Santos Limited

# 2009 Energy White Paper Public Submission

Santos

29 May 2009

# Table of Contents

**"EVERYWHERE IN THE WORLD WHERE NATURAL GAS IS AVAILABLE, IT IS BEING USED AND IT IS BEING WELCOMED BY THE USERS, FOR IT IS CHEAP, CLEAN, EFFICIENT AND EASILY HANDLED"**

SANTOS LIMITED, DIRECTORS' REPORT, 1967

**"OUR NATURAL GAS RESOURCES OFFER CLEAN, RELIABLE AND ABUNDANT ENERGY FOR AUSTRALIA AND ASIA"**

CHIEF EXECUTIVE OFFICER, SANTOS ANNUAL REPORT, 2008

**"THE MORE THINGS CHANGE, THE MORE THINGS STAY THE SAME"**

ALPHONSE KARR (1808-90); GEORGE BERNARD SHAW (1903)

## 1. EXECUTIVE SUMMARY – AUSTRALIA'S 'NEW' COMPARATIVE ADVANTAGE IN POWER GENERATION

**Natural gas and renewable energy is an immediate solution to establishing an Australian comparative advantage in clean, reliable power generation**

Australia's abundant natural gas resources combined with reliable gas-fired power generation technology places Australia in an enviable position to maintain long-term, clean energy security. Australia's substantial economic and social prosperity has been underwritten by a strong comparative advantage in power generation over many decades thanks to extensive coal resources. But the challenge of delivering energy security while managing climate change and its impact requires a new comparative advantage if this prosperity is to be maintained into the future.

**Australia's natural gas resources provide both immediate and long-term potential to underwrite such a new comparative and strategic advantage for Australia**. The low carbon intensity and proven reliability of gas fired power generation has, in particular, the potential to underwrite a broader portfolio of low to zero emission energy platforms. The potential of Australia's natural gas also extends beyond domestic energy security, and in supporting efforts to decarbonise the Asia-Pacific's energy system. This overarching potential requires a policy framework that provides both commercial certainty and encourages early technological innovation.

The opportunity around Australia's natural gas industry is four-fold:

1. an immediate, proven way to **transform baseload power generation away from high-carbon coal to low-carbon gas**, "buying-time" for advances in renewable technologies;
2. to act as a "natural" partner that **supports and accelerates the integration of intermittent renewable power generation** into Australia's energy grid;
3. supplying growing **Asia-Pacific demand for LNG**, particularly from the key economies such as China and India, and displacing higher-emission fuels; and
4. to build an industry that becomes **a major domestic economic driver**, generating thousands of new skilled jobs, tens of billions of dollars of new investment and more again in additional export revenue and government taxes and royalties.

The key issues that underwrite the compelling potential of Australian natural gas in this regard are:

- the **low carbon, water and land-use intensity** of gas-fired power generation;
- a large **resource base**, equivalent to several hundred years of current use, close to domestic (and foreign) demand points and linked by an extensive and growing pipeline network;

- its status as **a reliable, proven power generation technology**, including flexibility to provide baseload, intermediate and peaking loads (ie. the full load spectrum); and
- its competitive **affordability** as a power source, also underwritten by multiple gas producers.

The vision of reducing carbon emissions from stationary power generation will only be realised if carbon is priced. Unless a clear price and a level playing field are in place, the necessary multi-billion dollar investments in **baseload gas-fired power plants** will not take place. Unless a clear price of carbon and level playing field are in place, enabling reasonable assessments regarding the demand for gas, the pace of economic transition and providing overall investment certainty, then the full potential for natural gas will be at best delayed, at worst lost.

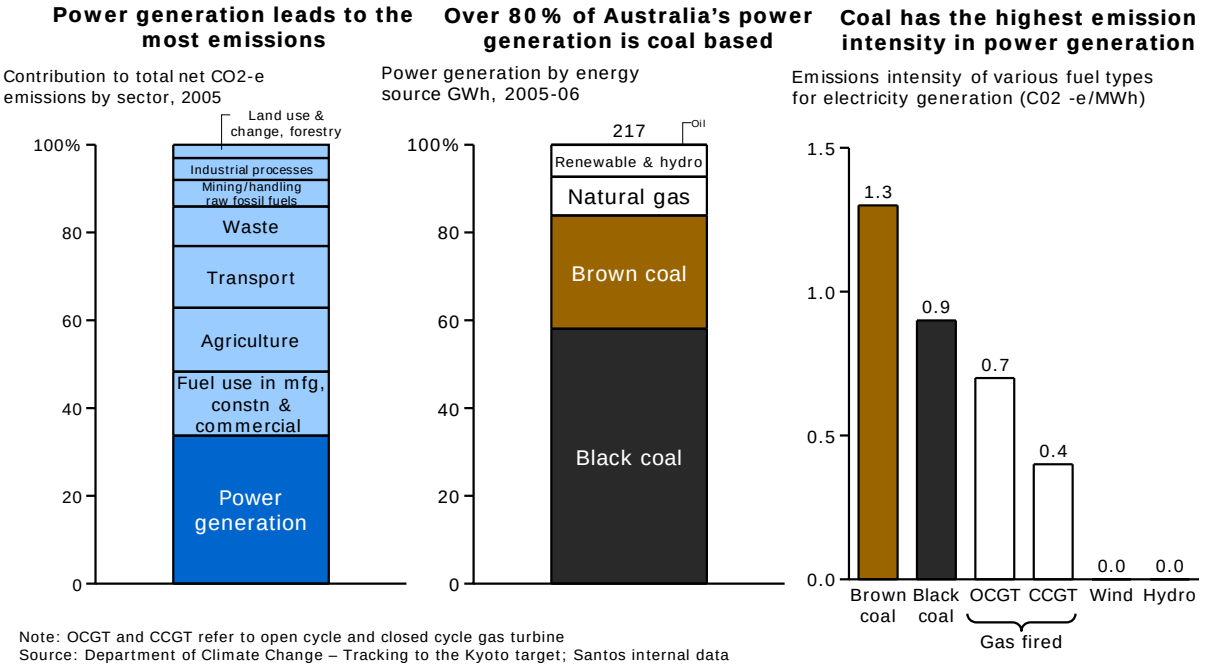
Accordingly, Santos welcomes the Energy White Paper which should bring clarity to Australia's energy debate, and **ensure Australia's domestic natural gas potential is given proper policy consideration**. For decades, Australians have had the luxury of taking energy for granted. A well-informed debate will help convey the scale, complexity and capital intensive nature of Australia's energy system. This, in turn, should enable sober public reflection and policy assessments regarding the energy choices available to Australia, including the costs and consequences of policy measures that distort a level-playing field in energy competition and obscure pursuit of lowest cost carbon abatement for industry and consumers now and well into the future.

Although Australians have used natural gas for many years, community recognition of its role in Australia's energy future is low. This submission seeks, through the Energy White Paper process, to encourage a **greater public awareness of natural gas** and its potential. This potential goes beyond energy security and carbon reduction to include substantial employment and investment opportunities, particularly in regional communities of Australia.

**By 2050, natural gas can underwrite a 20% reduction of carbon emissions in power generation over 2000 levels while still doubling the level of power available to Australian industry and homes.**

## 2. OVERVIEW

Any significant reduction in Australia's carbon footprint requires a substantial decarbonisation of emissions from the power generation sector. As Diagram 1 illustrates, the power generation sector is responsible for the largest share of emissions in the Australian economy (~35%). Within that, coal-fired power generation provides ~80% of Australia's electricity, using high-carbon baseload technologies, fed by either brown or black coal. For there to be substantial progress in this space then the reliance upon existing coal-fired power technology must be addressed.




Note: OCGT and CCGT refer to open cycle and closed cycle gas turbine
Source: Department of Climate Change – Tracking to the Kyoto target; Santos internal data

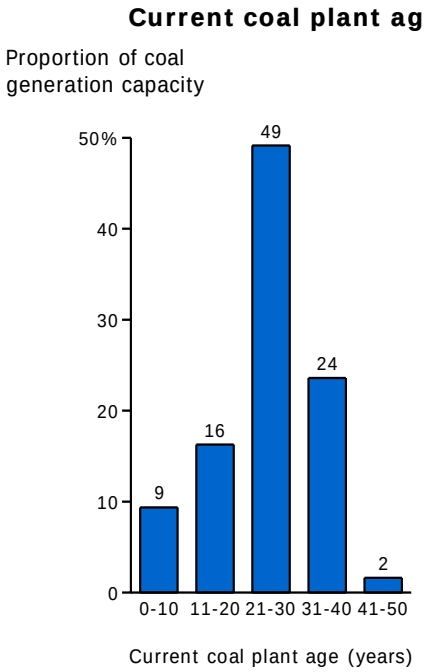
*Diagram 1*

The challenge, however, in achieving an economy-wide emissions reduction of 60% by 2050 is compounded by the fact that, absent significant change in demand behaviour and efficiency measures, demand for electricity in Australia will continue to grow. In eastern Australia alone, demand can be expected to double on a business-as-usual basis over the same timeframe.

Australia therefore confronts a situation where over the next decade and beyond, substantial baseload power investment is required. This is both a function of demand growth but also the ageing of eastern Australia's current coal plant fleet. As Diagram 2 illustrates, 75% of this existing fleet is currently 20 years or older.

**But only two proven technologies are currently available in Australia to deliver reliable baseload power generation: coal-fired or gas-fired power generation**. Traditionally, Australia's

use of gas-fired power has been low due to Australia's cheap and reliable, but high emission, coal fired-power. The role played by coal in this regard has provided a comparative advantage for Australia's economy and society, underpinning decades of strong economic performance.




A price on carbon, however, will fundamentally and permanently alter the existing Australian power generation landscape, and Australia's traditional comparative advantage will disappear. The need to identify Australia's 'next' comparative advantage becomes paramount if, as expressed in the Strategic Directions Paper, Australia is to "*…secure cleaner, adequate, reliable and affordable supplies of energy to support our overall economic and social advancement*"[1].

This 'next' comparative advantage is eminently achievable with an appropriate mix of energy policies, and particularly if the operation of competitive energy markets are sufficiently preserved.

*Diagram 2*

At the heart of this new comparative advantage lies the role of natural gas, and doing four things:

- underwriting the transition of Australia's **long-term baseload power** requirements to a low-carbon platform, while "buying time" for advances in renewable technologies;
- supporting immediate **uptake of intermittent renewable power generation** (eg wind, solar);
- driving **substantial economic benefit** through employment and investment growth and more export income and royalties; and
- supporting decarbonisation of energy systems in the Asia-Pacific through increased levels of **liquefied natural gas exports (LNG)**.

The latter will also help Australia to manage the implications of climate change and energy security as seen through Australia's broader national security framework.

[1] DRET Discussion Paper, 'Strategic Directions Paper', p.3, March 2009

## 3. THE VIRTUES OF NATURAL GAS

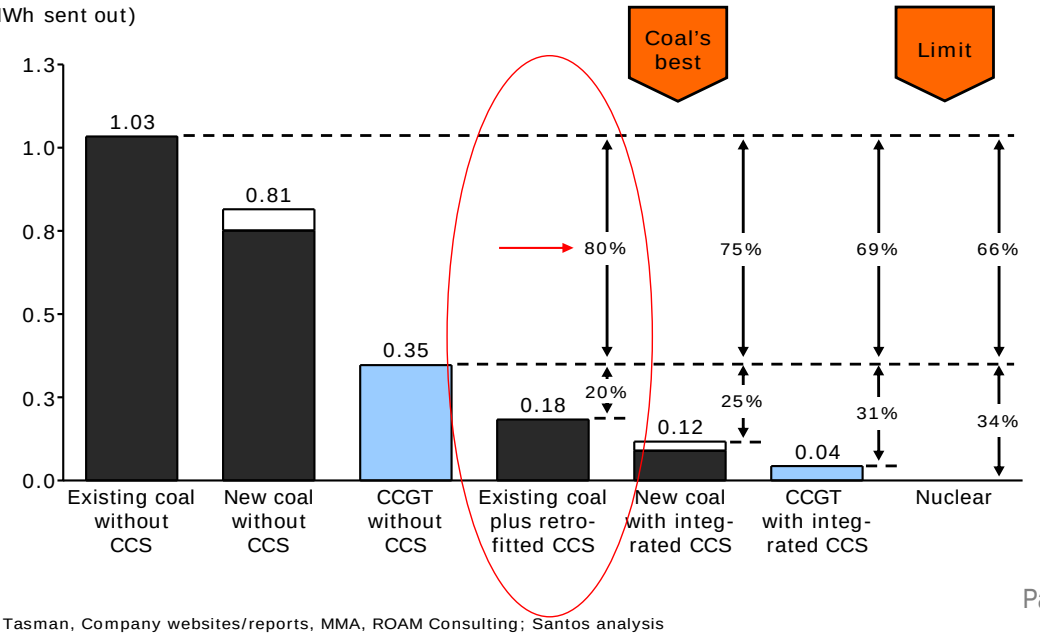
Australians have safely and reliably used natural gas for over 40 years. Its traditional use has been as a fuel for Australian industry, for power generation and for retail customers. It is a proven and reliable energy source that, in some respects, has become "old before its time". In reality, natural gas has never been more important for Australia. This dynamic is most apparent in Australia's short to medium term requirement for baseload power generation.

### 3a Clean Energy

Gas-fired power generation is **the only immediate measure by which to reduce substantially the carbon intensity of baseload power generation in Australia**. This is in terms of meeting both overall growth in energy demand and transitioning away from Australia's existing fleet of high carbon coal-fired baseload power generation as and when the fleet reaches a retirement age.

Of the two gas technologies open-cycle (OCGT) and combined-cycle (CCGT), CCGT is the technology platform used for base load. **Modern CCGT power stations emit ~40% of the CO2 produced by existing black coal power stations and ~30% of existing brown coal power stations**. More importantly, CCGT baseload power generation technology already delivers the large bulk of the carbon emission reductions that might be achieved should carbon capture and storage (CCS) technologies be successfully deployed in coal fired power generation. Diagram 3 (below) illustrates that, without any taxpayer-funded assistance, CCGT could today, reliably and affordably, delivers 80% of the projected carbon reductions that retro-fitting CCS to an existing baseload coal-fired power station in eastern Australia might achieve, and 75% of the reductions that might be achieved if new 'clean coal' power plants replaced existing baseload coal plants.

Average Eastern Australia Carbon Emissions Intensities
(tCO2e/MWh sent out)




Source: ACIL Tasman, Company websites/reports, MMA, ROAM Consulting; Santos analysis

### 3b An Abundant Supply

Australia's natural gas resource base is large and prolific, and **globally significant on any measure**. Estimates of the resource base compared to current annual demand indicate supply that will run well into the next century. This, however, has not always been the case and past legitimate concerns regarding long-term gas availability and proximity to eastern Australian markets now need to be unwound[2]. The single largest driver behind this unwinding is the emergence of eastern Australia's coal-seam gas (CSG) sector. This CSG resource has the potential to exceed that of the traditional home of Australia's gas reserves, the North West Shelf.

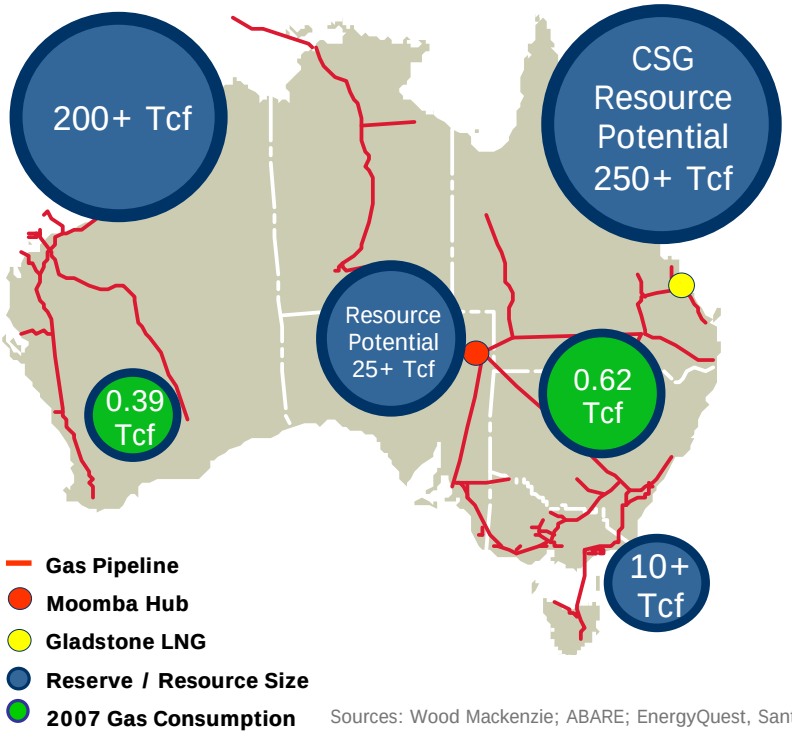



*Diagram 4*

Australia currently consumes ~1 Tcf of gas domestically each year, with ~60% of that occurring in the eastern States (Diagram 4). The largest proven reserve base remains off Australia's north-west coastline, with large bookings of reserves that underwrite substantial exports to the growing economies of Asia. In the past, some have suggested that these reserves would be required to underwrite eastern Australia's long-term gas demand.

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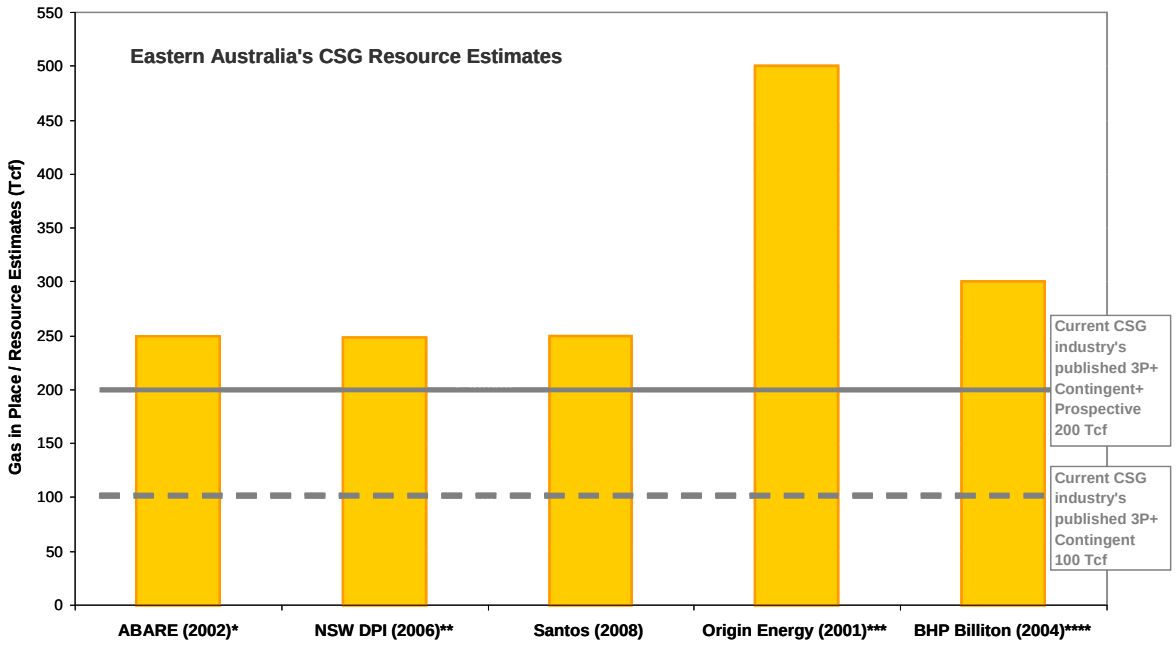
[2] See for example Research Paper, 'Australia's natural gas : issues and trends'. Parliament of Australia, Department of Parliamentary Services (2008) which still mention the possibility of a North West Shelf to eastern Australia pipeline.

In the space of a few years, however, eastern Australia's natural gas outlook has completely altered. Plans to import natural gas from Papua New Guinea into Queensland have been shelved. Indeed, and indicative of the scale and pace of change, within five years Queensland is expected to become Australia's third, and second largest, LNG export province.

Estimates of the potential eastern Australian CSG resource vary from 250 Tcf to 500 Tcf (Diagram 5). The consensus view, however, is that there is likely to be greater than 250 Tcf in eastern Australia, to which another 10 Tcf of conventional gas in offshore Victoria and up to 25 Tcf of unconventional gas in the Cooper Basin can be added.

This potential will meet eastern Australia's demand well beyond the next 100 years, including LNG, power generation, industry and other domestic requirements.

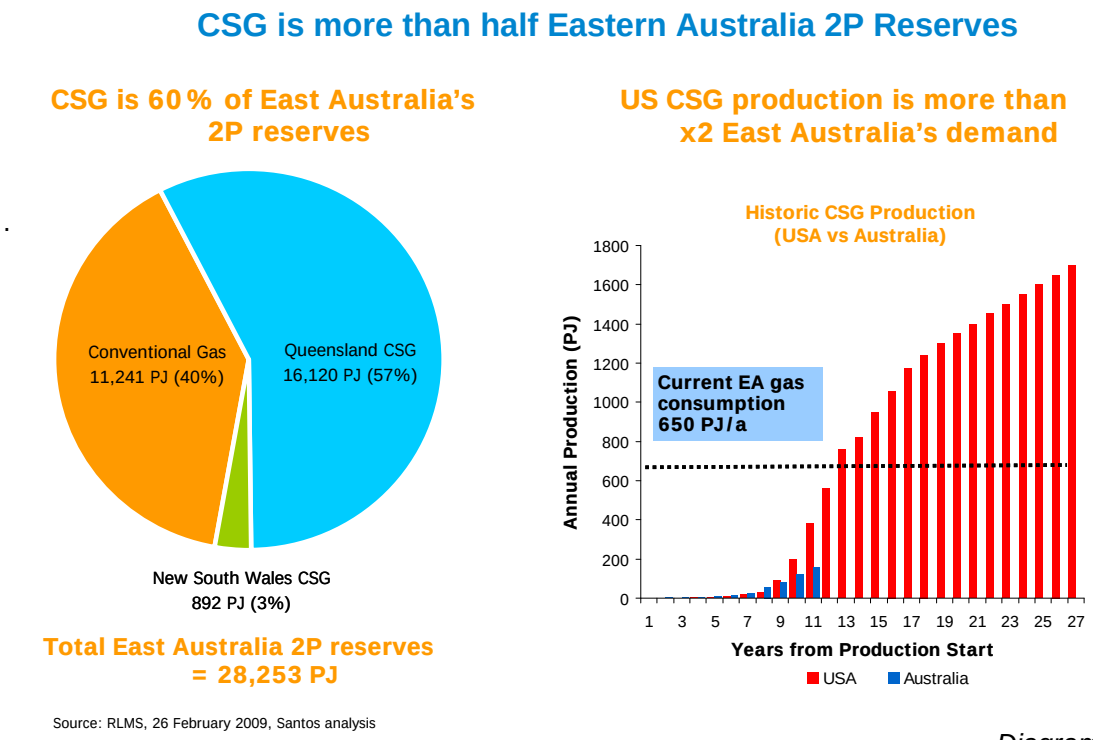



* Estimates of Qld Bowen & NSW Basins. Excludes Surat Basin in Qld
** Estimates of NSW Gunnedah and Sydney Basins only
*** Origin Energy (2001), "Origin Energy - Gas Supply in Eastern Australia, AGA Conference
**** BHP Billiton (2004) BHP Billiton's role in Coal Seam Gas, Presentation to 2nd Annual National CSM-CMM Summit

*Diagram 5*

Although the CSG industry has absorbed more than $20 billion of foreign investment over the last 18 months, it remains in its infancy. Nevertheless, CSG already supplies more than 20% of Eastern Australia's total gas production, a high market penetration for an industry less than a decade old, and reflects the very high quality of the fields in production.

Diagram 6 shows CSG as a proportion of eastern Australia's 2P Reserves and demonstrates the United States' experience with CSG. The US analogy illustrates that **where sufficient demand exists, CSG exploration and production will grow rapidly to meet that demand**. The corollary is that where demand is curtailed (or the supply side distorted), there will be no driver to continue to explore and increase production. Australia's domestic gas market is less than 1/20th that of the United States, and it is the proposed Gladstone LNG projects that are now stimulating drilling leading to large reserve additions and increased security of supply for the domestic market.




Source: RLMS, 26 February 2009, Santos analysis

*Diagram 6*

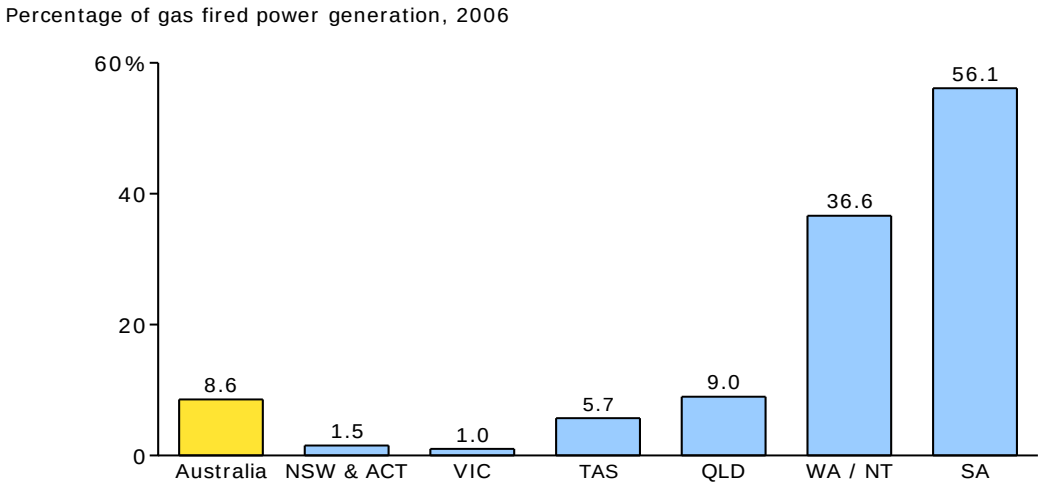
Since 2000, there has been a rapid conversion of gas into reserves. Eastern Australian 2P reserves, for example, have increased by an average annual compounding growth rate of 57% and 3P by 76%. Contingent resources have undergone a significant increase in the past two years with a 300% average annual compounding growth rate. Core Energy Group estimates that 2P reserves build will continue at a rapid pace, more than doubling over the period to 2015[3].

[3] Core Energy Group (2008), Australian Coal Seam Gas Outlook 2008

### 3c Proven, Reliable and Affordable Technology

Gas-fired power generation is a proven, reliable and affordable platform upon which to build Australia's future economic growth. In addition to clean, these three attributes are essential if Australia's baseload energy transformation is to occur in an economically responsible manner.

Traditionally, however, gas-fired power generation has provided a small percentage of Australia's power generation capacity, less than 10%. In 2006, natural gas accounted for 8.6% of power generated in Australia, while in Victoria and NSW penetration was less than 2% (Diagram 7).

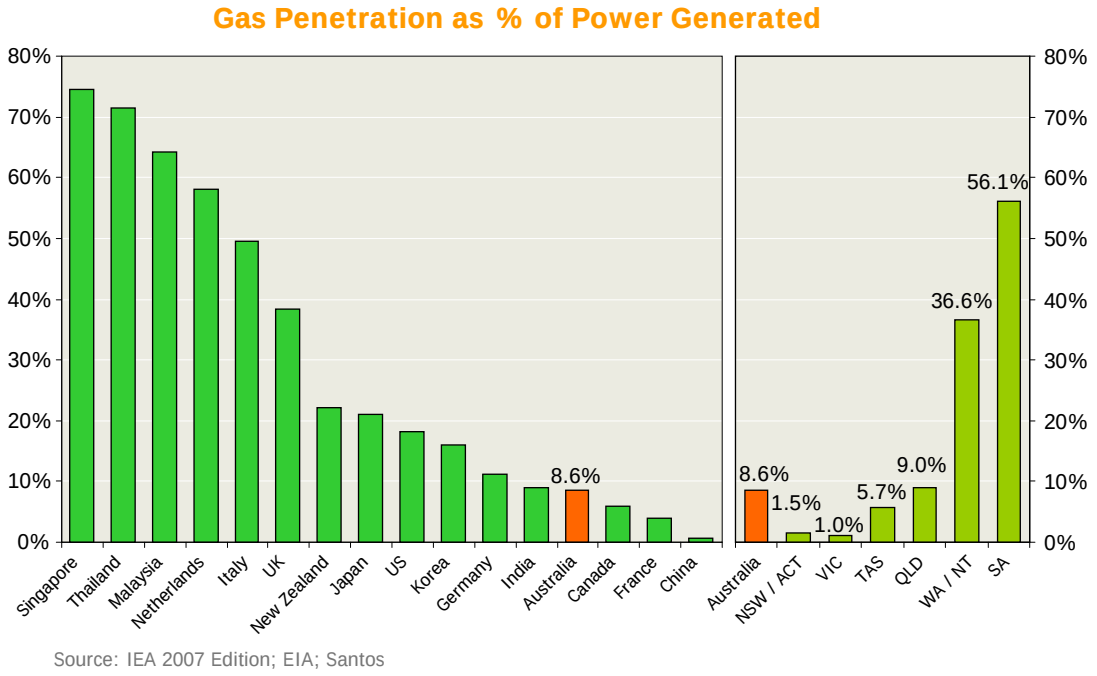



Note: VIC includes 5.2GWh from Snowy hydro
Source: Energy Supply Association of Australia, 2006 report

*Diagram 7*

This limited role is a direct function of Australia's historical coal usage – and not a reflection on the reliability or relevance of gas-fired technology. Indeed, it was the reliability of gas that acted as a buffer against the impact of the 2007 drought upon eastern Australian power generation. The drought naturally affected levels of hydro-electricity, but also coal-fired power generation due to coal's heavy reliance upon fresh water (see below). In 2007 the penetration of gas-fired power generation jumped to 12.1%, driven by additional reliance upon peaking and intermediate loads.

The very high levels of gas-fired power penetration in South Australia, Western Australia and the Northern Territory illustrate the larger potential for gas-fired power generation. Further evidence of the reliability of gas-fired power technology is demonstrated when a comparison is made between Australia's penetration rate and that of other major economies in Diagram 8.

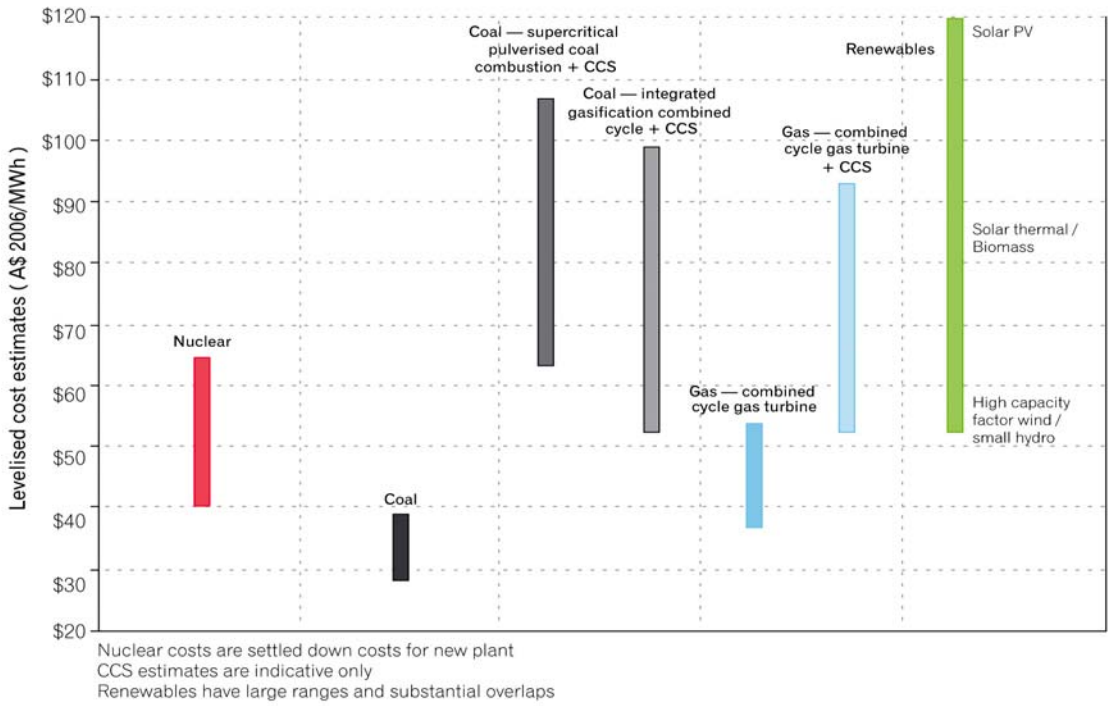



Source: IEA 2007 Edition; EIA; Santos

*Diagram 8*

Natural gas is an affordable fuel for the Australian economy and consumers. In Diagram 9[4] it can be seen that CCGT power generation compares favourably on an existing cost basis, albeit coal is the low cost generator in the absence of a carbon price.

**Lifecycle economic costs of electricity generation**

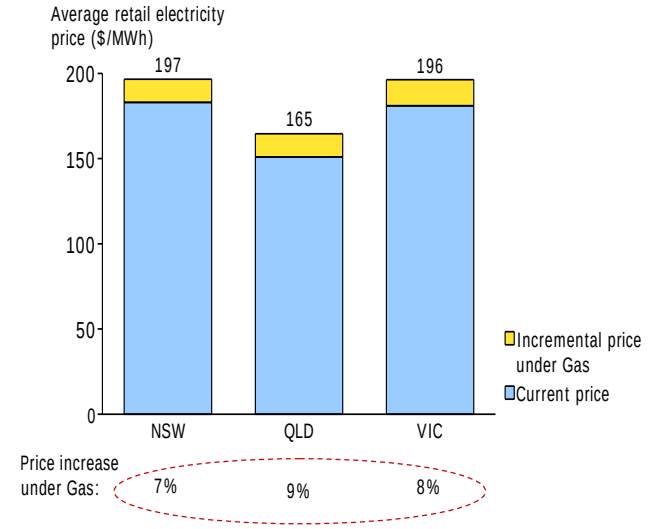



[4] Report to the Prime Minister by the Uranium Mining, Processing and Nuclear Energy Review Taskforce, December 2006

*Diagram 9*

The introduction of a carbon price into the economy, assuming an otherwise sufficiently level playing field amongst all fuel types is preserved, will maintain the price competitiveness of natural gas given CCGT's significantly lower carbon emissions per MWh than the existing coal fleet.

But the particular importance of a clear carbon price revolves less around enabling the competitiveness of CCGT. Rather, it is to act as **the catalyst for transition** whereby natural gas begins to displace the existing coal-fired power generation fleet, and puts Australia on the path to a cleaner power generation platform, most notably for baseload.




Notes: Incremental price under gas is scaled by proportion of electricity provided by base load (85%); Assumed gas price of $4.00/Gj delivered;
Source: ESCOSA price comparator; QCA price comparator; www.goswitch.com.au; Santos analysis

*Diagram 10*

As Diagram 10 illustrates, a transition to natural gas at current gas prices would have a modest impact on the existing average retail electricity price (coal without a carbon price) across eastern Australia while locking in significant carbon savings. It is expected that a carbon price of between $20 to $30/tCO2e would be sufficient to start the displacement process.

Any increase in gas price is unlikely to unsettle the potential for natural gas in power generation. The growing demand for gas will continue to put some upward pressure on domestic gas prices, but predictions of export parity are not supported by market analysts.

The consensus outlook for eastern Australia gas prices is for relatively flat prices with limited external price shock from the LNG industry (Diagram 11). This is due to the scale of the resource base that is emerging in eastern Australia.

**Forecast Eastern Australian Gas Prices**

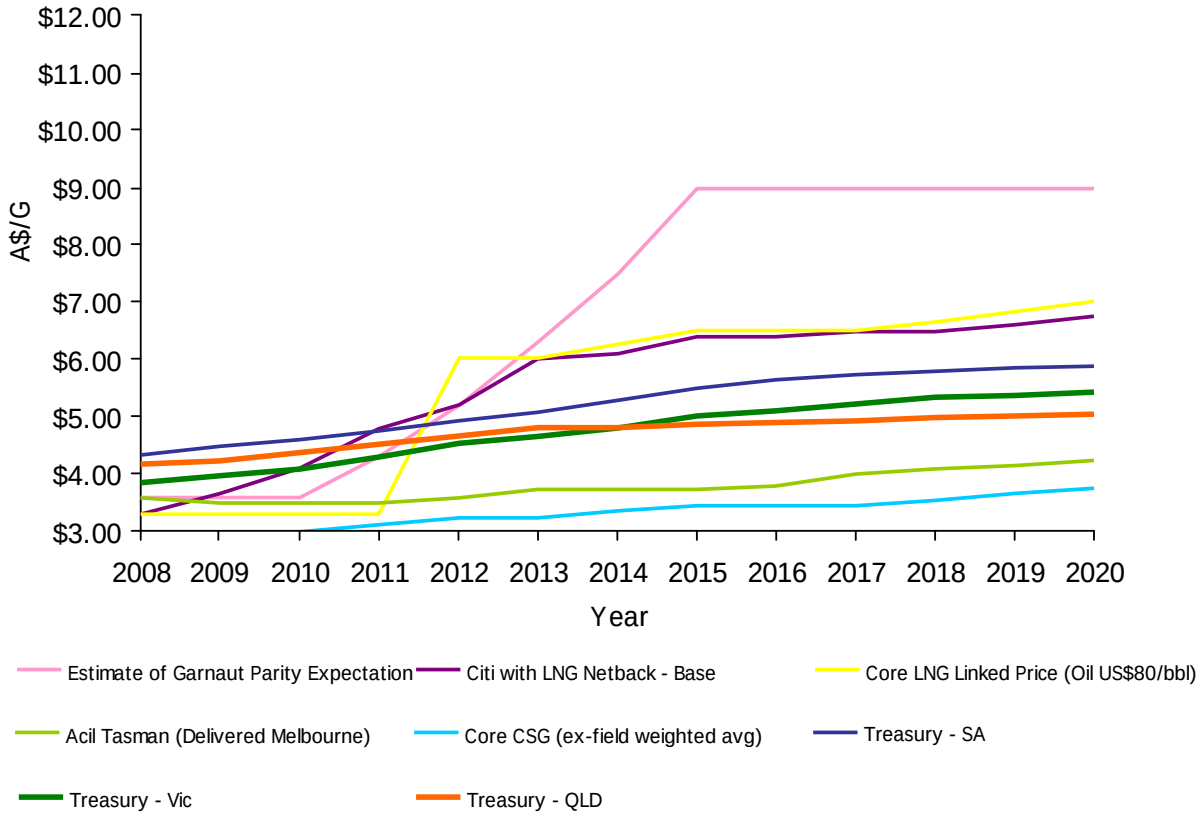



*Diagram 11*

It should also be borne in mind that the actual gas price only constitutes a small part of the overall cost of electricity to the consumer, currently in the order of 15%. The bulk of the retail electricity price is contained in the cost of generation, transmission and retail costs.

A compelling aspect of natural gas's potential to underwrite a low and zero emissions energy portfolio for Australia, is its immediate capacity to deliver baseload power generation. Without an immediate transition to low carbon baseload power as Australia's existing coal fleet retires, then the burden of carbon emission cuts will need to be felt more heavily across the wider economy.

### 3d Water Wise

Reliability is not just a function of technology, but of inputs – including the primary fuel and other external requirements. As demonstrated above, Australia has an abundant supply of gas within its own borders - its energy security is inherent. The issue of water, however, is often overlooked.

A comprehensive and integrated review of energy security in Australia should examine the dependence upon water. For example, the Latrobe Valley power generators use nearly 100,000 million litres of fresh water a year, which is equivalent to 25% of the potable water supplied by

Melbourne Water each year. **CCGT power-generation uses no more than 20% of the fresh water used by the existing coal-fired power generation fleet per MWH, and virtually no fresh water at all using certain CCGT technologies**, further enhancing its reliability from external disruption, and its much lower call upon Australia's water supplies. Santos' proposed Shaw River power project in western Victoria takes this a step further: to the extent water is required, it will use recycled water from the Port Fairy sewerage plant.

### 3e Existing Pipeline Infrastructure

Importantly, Australia's potential to deliver a baseload gas solution is reinforced by the presence of an already substantial network of pipeline infrastructure. This infrastructure is growing and already connects the major supply and demand points (Diagram 12).

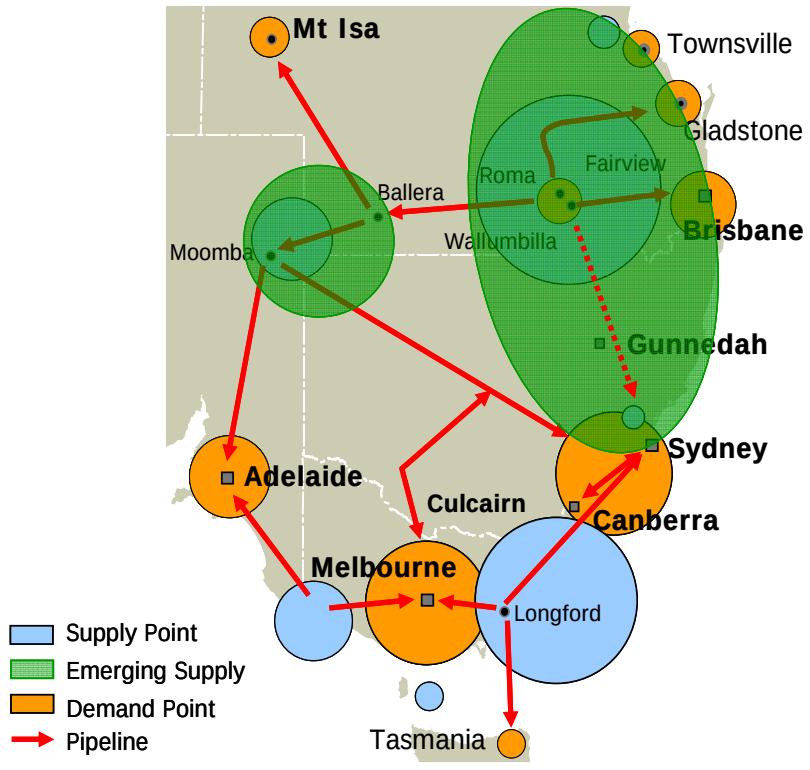


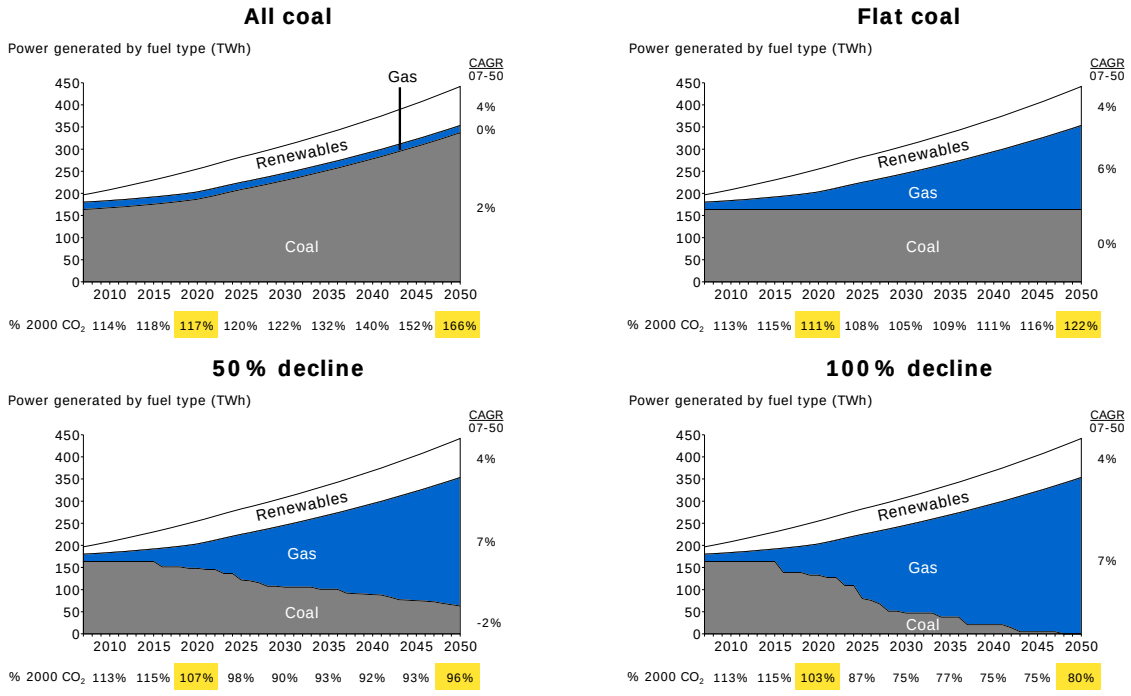

*Diagram 12*

**There is, simply put, no other low-emission baseload power generation technology available today or in the short to medium term than CCGT. Policy settings should ensure this potential and transition is neither delayed nor investment decisions obscured.**

## 4. THE TRANSITION POTENTIAL

To illustrate the potential of natural gas in helping to decarbonise eastern Australian power generation over the next 40 years, Santos examined four scenarios for eastern Australia, presented in Diagram 13.

The underlying power generation assumption between 2009 and 2050 an extrapolation from existing NEMMCO forecasts. All four scenarios factor in a 20% RET from 2020 onwards. No early retirement of existing coal-fired power stations is assumed, but rather retirement at the end of a 40-year plant life. The Flat Coal scenario assumes coal maintains its current level of generation, and when a coal plant is retired it is replaced by new coal generation. The 50% decline scenario assumes 50% of coal plants are retired at the end of 40 years, and are not replaced by new coal. The 100% retirement scenario assumes coal plants are not replaced with new coal when retired at the end of their useful life. CCS is assumed not to be viable and nuclear not available, which reflects their current status. Any demand not fulfilled by renewables or coal is satisfied by gas.




Note: Assumes CCS is not viable; Assumes no plant closes during transitional assistance; Assumes 40 year plant life; Eastern Australia only
Source: NEMMCO energy forecasts; ESAA EGA 2008; Department of Climate Change; Santos analysis

*Diagram 13*

The analysis indicates that unless there is at least a 50% retirement of the existing coal fleet between now and 2050, and replaced by the only other available baseload technology, namely gas-fired power generation, then carbon emissions across eastern Australia's power generation sector will rise. A 50% retirement will generate a 4% fall against 2000 levels. It is only under a

100% coal retirement scenario that there is any substantive reduction in total carbon emissions. Under the 100% retirement scenario, carbon emissions from eastern Australian power generation would fall by 20% compared to 2000 levels. This translates into a cumulative saving of over 1,500 million tonnes of CO2e between the 100% scenario and flat-lining the existing level of coal-fired power generation between now and 2050. A 20% reduction in carbon emissions across eastern Australia's power generation sector by 2050 would in itself contribute 9% towards the 60% economy-wide carbon reduction target set for 2050.

Were there to be a 100% transition, an ambitious assumption given the expectation that over this 40 year period there will be significant technological advances, particularly in baseload renewable power technologies, this would require less than 100 Tcf of natural gas. This is a volume that could be reasonably absorbed by the potential resource base of eastern Australia. Add into this equation an ambitious LNG scenario for eastern Australia, say a seven-train (21 mtpa) industry in Gladstone which would require no more than 50 Tcf to 2050, and eastern Australia's gas resources still remain more than adequate, and always with the prospect that new resources are discovered.

The rate of annual plant build required to underwrite a 100% coal-retirement scenario is also achievable. It would equate to an annual average build rate of ~2.5 400MW CCGT plants per year, slightly higher than the historical annual build rate between 1970 and 2006 of ~2.3, but well below the current average annual build rate of ~3.3 to 2010.

Indeed, there are early signs that **Australia is beginning to transition to a new comparative advantage underwritten by natural gas and renewable energy**. While this is occurring without a carbon price signal or market intervention, it reflects strong private investor preference for gas over coal-fired power generation, albeit with a bias towards investment in peaking and intermediate loads. If the full potential of natural gas is to be realised, however, and most particularly in baseload power generation, it will be imperative that the proposed CPRS legislation not discourage this investment through any measure that further tilts the playing field in favour of particular fuel choices or soften (delay) the desired impact of the CPRS. The same applies to any other Federal or State policy that impacts upon energy investment decisions.

In May 2009, ABARE noted that in the six months to April 2009, 1,880MW of new capacity, via ten projects, had been brought into operation around Australia, adding about 4% to Australia's total electricity generation capacity. 84% of that capacity was gas-fired (six projects), with four renewable projects providing the balance (13% wind, 3% biomass). More significantly, ABARE noted that 123 electricity projects were in the pipeline, with 22 'advanced', namely either under construction or committed. The 22 projects total 4,792 MW of capacity (~10% of Australia's total), 84% (4,049 MW) of which are non-renewable (coal or gas), with investment interest most strong in

natural gas, which accounts for 3,267 MW of that, or ~70% of that in the 'advanced' category. It is surprising, however, given the government's ambitions to reduce carbon emissions, that nearly as much coal-fired additions (~14%) are in the advanced category as renewable projects (~16%).

## 5. SYNERGY WITH INTERMITTENT RENEWABLE ENERGY

As highlighted in the 'Value of Technology' Discussion Paper, there is **long-term potential for natural gas to complement intermittent renewable power generation** such as wind. Santos strongly supports the Discussion Paper's assessment that "as a reliable baseload power supply, gas can be the other side of an optimal portfolio of generation that provides the reliability that intermittent renewable energy sources currently cannot.[5]"

The potential synergy is two-fold. First, smoothing out oscillations in intermittent renewable power generation to ensure an overall stable supply of power to industry and consumers. Second, acting as a 'bridging fuel' for further development of renewable and other low emission platforms, particularly renewable baseload platforms, both in a technological sense and commercial viability.

The implications of greater intermittency in Australia's power grid was flagged in the 2008 Electricity Supply Industry Planning Council's[6] submission to the Australian Energy Market Commission. In that Submission the Council notes work it has been doing on wind power generation and its integration into the National Electricity Market. It notes (Santos bolding):

> "The Planning Council has been progressing studies on wind generation in the NEM for a number of years…As an example of the work being undertaken, the following graph shows a typical trace of the aggregate wind output for Victoria and South Australia for one possible future scenario. The scenario envisages a total nameplate capacity of 1,500 MW of wind in South Australia plus 3,500 MW of wind in Victoria. The case uses existing and committed wind farm sites plus a selection of advanced wind farm projects to develop the case…
>
> The graph shows that although there is noticeable diversity between Victoria and South Australia, wind generation from both states frequently show significant correlation. The trace is based on the hourly output and the largest change from one hour to the next in this case is around 1,600 MW. When coupled to the natural variability in demand, **the demand on other generators to respond to falls in wind output rises to around 2,100 MW per hour**. **Current experience suggests that as much as half of this response would be required in five minutes**. Movements of this magnitude would be a challenge in the market especially at times where the capacity of other plant operating at the time is reduced by high wind generation levels. This analysis supports previous work and is broadly consistent with the performance we see currently, albeit at a much reduced scale."

[5] DRET Discussion Paper "Maximising the Value of Technology in the Energy Sector', p.10
[6] Submission to the AEMO, Electricity Supply Industry Planning Council, 14 November 2008, p.5

**The versatility of gas-fired power generation platforms – in particular peaking (using OCGT) and intermediate – to provide this targeted demand and smooth these fluctuations in a manner that preserves security of supply and system reliability is significant.** That these platforms would leverage off the same exploration and field development, pipeline infrastructure etc designed to support baseload gas fired power generation highlights the synergies and cost efficiencies that substantial investment in domestic gas infrastructure could have for Australia's overall energy security.

In its 2007 'Climate Solutions' Paper[7], the World Wildlife Fund identified replacing high-carbon coal with low-carbon natural gas as one of six key solutions to achieve the goal of averting dangerous climate change while avoiding serious environmental and social consequences. It described natural gas as a 'bridging fuel', offering an important opportunity to avoid the long-term locking-in of new coal power stations, providing significant carbon savings in the near term, while other energy sources and technologies with zero-carbon emissions are grown from a smaller industrial base. Santos supports efforts to accelerate the deployment of low-emission technology in Australia, and has previously partnered with other companies as part of the Australian Business & Climate Group to examine this issue. A substantial report was released publicly in August 2007 which, in Chapter 3, highlighted several barriers to early movement[8].

## 6. LNG

World energy demand is expected to grow by 45% by 2030, with greater than 60% of recent demand growth coming from the Asia-Pacific. Natural gas is growing its share of this demand from ~8% to ~12% and Australia and PNG are the only two countries in the Asia-Pacific expected to increase their LNG export volumes during this period.

Just as natural gas has significant potential to underwrite Australia's carbon transition, so to does **the export of Australian natural gas have the potential to support the decarbonisation of the Asia Pacific's energy system**. It is widely recognised that a global solution to climate change requires significant participation by emerging economies such as China and India. Both these countries, amongst many others in the Asia Pacific, have a strong appetite for Australian natural gas. This reflects natural gas's role in helping economies to transition to a lower carbon footprint,

[7] World Wildlife Fund International 'Climate Solutions: WWF's Vision for 2050' (2007) pp.20-21
[8] The August 2007 report on this topic can be found at http://www.santos.com/Content.aspx?p=341

as was explicitly reflected in the work program emanating from the most recent meeting of the India – Australia Joint Working Group on Energy and Minerals[9].

With supportive policy settings, Australia is uniquely positioned to become **the preferred supplier of LNG to the Asia-Pacific.** Not only would significant growth in the LNG sector support economic prosperity and the region's response to climate change, but it also positions Australia more prominently in the global energy system, including influence in international fora related to the energy and climate change. The potential surrounding Australia's LNG industry is fully documented in APPEA's 'Platform for Prosperity' Report of April 2007[10], subsequent to which the unfolding potential of Queensland's LNG industry only adds substantially to the potential.

## 7. MORE JOBS, MORE INVESTMENT, MORE ROYALTIES

A robust price on carbon and a sufficiently level playing field (including a well-designed CPRS) upon which fuel choices can compete will ensure strong growth across Australia's natural gas sector, both for domestic and export purposes. Strong growth means **thousands of new skilled jobs, tens of billions of dollars in new investment and more again in export revenues and royalty payments**.

A significant element of this employment and investment growth will be in regional Australia – and focuses around previously well-publicised large-scale LNG projects across Western Australia, the Northern Territory and Queensland, and the coal seam gas sector in NSW and Queensland. A 100% transition of existing coal to gas-fired power generation around baseload would require ~$8.5 billion in gas plant build between 2009 and 2020, and another $45 billion from 2021 to 2050.

This outcome would be an unequivocal good news story for Australia. At the same time it supports Australia's transition to a lower carbon footprint, and underwrites future energy security essential to long-term economic and social prosperity. Santos is surprised that recent analysis regarding the employment impact of the CPRS has largely ignored the natural gas industry.

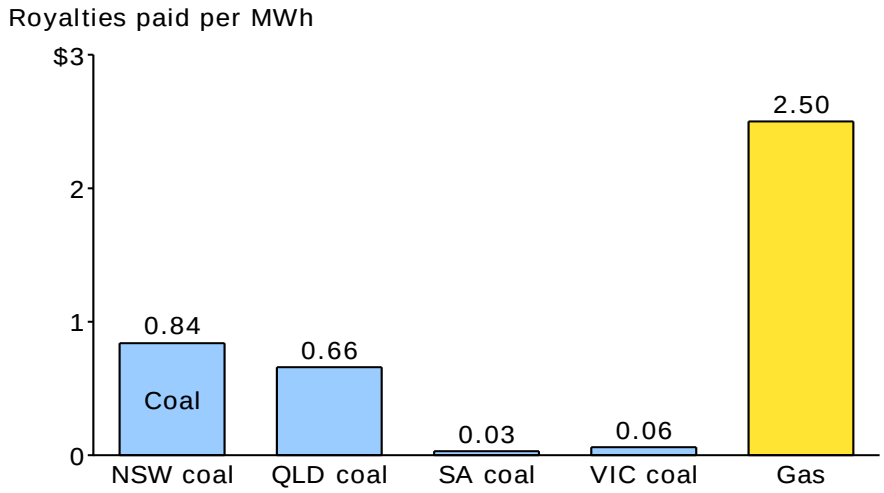
Queensland's CSG sector illustrates the enormous new economic potential, with over $20 billion in foreign investment in that sector within the last 18 months. Multiple multi-billion dollar LNG projects are now proposed for Gladstone, with backing from some of the world' most significant gas companies, and which will employ thousands, and ramping significantly during the construction

[9] 2009-2011 Work Program (Petroleum and Natural Gas), New Delhi, 17 March 2009
[10] APPEA, 'Platform for Prosperity, Australian Upstream Oil and Gas Industry Strategy', April 2007

phases (3,000+ per project). Santos alone, over the last four years, has injected over $1 billion into Queensland's economy via procurement from more than 1000 Queensland businesses.

Diagram 14 illustrates that the return to the public purse per MWh of electricity is higher under natural gas than coal. Increased penetration of gas-fired power generation will, therefore, have a positive impact on public finances. This chart also highlights the significant disadvantage gas has confronted in terms its ability to compete with other fuel sources in the power generation market, particularly coal, despite its much cleaner carbon profile and lower water intensity.

*Diagram 14*




Note: NSW coal royalties vary by mine type: 8.2% of open cut, 7.2% of underground, 6.2% of deep underground coal; QLD coal royalty is 7% of value up to $A100 per tonne and a further 1.5% for each $A100 per tonne above that; SA coal royalty is 1.5% for first 5 years then 3.5% from 5 years; Victoria Coal royalty is a multiple of the Net Wet Specific Energy by an index linked to CPI (currently 0.0616), as spot Price of brown coal is not readily available assumed to be $7 per tonne; Gas royalty is 10%;
Source: Department of Primary Industries (NSW); Department of Mines & Energy (QLD); Department of Primary Industries and Resources (SA); Department of Primary Industries Earth Resources (VIC);

## 8. NATURAL GAS – POLICY RESPONSE

**A carbon price and level playing field will ensure natural gas can underwrite a clean, reliable and affordable portfolio of energy opportunities for Australia**

The potential that Australia's domestic natural gas industry can bring to Australia's energy security framework, broader economy and arguably the long-term interests of Australian consumers are best protected by ensuring **a level playing field for competition between fuel types** is in place set against clear policy objectives, most particularly certainty around Australia's carbon emission trajectory.

Santos recognises that a level-playing field is not in the offering given, for example, bipartisan political support for a Renewable Energy Target. The merits and costs of such a target have been previously analysed by independent bodies such as the Productivity Commission and commented upon by the Wilkins Review and do not require further commentary.

It will be important, however, that if the bridging role that independent organisations such as the World Wildlife Foundation identify for natural gas are to occur, then a sufficiently level-playing field must exist and upon which the large capital investments can have their foundation. As the Investment Discussion Paper flags, **risks to energy security will emerge if investments in new generation are further delayed**. Santos strongly agrees that any policy settings that create perceptions of investor uncertainty or market distortion will impact this ability to invest. It is therefore important that policy settings focus clearly on the overarching outcome desired, and less on trying to influence the process by which to achieve that outcome. **Policy settings should also seek to encourage those solutions that require no technological or economic leap of faith.**

Specific targets for domestic gas market development were set by the gas industry's peak body, APPEA, in the April 2007 Industry Strategy Paper 'Platform for Prosperity'. Chapter 6.3, in particular, identifies a number of issues that impact upon the development of Australia's domestic gas industry. The various distortions – particularly non-neutral fiscal regimes and selective subsidy arrangements – are identified in this chapter. Santos continues to strongly support APPEA's Platform for Prosperity as a measured and prudent way forward if the full potential of Australia's natural gas industry is to be realised.

**Natural gas and renewable energy is a sensible path forward for Australia's carbon transition. It minimises 'leaps of faith' while securing future energy requirements at the same time as preserving the capacity for technological, low and zero emission, innovation.**

## About Santos

Santos is a major Australian oil and gas exploration and production company with interests and operations in every major Australian petroleum province and in Indonesia, Papua New Guinea, Vietnam, India, Bangladesh, and Kyrgyzstan. Santos is one of Australia's largest domestic gas producers, supplying sales gas to all mainland Australian states and territories, ethane to Sydney, and oil and liquids to domestic and international customers. Through its interest in the Darwin LNG project, Santos is already a producer of liquefied natural gas which is exported to customers in Japan.

For more information, see www.santos.com

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