



MEDIA RELEASE

29 October 2006

NATURAL GAS CAN ANSWER GREENHOUSE GAS DEMANDS, SAYS NEW REPORT

Greater use of natural gas can help to reduce Australia's contribution to greenhouse gas emissions, Australian Pipeline Industry Association (APIA) Chief Executive, Ms Cheryl Cartwright, said today.

Ms Cartwright said that, in spite of the accepted need to address climate change, the obvious benefits and availability of natural gas had, so far, been virtually ignored by the Government.

A new report, commissioned by APIA and released today, demonstrates that, while renewable energy generation might be viable in the future and public acceptance of nuclear power remains doubtful, natural gas is the sensible alternative.

"Natural gas can make a major contribution to the reduction of greenhouse gas emissions in order to address climate change," Ms Cartwright said. "Gas is less expensive and more reliable than renewable energy sources and it is certainly more greenhouse-friendly than is coal. Even if industries move to geo-sequestration of fossil fuels, gas is generally less expensive than coal."

The report says: "At a cost of around \$50 per tonne of carbon dioxide equivalent injected, sequestering emissions would roughly double the cost of electrical power from new generation coal generators, and add about one third to the cost of electrical power generation from natural gas."

The report concludes: "In managing the near term need for new energy, and if greenhouse gas minimisation is a priority, it will be necessary to rely on natural gas and renewable energies, as the currently available lowest emission technologies."

"With the abundant supply of natural gas, and proven technologies, this fuel can be introduced relatively quickly as an alternative energy source, while newer low-emission and sequestration technologies are developed for the long-term reduction of greenhouse emissions from the stationary energy sector."

Ms Cartwright said that recent opinion polling confirmed the Australian public is demanding action to address climate change.

"Yet we are having a misplaced debate over nuclear, 'clean coal' and renewable energy," Ms Cartwright said.

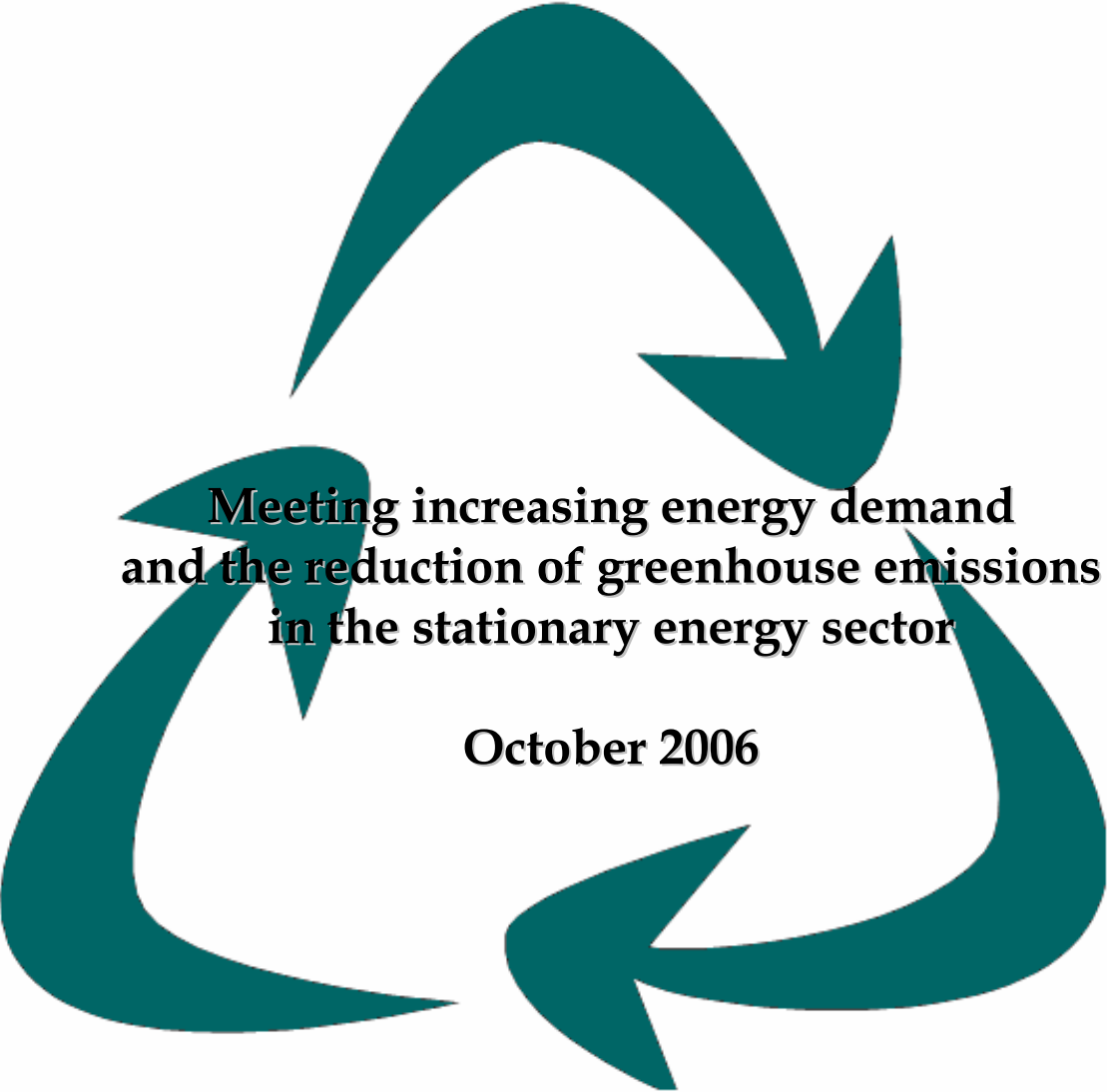
"These energy sources may well meet some of Australia's long-term needs but the current discussion ignores the fact that natural gas can make a major difference in the short to medium term; it can be the 'transition' fuel for Australia, while newer technologies are being further developed. It will be quite some time before renewable energy sources are reliable, efficient and economic."

"Increased use of natural gas should be a key part of a greenhouse gas response, rather than simply focussing on the long-term possibilities of renewable energies and unpopular solutions such as nuclear."

The report, *Increasing Energy demand and the Reduction of Greenhouse Emissions in the Stationary Energy Sector*, was written by South Australian-based greenhouse and energy consultant, Mr Derek Sullens.

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**Meeting increasing energy demand
and the reduction of greenhouse emissions
in the stationary energy sector**

October 2006

Report by:
Derek Sullens
Greenhouse & Energy Consultant

Commissioned by:
The Australian Pipeline Industry
Association



**Meeting increasing energy demand
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This paper explores the current and future options to meet increasing Australian energy demand, against a backdrop of increasing community and global concern about reducing greenhouse emissions.

The focus of this paper is stationary energy (ie energy use excluding transport).

Executive Summary

With a predicted 60% growth in energy consumption between 2003-4 and 2029-30, it is expected that Australia's greenhouse emissions will grow by a similar amount unless measures are taken to improve energy efficiency, reduce emissions of current technologies and energy sources, as well as encourage adoption of new technologies to reduce emissions. This opportunity to introduce new technologies will be enhanced by requirements to refurbish or shutdown ageing energy supply facilities in the near future.

Australia has a diversity of primary power sources including the full range of renewable energy sources, fossil fuels and uranium. It is unlikely that nuclear energy will be an acceptable option for Australia in the short to medium term due to public perceptions of safety, security, and waste disposal issues, particularly as many other energy sources are available within Australia.

It is anticipated that improved energy efficiency, renewable energy and improved fossil fuel technologies will be key features of Australia's future energy mix in the short to medium term.

The Federal Government has not indicated a long-term target for greenhouse emissions reduction, but internationally there have been suggestions of reducing 2050 emissions to 50% or 60% of 1990 emissions. Governments should set a long-term target so that incremental changes aimed at meeting the target can begin.

For Australia to achieve a 25% reduction in greenhouse emissions by 2030 from the level in 2004, current growth in energy demand means that Australia would need to reduce greenhouse emissions per unit of end-use energy by about 56%. The goal of reducing the energy sector's greenhouse emissions by such significant levels can only be achieved by radical improvements in technology.

Coal is a low-cost and abundant fuel that is used in Australia as a fuel source for power generation and energy intensive industries and as an export commodity. Coal combustion is currently the largest source of Australia's greenhouse emissions. Efforts are being made to improve coal combustion efficiency and to develop ways of disposing of its greenhouse emissions, which is essential in order to make coal an acceptable fuel for broad use in a carbon constrained future.

Natural gas is the lowest greenhouse gas emission fossil fuel.

Renewable energy applications emit negligible greenhouse gases, but most of these applications are some years from broad commercial realisation or economic competitiveness.

Greenhouse emissions in the stationary energy sector can be contained in the near term by expanding the use of gas while new, lower greenhouse emission technologies are developed to a point of commerciality, including low emission coal technology and renewable energy technology.

In order to encourage industry to move to more greenhouse-friendly power generation all levels of government need to provide financial, legal and policy incentives.

Growth in energy demand

World energy consumption has been forecast to increase by almost 60% between 2002 and 2030 (World Energy Outlook, IEA, 2004). Over a similar period, Australia's domestic energy consumption is also expected to increase by 60%. Total Australian energy production is expected to double as energy exports continue to increase.

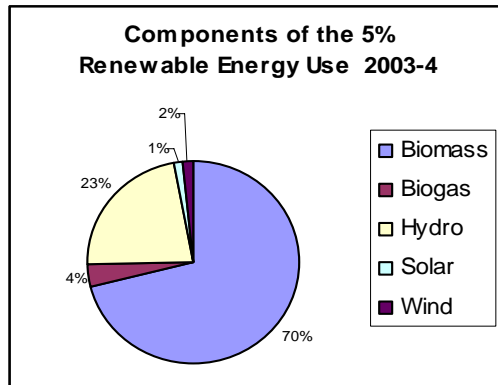
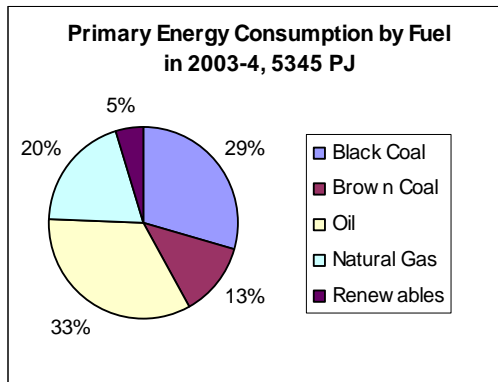
Recent droughts and unstable weather conditions have increased public focus on global warming and concerns about greenhouse emissions from fossil fuels. Renewable energies have been receiving particular attention as cleaner sources of energy, and debate has been rekindled regarding nuclear energy.

In considering Australia's opportunities to address the growing need for energy while meeting concerns regarding increasing greenhouse emissions, it is useful to consider the international situation.

Germany and Denmark have led the way in wind-powered electricity generation. The use of solar energy continues to increase in Japan. Nuclear energy is under reconsideration for energy supply in the US, France and Japan, but there remains some public concern regarding safety, security and waste disposal. Coal is expected to underpin both China's and India's

growing demand for electricity. The International Energy Agency is forecasting the increased use of natural gas, including increased use of liquid natural gas (LNG) where local supplies become inadequate to meet demand. The use of oil for transport is expected to remain dominant, with bio-fuels gaining some market share but this increase is from a very small base.

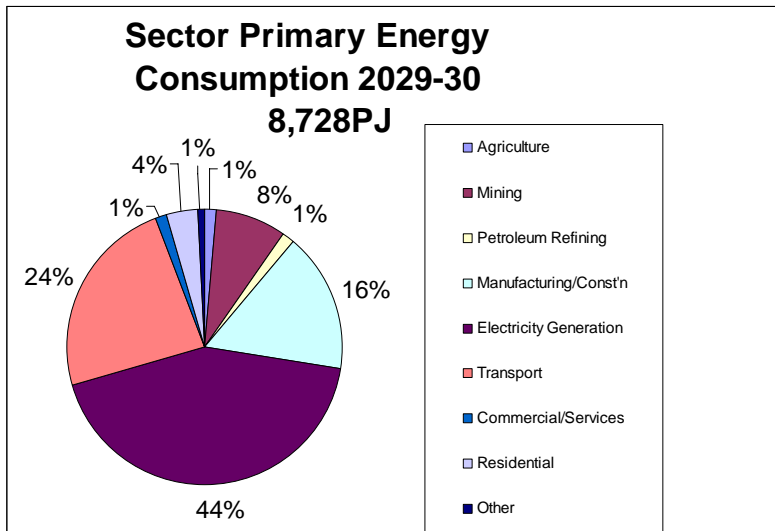
Current fuel use and Australia’s future energy consumption



Data source: ABARE Energy Projections report, October 05

Australia’s current primary fuel consumption is dominated by coal (42%), oil (33%), which is mainly used for transport, and gas (20%). Renewable Energy comprises only 5% of the energy mix and is predominantly biomass (70%), which includes wood, wood waste and sugar cane residue), hydro (23%), biogas (4%, from landfill and sewage gas), wind (2%) and solar (1%).

Primary energy consumption is forecast to increase from 5,435 PJ in 2003-04, to 8,728 PJ by 2029-30. (A PJ is the energy equivalent of about 29 million litres of petrol, the fuel used by 14,000 “average” Australian vehicles over one year.)

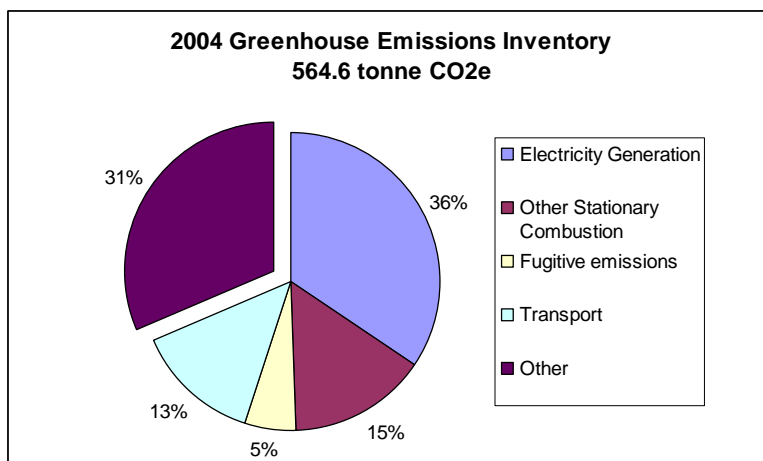


Data source: ABARE Energy Projections report, October 05

The pattern of future domestic consumption is forecast to be similar to 2003-2004. Electricity generation (44%), transport (24%) and manufacturing (16%) are the largest consumers of primary fuels.

Greenhouse emissions from current energy use, and influencing factors

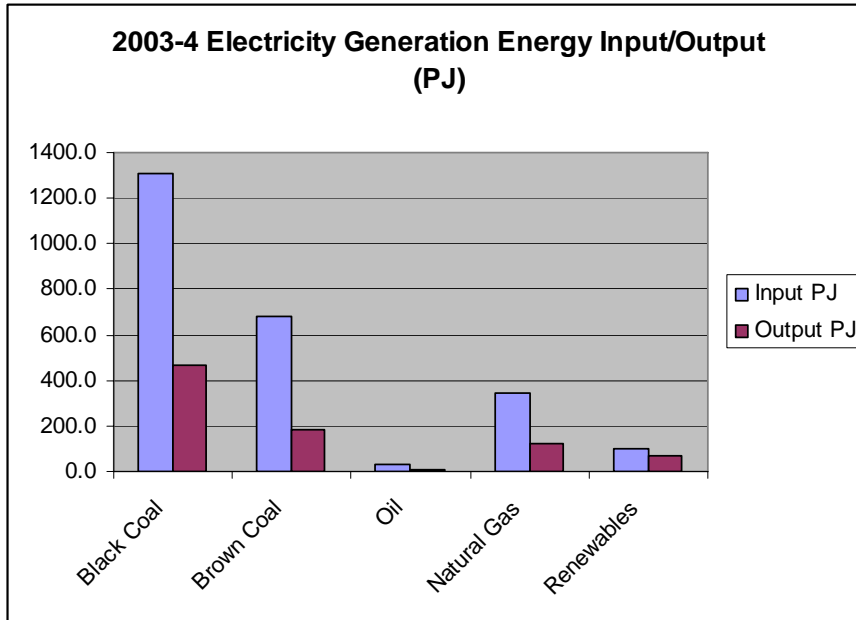
Energy, including transport, electricity generation, other stationary combustion and fugitive emissions from fuels (ie leakage during extraction, processing and transport - mainly from coal), were 69% of Australia's greenhouse emissions in 2004. Hence the production and use of energy is critical to the nation's future greenhouse emissions profile.



Data Source: Australian Greenhouse Office Factors and Methods Workbook, December 2005

The conversion of fossil fuels to electrical power has an average efficiency of 35%; ie 65% of energy is lost, mainly as waste heat. In producing electricity in 2003-4, the 65% of energy lost was about 1600PJ (equivalent to about half of

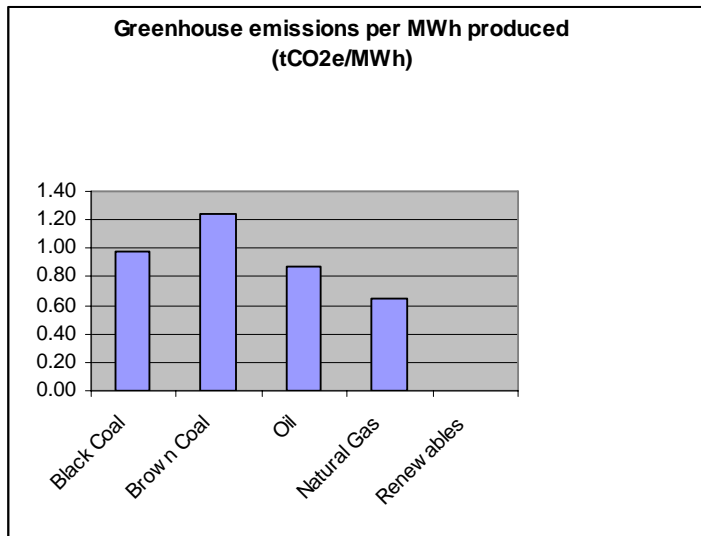
Australia's end use consumption) and contributed roughly 140 million tonne CO₂e, about 25% of the Australian 2004 greenhouse inventory.



Data source: ABARE Energy Projections report, October 05

Some of this lost heat can be recovered by using combined cycle and cogeneration technology, which converts the waste heat energy to useable power (a target for energy efficiency improvement potential described below).

Coal is currently the main fuel used for electricity generation. Greenhouse emissions per MWh from black coal-fired electricity generation are about one and half times the emissions from natural-gas-fired plant and emissions from brown coal-fired generation emissions are almost double the emissions from natural-gas-fired plant. Emissions from renewable energy are almost negligible.



Data Source: Energy Efficiency Opportunities Industry Guidelines (2006)

In fact, if all Australia's 2003-2004 power had been generated from natural-gas-fired generators and from renewable energy sources, greenhouse emissions would have been halved, without introducing energy efficiencies.

Future use of coal

Coal is expected to continue to be an important source of energy in Australia and internationally because of its abundance and low production costs. Research and technical development is currently being undertaken to improve the efficiency of coal-fired generation to reduce its greenhouse emissions.

New Energy Supply for Australia - Key Factors

Over the next 25 years, new energy sources will need to be developed to replace a substantial proportion of existing energy supply as well as to meet the anticipated growth in demand. Rebuilding of energy supply provides an opportunity to reduce greenhouse emissions by introducing low greenhouse emission technologies that are economically viable.

The principal options for energy sources that will offer reduced greenhouse emissions include:

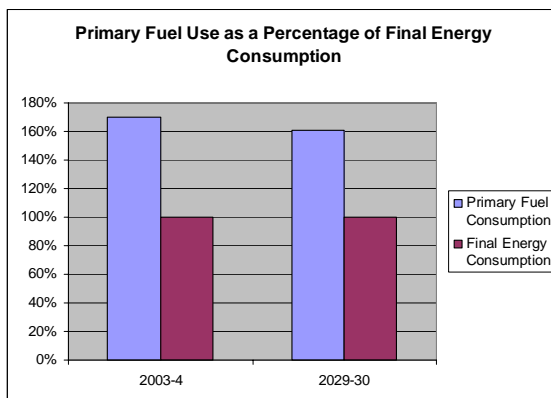
- Renewables (mainly solar and wind)
- Fossil fuels (using improved technologies)
- Nuclear

Energy Efficiency Improvement

Investing in improvements in energy efficiency has the appeal of saving fuel costs as well as reducing greenhouse emissions.

Australian government incentives towards realising energy efficiency improvements include:

- The voluntary Generator Efficiency Standards measure introduced in 2000, with anticipated greenhouse emission reductions of 4 million tonne CO₂e per year (about 1.3% of 2004 emissions).
- The Federal Government's Energy Opportunities Act which took effect in July 2006, requiring organisations using more than 0.5PJ/yr of energy to undertake energy opportunity assessments and identify projects that payback within 4 years.
- Minimum energy performance standards for buildings incorporated in the Building Code in 2006.



Data source: ABARE Energy Projections report, October 05

In any analysis some improvement in energy efficiency should be assumed, for example ABARE assumptions for 2030 energy demand assume an energy efficiency reduction of 10% in primary energy requirements as a percentage of final energy use.

Further efficiency in end use, energy production and conversion might have the potential to reduce the demand for primary fuels by a possible further 10-20%, with corresponding reductions in fuel costs and greenhouse emissions. However, achieving a significant reduction of 25% or more of Australia's greenhouse emissions in the 25-year time-frame is likely to require substantial investment in the development of renewable energy sources, improved zero-emission technologies and/or large scale recovery and disposal of greenhouse gases emitted by fossil-fuel power generation.

Primary energy technologies

Different technologies have different advantages and impediments. Attachment 1 provides an assessment of the likelihood of their possible adoption in the future energy mix, based on these attributes.

The adoption of any particular technology is driven by safety, security and environmental issues as well as commercial considerations. Adverse publicity from the Chernobyl, Three Mile Island and, more recently, Forsmark Sweden incidents have damaged nuclear energy's public image and there has been reluctance to sanction new reactors in Japan, the US and France all of which have significant nuclear generating capacity (refer Attachment 2 for more information regarding the international picture). Australia has many alternatives to nuclear energy generation, so it is unlikely that nuclear power generation would be publicly acceptable.

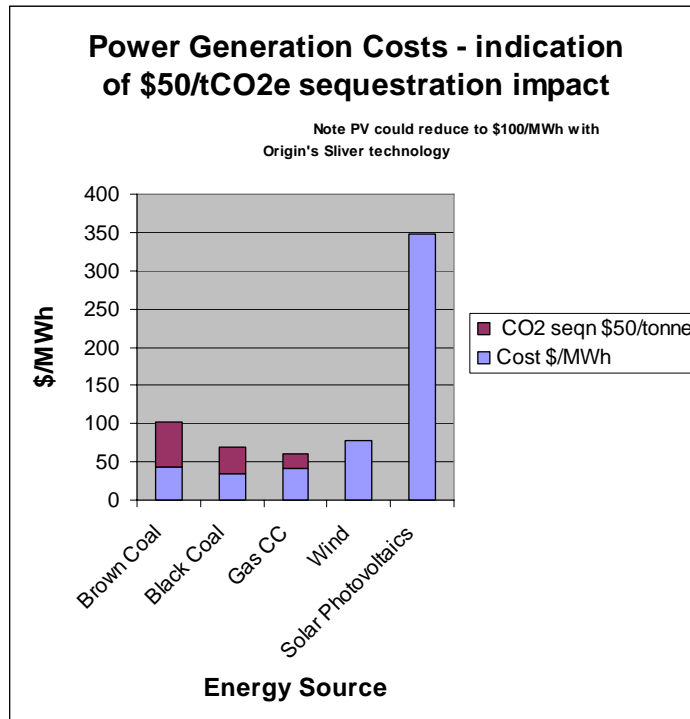
Both renewable energies and fossil fuels have a role in the future development of greenhouse-friendly energy generation:

- **Renewable energies.** It will be some time before this option becomes economically competitive on a broad scale. While renewable energies' share of the market is seen to be increasing and costs are reducing, the rate of cost reduction and production capability of new renewable energy facilities would not meet expanding energy demand on their own. Hence fossil fuels will be required into the foreseeable future as primary sources of energy.
- **Fossil fuel** Greenhouse emissions capture and sequestration will be necessary in order to substantially reduce greenhouse emissions. Capture and geo-sequestration (injection of CO₂ underground) of greenhouse emissions from fossil fuels has the potential to achieve significant reductions in emissions.

At a cost of around \$50/tCO₂e injected, sequestering emissions would roughly double the cost of electrical power from new generation coal generators, and add about one third to the cost of electrical power generation from natural gas.

Clearly, any move to reduce greenhouse emissions in energy generation will be costly.

Costs will vary between projects, but on this assessment, natural gas with geo-sequestration would prove to be very cost competitive.



Data source: COAG 2002 report – *Towards a Truly National and Efficient Energy Market and AGO Factors and Methods Workbook December 2005*

Incentives to reduce greenhouse emissions in energy generation

Due to the costs involved in the introduction of greenhouse-sensitive technology, power generation industries will require appropriate legal, policy and financial frameworks and encouragement from all levels of government.

Already, some legislation is in place (refer Attachment 3), including the Federal Mandatory Renewable Energy Scheme, the NSW Electricity Retailers Benchmark Scheme and Queensland's 13% gas electricity generation scheme. Clearly, a national emissions trading scheme (NETS), would increase the cost of energy production.

The Federal Government has not supported the states' NETS initiative, but has put in place a number of incentives for researching and developing new technologies, including:

- \$100 million for R&D, demonstration and commercialisation for renewable energy
- \$75 million for solar city trials of solar technologies
- \$34 million for wind forecasting and electricity storage
- a \$500 million Low Emission Technology Demonstration fund.

Conclusion

- ✦ there is international consensus that greenhouse gas emissions must be reduced
- ✦ to reduce emissions in energy generation, high-cost alternatives are available in renewable energy sources, such as solar and wind; and possibly geo-sequestration of emissions from fossil fuel fired power generation
- ✦ lower cost technologies to tap renewable energy sources are still being developed
- ✦ geo-sequestration of emissions from coal fired power generation requires further development and will require substantial investment
- ✦ natural gas currently offers the lowest greenhouse emitting fossil fuel power generation and could prove to be the lowest cost geo-sequestration option
- ✦ in order to encourage industry to move to greenhouse-friendly power generation, governments need to provide appropriate incentives and frameworks, including financial, legal and policy incentives

In managing the near term need for new energy and if greenhouse gas minimisation is a priority, it will be necessary to rely on natural gas and renewable energies, as the currently available lowest emission technologies. With the abundant supply of natural gas, and proven technologies, this fuel can be introduced relatively quickly as an alternative energy source, while newer low-emission and sequestration technologies are developed for the long-term reduction of greenhouse emissions from the stationary energy sector.

Attachment 1

Below are tables covering key technologies and the suggested likelihood of their contribution to the future energy mix.

Table 1 Renewable Energy

Energy source	Impediments	Advantages	Likely contribution to future energy mix
Hydro	<ul style="list-style-type: none"> • Environmental intrusion • Dependent on rainfall • Limited site availability 	<ul style="list-style-type: none"> • Proven technology • Dual use water storage/power supply 	Low
Wind	<ul style="list-style-type: none"> • Uncertain availability • Requires back-up power, or storage and appropriate switching • Limited location • Small capacity • Environmental intrusion • Cost 	<ul style="list-style-type: none"> • Proven technology • Decreasing cost with greater market penetration 	Moderate
Solar	<ul style="list-style-type: none"> • Uncertain availability • Dependent on sunlight hours • Requires back-up power or storage • Small capacity • Cost 	<ul style="list-style-type: none"> • Proven/developing technology • Decreasing cost with greater market penetration • Possible location at consumption point • Small power stations (remote) 	High
Wave/ tidal	<ul style="list-style-type: none"> • Limited, niche location • Requires back-up power or storage 	<ul style="list-style-type: none"> • Seaside, remote areas with suitable conditions 	Low
Biomass/bio gas	<ul style="list-style-type: none"> • Limited to waste availability or takes land to grow • Can be burned with coal 	<ul style="list-style-type: none"> • Uses proven combustion technology 	Moderate

Notes

Solar has particular application as a “distributed energy” for buildings, while biomass has more application for centralised energy production and distribution by network.

If Hot Dry Rock geothermal energy tests are successful, it offers the possibility of centralised, large scale electrical power over the 10 -15 year horizon.

Table 2 Fossil Fuels

Energy source	Impediments	Advantages	Likely contribution to future energy mix
Natural Gas	<ul style="list-style-type: none"> • Greenhouse emissions • Other combustion emissions (restricted by legislation) • Requires pipeline transport system 	<ul style="list-style-type: none"> • Distributed energy for small users • Large capacity stationary energy • Co-generation for applications where heat is of value • Emissions could be captured for disposal (eg injection underground “geo-sequestration”) 	High
Coal	<ul style="list-style-type: none"> • Greenhouse emissions (50% > natural gas) • Other combustion emissions (> gas but restricted by legislation) • Requires train or truck transport • Requires time to fire up boilers (only suitable for base load supply) 	<ul style="list-style-type: none"> • Large scale stationary energy • Transportable by truck, rail, ship • Potential for coal gasification/combined cycle plant for greater efficiency • Emissions could be captured for disposal (eg injection underground “geo-sequestration”) 	Moderate
Oil (Petroleum Products)	<ul style="list-style-type: none"> • Expense reduces application for large scale stationary energy • Greenhouse emissions (> gas < coal) 	<ul style="list-style-type: none"> • Non fuel applications as lubricant/plastics feedstock • Transport fuel • Easily transportable by truck, rail, ship pipeline • Useful for small remote community power generation 	High demand for transport

Table 3 Nuclear Energy

Energy source	Impediments	Advantages	Likely contribution to future energy mix
Uranium	<ul style="list-style-type: none">• Operational safety record• Consequences of explosion/meltdown• Waste disposal and decommissioning of old plant	<ul style="list-style-type: none">• Negligible Greenhouse emissions in operation (Mining, milling and enrichment of low grade uranium incurs emissions)	Low

Nuclear Energy – International practice

Some 16% of 2002 global electricity generation was provided by nuclear energy power stations in 31 countries. 85% of 2002 global nuclear power generation was provided by OECD countries (France generated 79% of its 2002 power usage). The USA generates some 20% of its electricity from nuclear power.

Debate about nuclear energy expansion, and/or replacement of plant coming to the end of life, has been influenced by potentially dangerous incidents at Chernobyl, Three Mile Island and more recently, Forsmark, Sweden. Disposal of waste and security against terrorism have also been cited as issues. Some countries (including Sweden, Belgium and Slovakia) have said they will phase out nuclear power while others maintain plans to expand nuclear generation capacity.

The USA shut down some 7 of its 120 reactors due to economic, regulatory and political considerations (Uranium Information Centre). However, the increasing price of fossil fuels and strategic implications of having to import them, has favoured reconsideration of nuclear power generation not only in the US but in other countries.

The current position regarding future reactors as set out by the UIC is summarised below:

World Nuclear Power Reactors 2005-06 (From UIC table)

Country	Operable reactors	Under construction/ planned	Proposed
Belgium	7	0	0
Canada	18	4*	0
China	10	18	50
China (Taiwan)	6	2	0
Czech Republic	6	0	2
Finland	4	1	0
France	59	1	1
Germany	17	0	0
India	16	11	20
Japan	55	13	1
Korea	20	8	0
Russia	31	11	18
South Africa	2	1	24
Spain	8	0	0
Sweden	10	0	0
Ukraine	15	2	0
UK	23	0	0
USA	103	3	21
Other	32	15	23
Total	442	90	160

* Includes 2 laid up units, to be refurbished

There will be a need to shut down existing units as they reach end of life (for example France has to start replacing its reactors circa 2020). However, there is a current trend to extend operating lives on a refurbishment and recertification basis and there are likely to be additions to the number of planned units if the nuclear lobby is successful.

Key government legislation affecting the energy mix

Legislation (Federal/State)	Description	Nominated Objective	Remarks
<i>Renewable Energy (Electricity) Amendment Act 2000 and subsequent amendments</i> (Federal)	Imposes a legal obligation on electricity retailers and other large electricity customers to source an additional 2% of their electricity from renewable or specified waste-product energy sources by 2010. Renewable energy certificates need to be provided for compliance or a penalty is applied (\$40/MWh abatement certificate shortfall)	Reduce emissions of greenhouse gases and encourage the development of a renewable energy industry in Australia. REC's will cease to apply beyond 2020. (Compliance certificates are tradeable to achieve lowest cost compliance)	Spot prices for July 2005 certificates (REC's) \$28.90/MWh <i>Spot prices BCSE-SEU, July 2005</i>
<i>NSW Greenhouse Abatement Scheme (commenced 1/1/2003)</i> (NSW)	Requires individual electricity retailers and certain other parties who buy or sell electricity in NSW to meet mandatory benchmarks based on the size of their share of the electricity market. Greenhouse abatement certificates need to be provided for compliance or a penalty is applied (\$11.50/tCO _{2e} abatement certificate shortfall)	Reducing the emission per head of NSW population from 8.65 tCO _{2e} /yr to 7.27 tCO _{2e} /yr by 2007 and hold emissions at that level to 2012. (Compliance certificates are tradeable to achieve lowest cost compliance achieved)	Spot prices for July 2005 certificates (NGAC's) \$11.70/tonne of CO _{2e} <i>Spot prices BCSE-SEU, July 2005</i> CO _{2e} is roughly equivalent to the emissions from an average 0.9 MWh of generated power)
<i>Queensland 13% Gas Scheme (commenced 1/1/2005)</i> (Queensland)	Requires Queensland electricity retailers and other liable parties to source at least 13% of their electricity from gas-fired generation. Gas electricity generation certificates need to be provided for compliance of a penalty is applied (\$11/MWh certificate shortfall, CPI indexed)	Assist in encouraging the development of new gas sources and infrastructure in Queensland and reduce greenhouse gas emissions from the Queensland electricity sector. Scheme terminates after 15 years (Compliance certificates are tradeable to achieve lowest cost compliance)	Spot prices for July 2005 certificates (GEC's) \$15.50/MWh <i>Spot prices BCSE-SEU, July 2005</i>

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