	Application status
Ancillary uses			
Combustion air for conventional pf power station	Thermal	Combustion in pulverised fuel (pf) power station boiler furnace	Demonstrated in a pilot-scale unit, and being considered for a full-scale demonstration
Combustion air for gas turbine	Thermal	Combustion in conventional gas turbine combustor	Not demonstrated yet
Combustion air for gas engine	Thermal	Combustion in gas engine combustor	Demonstrated
Principle uses			
Thermal flow reverse reactor (TFRR)	Thermal	Flow reverse reactor with regenerative bed	Demonstrated in pilot plant. Full scale plant under construction
Catalytic flow reverse reactor (CFRR)	Catalytic	Flow reverse reactor with regenerative bed	Mitigation – demonstrated Utilisation – not demonstrated yet
Catalytic monolith combustor (CMR)	Catalytic	Monolith reactor with a recuperator	Mitigation – demonstrated Utilisation – not demonstrated yet
Catalytic lean burn gas turbine	Catalytic	Gas turbine with a catalytic combustor and a recuperator	Mitigation – combustion demonstrated Utilisation – being developed in a lab-scale unit
Recuperative gas turbine	Thermal	Gas turbine with a recuperative combustor and a recuperator	Mitigation – demonstrated Utilisation – demonstrated in a pilot-scale unit, and requires further development for large scale implementation

Lean-burn gas turbines being developed in the world include EDL's recuperative gas turbine, CSIRO lean-burn catalytic turbine and Ingersoll-Rand's (IR) microturbine with a catalytic combustor. The EDL recuperative gas turbine is designed to operate continuously when the methane concentration in air is above 1.6%. CSIRO devised a combined 1% methane catalytic turbine and gas engine system to maximise mitigation and utilisation of methane from both drainage gas and ventilation air. CSIRO's 1% methane catalytic combustion gas turbine system can use a much greater proportion of ventilation air compared with a 1.6% methane gas turbine.

For this system, the gas engines mainly use the drainage gas with a higher efficiency, and the catalytic turbines mainly use VAM with part of drainage gas as a supplement fuel. This allows the technology to mitigate and utilise much more methane and generate more electricity, though it operates at a lower efficiency, than the gas engines using that part of drainage gas.

Ventilatio



ns

ine

% CH_4

$_4$

3. Gas 5% CH_4

VAM accounts for 64% of the mines emissions. Difficult to use as air volumes are large and methane source is dilute and variable in concentration and flow rate.

3. CHALLENGES AND/OR PRIORITIES TO GREATER CMM RECOVERY AND USE

Although Australia has very large resources of coal seam gas – some 275,000 cubic petajoules – the challenge has been to find economic ways to extract this gas without sterilising coal resources. A further challenge domestically is proving up what is recoverable.

A large research program was undertaken by Australian industry in the 1990s to develop Australia's capability to extract coal seam gas ahead of coal mining operations. Australia has also undertaken extensive research into capturing and utilising fugitive methane emission from coal mines.

A range of technologies have been developed to support the commercial extraction of methane from coal seams with different geological structures.

Until relatively recently, the Queensland coal industry was dominated by open cut mines or relatively shallow underground mines without significant methane problems. Consequently, CMM and its capture and utilization are relatively new industries.

Gas ownership

CMM drainage and CBM resources are separately administered. The former by mineral resources legislation and the latter by petroleum resources legislation in Queensland and New South Wales. In Victoria, coal bed methane resources are administered under the legislation for mineral resources development.

Potential for conflict between production of coal and coal mine methane and the production of coal bed methane can occur in areas where the coal bed methane resource is located within a potentially economically mineable coal deposit.

Legal Framework

There is currently no national legislative framework in place for CMM. Each State has its own legislation and licensing arrangements.

In November 2002, the Queensland government released a new coal bed methane regime to address issues that arise where coal bed methane and coal exploration and production activities may occur under different tenures granted over the same area. To implement the new regime in Queensland, a new *Petroleum and Gas (Production and Safety) Act* was passed in 2004 to replace the *Petroleum Act 1923*. The *Minerals Resources Act 1989* and *Coal Mining Health and Safety Act 1999* will also be amended.

With recent amendments to legislation in Queensland, there is now a clear distinction between resources administered under the *Mineral Resources Act 1989*, and those coming under the *Petroleum and Gas (Production and Safety) 2004* Act.

There is no legislative requirement for information to be provided to the Queensland Department of Natural Resources and Mines under the terms applying to the grant of the original Mining Lease, however the *Production and Safety Act 2004* separates the rights to in-situ methane from that of the coal containing it.

In New South Wales, the *Mining Act 1992* is the principal legislation which governs mineral exploration. There are no regulations in place at present for CMM extraction and utilisation which is currently considered to be contained within a coal extraction or mining lease. Specific regulation is being drafted. CSG however, is regarded as a petroleum product in New South Wales and hence falls under the *Petroleum (Onshore) Act 1991.*

Licensing

In Queensland a Mining Lease for coal does not bestow rights to the holder for contained coal seam gas. Coal mine methane production now comes under the *Petroleum and Gas (Production and Safety) Act 2004*, and requires a Production Licence which can co-exist with a ML covering the same area.

In New South Wales, a Mining Lease or Exploration Licence is required before mining operations commence. If the holder of the lease wants to mine for CSG an application must be made for the inclusion of petroleum in the Mining Lease.

Royalties

In Queensland where an oil and gas exploration tenement co-exists with a coal mining lease and production testing within that exploration tenement yields in excess of 3 million cubic metres of gas, the tenement holder is liable for royalty payments.

Under the *Mineral Resources Act 1989(NSW)*, where CMM is produced as a by-product of coal mining, there is no provision for payment of royalties on ventilation air methane, or on pre-or post-drainage methane that is flared.

Extensive work is now being undertaken to extract methane from deep coal seams in and around Sydney. In order to facilitate the development of these resources, the NSW State Government has not been imposing royalties on the capture and utilisation of waste gases from coal mining, and is providing 5 year exemptions for stand alone coal seam gas operations.

Environmental standards

In New South Wales flaring is now the standard for environmental reasons, to reduce the greenhouse intensity of coal mining, but further legislative changes to the MRA now require that pre- and post-drainage methane is used or flared rather than simply being vented (wherever possible and practicable).

Climate change position

Australia recognises the seriousness of climate change and the need for an effective global and national response. Australia remains an active member of the United Nations Framework Convention on Climate Change and is committed to Australia's internationally agreed target of limiting emissions to 108% of 1990 levels between 2008 and 2012. Due to strong action by the Government, including a $1.78 billion domestic climate change program, Australia is on track to meet this target.

Australia is actively working in the international arena to address climate change in practical ways, through bilateral cooperation and multilateral technology initiatives.

Technical difficulties

For drainage gas, conventional gas engines/turbines can be used when CH_4 concentration is over 30%, but gas supply continuity is an issue.

VAM is most difficult to use as an energy source as the air volume is large and the methane resource is dilute and variable in concentration and flow rate.

R&D resources

R&D work is carried out predominantly by:

CSIRO Exploration and Mining

- Effective recovery of CMM: drainage gas system improvement
- Efficient utilization of CMM: cogeneration system for drainage gas, enriching process and catalytic gas turbine for ventilation air methane capture, mitigation and utilization.

Energy Development Limited

- CMM utilization: recuperative gas turbine

BHP Billiton

- CMM utilization: gas engines, thermal flow reverse reactor

4. MARKET ASSESSMENT AND REFORM ISSUES

Transportation (onsite v. offsite use) and End uses (power v. sale to pipeline)

Queensland's current energy policy *A Cleaner Energy Strategy* including the 13% Gas Scheme was aimed specifically at promoting the use of gas for power generation and reducing the reliance on coal. As a consequence, there has been an 'explosion' in interest in coal seam gas, both in producing coal regions and remote from existing mines. Outcomes include the Townsville Power Station and Enertrade Gas Pipeline projects, with the latter delivering coal seam gas produced by CH4 near Moranbah commencing January-February 2005.

The construction of the Enertrade Pipeline, and the route selected was aimed at optimizing the possibility of collecting additional gas 'en route', as new projects developed or more gas becomes available. From its origin near Moranbah, the gas pipeline has been planned and constructed such that it can be readily extended south into the central and southern parts of the coalfields, to gather further gas in the future.

In the near future, commercial CMM production is likely to be based around on-site utilization of gas for energy production, particularly at German and Oaky Creek, as there is no facility yet to readily supply pre-drained methane direct to a pipeline. CMM from Grosvenor and North Goonyella could conceivably deliver gas direct to the Enertrade pipeline with a minimum of additional infrastructure requirements.

Prices and tariffs

In Queensland, the *Gas Supply Act 2003* regulates the reticulated fuel gas market (the supply and sale of fuel gas by distribution pipeline). Natural gas from the Cooper-Eromanga Basin (Queensland) is considerably more expensive than coal on a per unit energy basis, probably around A$3.00 per gigajoule at the well head.

The comparable cost of CSG or CMM is not known, but there have been many undertakings and contracts signed to supply CSG to a range of industrial customers in Queensland, which is driving the interest in the resource.

The long term price of CSG/CMM will be determined by the success of extracting the resource – many areas of the Bowen Basin in Queensland are known to contain gas, but equally many areas are known to have low porosity / permeability characteristics that could impinge on commerciality of production.

Carbon credits

Australia does not have a national system of accounting for carbon credits. Queensland's 13% Gas Scheme was established on 1 January 2005 and will remain in force until 2020. The Scheme creates liable parties, defined as those who are connected to or sell electricity to customers connected to a major grid, who must purchase Gas Electricity Certificates equal to 13% of electricity sold or used in Queensland.

The Strategy was aimed at diversifying Queensland's energy mix towards the greater use of gas, assisting in encouraging the development of new gas sources and gas infrastructure in Queensland, and reducing greenhouse gas emissions from the Queensland electricity sector. The scheme increases revenue for coal mine methane power stations, among other gas-based sources of electricity, by creating Gas Electricity Certificates which have value and can be traded separately to electricity.

The New South Wales' *Greenhouse Gas Abatement Scheme* commenced on 1 January 2003 and remains in force until 2012. The Scheme imposes mandatory greenhouse gas benchmarks on all NSW electricity retailers to abate the emission of greenhouse gases from the consumption of electricity in NSW. Participants are required to reduce their emission of greenhouse gases to the level of their benchmark or offset excess emissions by surrendering abatement certificates, known as NSW Greenhouse Abatement Certificates.

Eligible generators, including coal mine methane power stations in NSW and Queensland are eligible to generate NSW Greenhouse Abatement Certificates and receive revenue from NSW electricity retailers.

5. KEY STAKEHOLDERS IN THE CMM INDUSTRY (not exhaustive by any means)

Australian Government

Queensland and New South Wales State Governments

Coal Companies (existing):

Anglo Coal

BHP-Billiton-Mitsubishi

Xstrata

Coal Companies (future):

Rio Tinto

AMCI Australia

Power Companies:

Stanwell Corporation

CS Energy

Tarong Energy Corporation

Transfield (owner of the Townsville Power Station)

Infrastructure Providers:

Enertrade

Energy Wholesalers and Retailers:

Ergon

Energex

Gas Customers:

Power Stations

Large-scale industrial applications

Fertilizer plants (Incitec)

Retail consumers (in reticulated areas)

6. FINANCING

The Government's GGAP has underpinned the development of CMM to date and played an important part in helping Australia meet its international emissions reduction target with $43.47 million having been provided to four projects installing seven CMM power stations. The third and final round of funding is now being finalised.

7. CURRENT COOPERATION AMONG COUNTRIES (e.g. existing bilateral agreements or grants)

The Department of Industry Tourism and Resources has in place a number of bilateral agreements with various countries on resources/energy cooperation which are implemented through the high level group (government-to-government) meetings. A specific project being undertaken through the Australia China Special Fund is titled – International networking on greenhouse gas mitigation through low heating value gas turbine – and involves CSIRO and Shanghai Jiao Tong University.

The Australian Government also has a framework for joint cooperation with China through the Memorandum of Understanding on Climate Change Activities, which was established in August 2004 between the Australian Minister for Foreign Affairs, Mr Alexander Downer, and the Vice Chairman of China's National Development and Reform Commission, Mr Liu Jiang. The bilateral Australia-China Climate Change Partnership is focused on the delivery of practical climate change projects that are of mutual benefit to both countries. CMM projects have been identified as a particular area of interest for China under this partnership.

8. "WISH LIST": WHAT ARE YOU LOOKING FOR (e.g., financing) and/or can you provide (e.g., technology transfer)?

The further development and demonstration of CMM technologies through collaborative projects that provide Australian companies the opportunity to showcase their expertise and experience across the entire spectrum of coal mine methane or coal seam methane issues – from methane detection, monitoring, and drainage to utilisation.

9. CONCLUSIONS AND OBSERVATIONS

While commercially the CMM industry in Australia is relatively young, significant R&D has been carried out and commercial-scaled coal mine methane power stations are operating, and several more are being constructed. Capture and utilisation of methane gas is receiving increasing attention by both mining companies and energy producers. Given the considerable R&D carried out both domestically and internationally, Australia views this as an area where international collaboration and technical cooperation will ensure the development of this industry – both with a view to ensuring its commercial viability and to reducing fugitive emissions in an effort to reducing its greenhouse gas signature.