Australia's Greenhouse Gas Emissions – Targets and Progress Review Draft Report: October 2013

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INTRODUCTION

Since 1959, the Australian Petroleum Production & Exploration Association (APPEA) has been the peak national body representing the upstream oil and gas exploration and production industry. APPEA has more than 85 member companies that explore for and produce Australia's oil and gas. In addition, APPEA's more than 220 associate member companies provide a wide range of goods and services to industry. Further information about APPEA can be found on our website, at www.appea.com.au.

APPEA has been engaged in the greenhouse policy debate since its inception and has participated in every major consideration of national climate change policy approaches in Australia. APPEA welcomes the opportunity to provide comment on the Climate Change Authority's *Australia's Greenhouse Gas Emissions – Targets and Progress Review Draft Report: October 2013*. This follows on from APPEA's 30 May 2013 submission on the Authority's *Issues Paper*.

APPEA is committed to working with policy makers as they develop policy responses to climate change. With that in mind, APPEA has developed the *Climate Change Policy Principles* document – a copy of which is at Attachment 1[1] – setting out the principles that APPEA considers should underpin Australia's response to climate change.

Most importantly, APPEA supports a national climate change policy that delivers abatement at least cost.

APPEA is also a member of the Australian Industry Greenhouse Network (AIGN), a network of industry associations and individual businesses that contribute to the climate change policy debate and see value in joint industry action on climate change policy issues in order to promote sustainable industry development[2]. APPEA has contributed to the AIGN submission on the *Draft Report*.

In addition to the APPEA submission, a number of APPEA members have made individual submissions to the Authority on the *Draft Report*. This response should be read in conjunction submissions from individual APPEA members.

APPEA's submission addresses specific sections of the *Draft Report*, focussing on those areas that are particularly important for the upstream oil and gas industry.

THE AUSTRALIAN UPSTREAM OIL AND GAS INDUSTRY

It is also important to place our views on the issues raised by the *Draft Report* within the context of the current state and potential future contribution of the upstream oil and gas industry to the Australian economy and to the welfare of all Australians.

Reliable, secure and competitively priced energy is crucial to our everyday lives in Australia. Within this framework, oil and gas plays a key role in meeting many of our energy needs.

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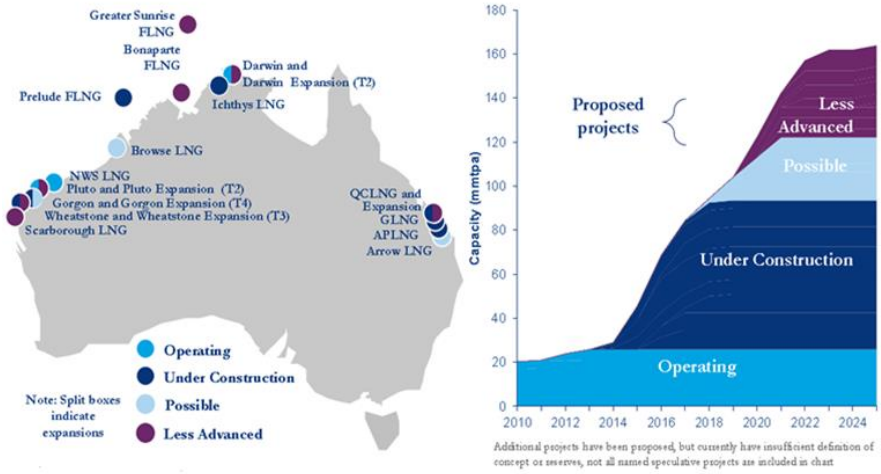
[1] A copy of APPEA's *Climate Change Policy Principles* can also be found at www.appea.com.au/industry-in-depth/policy/greenhouse.
[2] See www.aign.net.au for further information.

Australia has vast resources of natural gas. Geoscience Australia[3] has estimated that Australia has over 819 trillion cubic feet (tcf) (900,540 petajoules) of natural gas resources. By way of comparison, Australia's production of natural gas in 2011-12 was around 2 tcf (2,200 petajoules), meaning Australia has more than enough gas to service both domestic and export markets for decades.

Our abundant natural gas resources, in particular, place Australia in an enviable position to maintain long-term, cleaner energy security domestically and internationally. Natural gas makes it possible for Australia to meet the world's growing energy needs over the coming decades while incorporating a strategy to curb emissions and address the risk of climate change.

Just as importantly, the industry creates significant wealth for the country, including through the employment of many Australians, underpinning the revenue collections of governments and generating valuable export revenue for the Australian economy. Almost $200 billion is currently being invested in oil and gas projects including seven major liquefied natural gas (LNG) export projects[4]. According to economic modelling commissioned by APPEA and conducted by Deloitte Access Economics[5], this will increase Australian GDP by up to 2.2 per cent a year and over the investment phase, will create about 103,000 (full-time equivalent) jobs across the Australian economy. Companies all over Australia are supply goods and services to the oil and gas industry, and the use of fly-in, fly-out staffing is spreading the benefits of the industry across Australia. Figure 1 provides an overview of Australia's LNG projects.

Figure 1: Australian LNG projects: by liquefaction status



Source: Wood Mackenzie LNG Tool, August 2012.

[3] Geoscience Australia (2012), *Australian Gas Resource Assessment 2012*, 14 May (available at www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=74032).
[4] See Bureau of Resources and Energy Economics (2013), *Resources and Energy Major Projects*, for a listing of upstream oil and gas projects at the Publicly Announced Stage, Feasibility Stage, Committed Stage and Completed Stage (available at www.bree.gov.au/publications/remp.html).
[5] See Deloitte Access Economics (2012), *Advancing Australia: Harnessing our comparative energy advantage*, 25 June (available at www.appea.com.au/wp-content/uploads/2013/04/120625_DAEreportAPPEAfinal.pdf).

By 2020, the sector's economic contribution to the national economy will more than double to $65 billion and taxation paid will rise from $8.8 billion in 2012 ($4.9 billion in corporate taxes and $3.8 billion in production taxes) to reach almost $13 billion.

While the Australian economy has benefited and will continue to benefit significantly from LNG investments committed in the past, there are even more projects under consideration, representing a potential additional investment exceeding $180 billion. Realising these would benefit the entire nation. Analysis by McKinsey & Co[6] shows GDP would increase by 1.5 per cent, about 150,000 jobs would be created across the Australian economy, and tax revenues created equivalent to nearly half the total federal debt. The benefits of improving productivity would also flow to other sectors.

This means that the stakes are high in realising the industry's potential benefits.

THE ROLE OF NATURAL GAS

Greater use of Australian natural gas – in the domestic market, and in Asia as LNG exports – can significantly reduce greenhouse gas emissions.

THE IMPORTANCE OF NATURAL GAS AS A LOW GREENHOUSE GAS EMISSIONS ENERGY SOURCE IN AUSTRALIA

Australia could generate significant additional national economic, environmental and social benefits through greater utilisation of its substantial natural gas resources.

Using more natural gas in Australia's power generation and resource processing would significantly enhance the nation's ability to meet increasing energy needs while at the same time reducing greenhouse gas emissions.

These outcomes are possible because currently available natural gas technologies produce only 30 to 50 per cent of the emissions produced by current coal technologies in generating electricity.

According to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (and a range of energy industry analysts), current generation coal-fired power stations produce between 0.8 and 1.2 tonnes of carbon dioxide equivalent greenhouse gas emissions (CO_2-e) per megawatt hour (MWh) of generation while a combined cycle gas turbine power station produces only around 0.35 to 0.36 tonnes CO_2-e/MWh[7].

This is illustrated in Figure 2, which shows[8] the significantly lower greenhouse gas emission associated with the gas-fired electrical power generation compared to the use of other conventional fuels.

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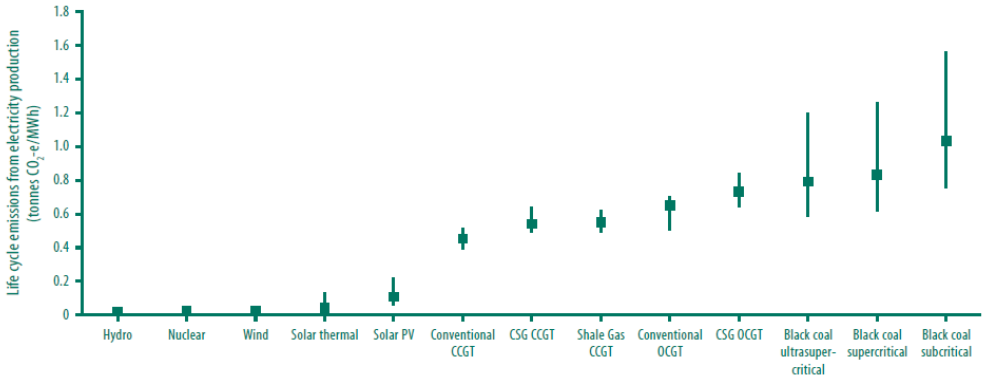
[6] McKinsey & Co (2013), *Extending the LNG boom: Improving Australian LNG productivity and competitiveness*, 28 May (available at www.mckinsey.com/locations/australia/knowledge/pdf/extending_lng_boom.pdf).
[7] Energy Futures Forum (2006), *The Heat is on: the future of energy in Australia,* December (see www.csiro.au/Organisation-Structure/Flagships/Energy-Flagship/Energy-Futures-Forum.aspx for further details).
[8] Australian Council of Learned Academies (2013), *Engineering Energy: Unconventional Gas Production, a study of shale gas in Australia Final Report*, 4 June (available at www.acola.org.au/index.php/projects/securing-australia-s-future/project-6).

Figure 2: Emissions intensity of various fuel types for electricity generation (tonnes CO_2-e/MWh)



Source: ACOLA (2013).

Natural gas provides the one of the lowest cost means by which Australia can reduce greenhouse gas emissions in the electrical power generation sector, both through increased use of existing gas-fired power stations and a 'coal to gas shift' (that is, new gas-fired power stations).

Natural gas is also an important safeguard for intermittent renewable energy sources. For example, modelling done by South Australia's Electricity Supply Planning Council notes that every 5,000MW of wind power generation requires around 2,100MW of gas-fired power generation to ensure that a reliable supply of electricity is available to the grid[9].

The increased use of natural gas also has several additional environmental benefits, such as:

- Reduced emissions of particulates.
- Reduced emissions of sulphur dioxide (an important contributor to smog and acid rain).
- Significantly lower demand for water for power station cooling.

Much greater use of Australia's extensive gas resources will be crucial in meeting the challenge of significantly reducing global greenhouse gas emissions at lowest possible cost whilst enhancing Australia's economic and export performance.

THE IMPORTANCE OF NATURAL GAS AS A LOW GREENHOUSE GAS EMISSIONS ENERGY SOURCE IN ASIA

The unique role Australia's LNG industry can play in contributing substantially to the economic development of the nation and reduce greenhouse gas emissions is considered on page 11 of this submission in the context of Australia's future emissions outlook.

[9] Electricity Supply Industry Planning Council (2008), *Submission to AEMC Review of Energy Market Frameworks in Light of Climate Change Policies*, November (available at www.aemc.gov.au/Media/docs/Electricity%20Supply%20Industry%20Planning%20Council-51706fed-d681-4e3a-ba64-de54e8de7176-0.PDF).

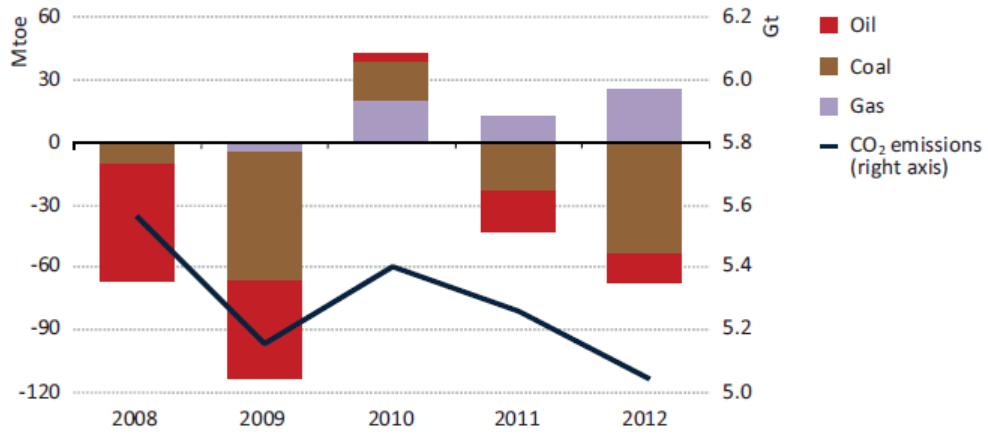
NATURAL GAS AND REDUCING GREENHOUSE GAS EMISSIONS: THE EXPERIENCE OF THE UNITED STATES

Clear evidence of the greenhouse-related benefits arising from the greater use of natural gas in power generation is provided by the recent experience of the United States.

In June 2013, the International Energy Agency (IEA) released a report[10] noting that emissions from the United States had fallen by 3.8 per cent (200 Mt) over the previous year. In total, US emissions have fallen between 400 and 500 Mt – twice the reduction achieved in the rest of the world as a result of the Kyoto Protocol.

The IEA attributed this fall to the increased uptake of natural gas, in particular from shale sources, which replaced coal in power generation, as indicated in Figure 3 below.

Figure 3: Change in fuel consumption and total energy-related CO_2 emissions in the US



Source: IEA (2013).

COMMENTS ON SPECIFIC SECTIONS OF THE *DRAFT REPORT*

Our abundant natural gas resources place Australia in an enviable position to maintain long-term, cleaner energy security domestically and internationally. Natural gas makes it possible for Australia to meet the world's growing energy needs over the coming decades while incorporating a strategy to curb emissions and address the risk of climate change.

CHAPTER 11 RECOMMENDED EMISSIONS REDUCTION GOALS FOR AUSTRALIA

The *Draft Report* asserts on page 117 that Australia should aim to achieve more than the current unconditional 2020 target of a 5 per cent reduction in emissions. The Authority presents two options: a 2020 emissions reduction target of 15 per cent below 2000 levels, with a 2030 trajectory

[10] International Energy Agency (2013), *Redrawing the energy-climate map*, June (available at www.worldenergyoutlook.org/media/weowebsite/2013/energyclimatemap/RedrawingEnergyClimateMap.pdf).

range of 35-50 per cent; or a 2020 target of 25 per cent with a 2030 trajectory range of 40 to 50 per cent.

In its submission on the *Issues Paper*, APPEA noted that in setting Australia's emission reduction goals, the key consideration is that Australia should make an equitable contribution, in accordance with its differentiated responsibilities and respective capability to global action, to reduce greenhouse gas emissions.

As a resource rich export focussed economy, Australia has a relatively emissions-intensive resource endowment and comparative advantage that is largely based on our ability to develop this extensive resource base. Combined with Australia's relatively small and widely dispersed population base, it is little surprise that Australia has a relatively high level of per capita emissions.

Climate change is a global issue. It is the relevant level of absolute concentration of greenhouse gases in the atmosphere that matters to global climate outcomes. Therefore, it is inappropriate for the Authority to focus on per capita emissions levels as a comparator for Australia's emissions level.

APPEA opposes the reliance of the *Draft Report* on per capita emission levels in assessing Australia's emissions and emission reduction goals. The Authority should instead focus on using a more appropriate measure of Australia's emissions level – absolute emissions levels, emissions as a proportion of GDP or similar.

One of the key outputs from this Review will be a recommendation for the emissions reduction goal Australia should commit to for 2020 (and beyond). The *Draft Report* claims Australia should move from its existing commitment (of a reduction in its emissions of 5 per cent from 2000 levels by 2020) to a higher emission reduction goal and that the criteria to move beyond Australia's existing commitment have been met.

APPEA notes that many of these criteria are necessarily subjective by nature and open to interpretation. APPEA does not agree that, based the current state of international commitments, either as set out in the *Draft Report*, or in the various UNFCCC agreements. This point is made emphatically by the failure of the Conference of the Parties 19 / Meeting of the Parties 9 in Warsaw, Poland in November 2013 to reach agreement. Indeed, Japan moved away from its current commitments to announce a significantly lower emission reduction goal. This means the conditions have not been established for movement beyond a 5 per cent reduction goal:

- The level of global commitment remains unclear, with key agreements for international action to 2020 not up for negotiation and agreement until 2015.
- Specific targets for advanced economies have not been established.
- Verifiable emissions reductions for China, and especially India, are not in place.
- A robust global agreement is not in place and clarity on access to markets has not been established.

In summary, the conditions for Australia to move beyond the existing agreed 5 per cent reduction goal have not been met. The Authority's *Final Report* should not recommend a move away from the 5 per cent reduction goal.

SECTION 8.7.2. CARRYOVER FROM THE FIRST COMMITMENT PERIOD OF THE KYOTO PROTOCOL

The *Draft Report* at page 92 concludes Australia's carryover from the first Kyoto Protocol commitment period would be best used as a 3 percentage point contribution to a more ambitious 2020 emissions reduction target to be recommended by the Authority.

APPEA does not agree with conclusion. Any carry-over should be used to expand the cap or banked for use against future emissions targets. It would be against Australia's national interest and against the overarching goal of achieving Australia's emissions reduction targets at least cost for the extra units to be unilaterally cancelled or used as an excuse to increase Australia's 2020 emissions reduction target.

SECTION 3.2.2. INTERNATIONAL ACTION

As noted above, Australia should with engage the international community in pursuing identified and beneficial environmental outcomes through greenhouse gas emissions reduction action. However, that the conditions for Australia to move beyond its existing 5 per cent reduction target have not been met.

The Review's *Final Report* should not recommend a move away from the 5 per cent reduction target.

Given the global nature of climate change and economic activity, the international context is important when considering an appropriate 2020 target for Australia. The international context is also relevant to how Australia's economy will change over time, and can affect the competitiveness of Australian industry. This last issue is of particular importance, but is often overlooked in the public debate on international action.

A key area of focus for Australia's upstream oil and gas industry, particularly the export-focused LNG industry, is the action of Australia's trade competitors. One of the key factors to consider when assessing any changes to Australia's emissions reduction targets is the action or inaction of trade competitors. The *Draft Report* pays little attention to this issue and this shortcoming should be addressed before the *Final Report* is released in February 2014.

The growth in LNG demand has been driven by the economic and industrial transformation of key economies in the Asia-Pacific region. Australia's LNG projects face fierce global competition.

Table 1 below, updated from APPEA's submission to the Issues Paper, lists the specific actions being taken in a number of trading partner and competitor countries including the most basic indicator of policy action – whether the country has made a pledge under the Cancun Agreements[11] – and data from the *BP Statistical Review of World Energy, June 2013*[12].

[11] See cancun.unfccc.int/mitigation for further information.
[12] See www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013/review-by-energy-type/natural-gas/natural-gas-trade-movements.html for further information.

Table 1 lists the top 20 LNG exporting countries, their total exports – in billions of cubic metres (bcm) and as a percentage of global exports – and whether the country has made a pledge under the Cancun Agreements. Table 1 includes the United States, which is a potential future competitor, given the export potential of development of its enormous shale gas resources.

Table 1: LNG Exports

Country	LNG exports (bcm)	LNG exports (%)	Cancun Agreement pledge
US	0.8	0.2	Yes
Brazil	0.4	0.1	No
Trinidad & Tobago	19.1	5.8	No
Peru	5.4	1.6	Yes
Norway	4.7	1.4	Yes
Other Europe	3.2	1.0	Yes
Russian Federation	14.8	4.5	Yes
Oman	11.2	3.4	No
Qatar	105.4	32.2	No
United Arab Emirates	7.6	2.3	No
Yemen	7.1	2.2	No
Algeria	15.3	4.7	No
Egypt	6.7	2.0	No
Equatorial Guinea	4.9	1.5	No
Nigeria	27.2	8.3	No
Brunei	9.1	2.8	No
Indonesia	25.0	7.6	Yes
Malaysia	31.8	9.7	No
Australia	**28.1**	**8.6**	**Yes**

Source: UNFCCC (2013); BP (2013).

Table 1 shows that of the 19 countries listed, 12 have not made pledges under Cancun Agreements. Those 12 countries accounted for around 75 per cent of global LNG exports in 2012. This includes Qatar, one of Australia's major LNG competitors and the world's largest exporter of LNG (with more than 32 per cent of global exports).

Of the remaining seven countries, only Indonesia and Russia (and potentially the United States) could be regarded as directly competing with Australia for LNG market share in the Asia-Pacific. In reality, greenhouse policy initiatives that do apply in practice in Indonesia and Russia are unlikely to have a material impact on their LNG industries.

Future competition (along with that from the US) is likely to come from PNG and East Africa – neither of which could be said to be at the forefront of greenhouse gas reduction policy action.

In summary, the analysis shows that very few of Australia's major LNG competitors are taking on emissions reduction obligations. Indeed, none have policies in place that impose an "effective" carbon price on their LNG exporters. Further, the prospect of our competitors taking meaningful action in the foreseeable future is low.

The upstream oil and gas industry is currently investing around $200 billion in oil and gas projects under construction. These projects will have an enormous positive influence on economic activity in Australia. Separately, they represent some of the biggest projects ever undertaken in Australia; collectively, they account for over 30 per cent of all Australian business investment. The industry also has a further more than $150-180 billion in investment under consideration.

The continued expansion of Australia's oil and gas industry represents incredible opportunities to all Australians. Australia should be capitalising on these opportunities and maximising growth in living standards and employment by efficiently allocating resources. The economic advancement in our region is overwhelmingly positive for the nation, playing to our comparative advantages as a secure and reliable energy exporter.

The Authority's *Final Report* needs to better recognise that the situation facing many individual trade-exposed industries differs from broad economy-wide aggregate comparisons:

- It is the competitive position facing individual industries; not just broad action or intention to act at the economy-wide level that counts.
- The actions of key competitor countries also count; not just the action of so-called "major economies/emitters".

CHAPTER 10 ECONOMIC IMPLICATIONS OF AUSTRALIA'S EMISSIONS REDUCTION GOALS

While the *Draft Report* provides in Chapter 10 discussion and economic modeling to support its recommendations to move beyond Australia's existing emission reduction goal, the *Draft Report's* focus on per capita emissions and a 'contraction and convergence' approach to examine whether Australia should move beyond its existing emissions reduction goal does not provide an appropriate basis to assess the economic and social implications of its recommendations.

The level of economic 'effort' required to meet Australia's commitments and how that level of effort/commitment compares to other countries (comparable effort) is critical. It is difficult to determine, on face value, the level of emissions reduction effort involved in meeting these climate change commitments. Much depends on the particular economic structure of countries and the choice of a historical base year in which to measure future emissions reduction.

A useful means of assessing comparable effort, and one that should be examined in the *Final Report*, can be made from examining how a country's commitments diverge from its 'no commitment' emissions baseline, adjusting for chosen base years and whether targets are prescribed as a reduction in absolute emissions or the emissions intensity of Gross Domestic Product (GDP). A report by Deloitte Access Economics (DAE)[13], *The Clean Energy Future: Cancun commitments and comparable effort*, commissioned by AIGN and the Business Council of Australia

[13] See www.aign.net.au/file_download/967/CEF+-+Cancun+and+comparable+effort.pdf for further information. This report stands alongside similar previous studies undertaken by Access Economics for AIGN, *Road to Copenhagen: Negotiating Australia's 'comparable effort'* and *Road to Copenhagen: Economic 'comparable effort' modelling of Australia's national allocation*. Both are available at www.aign.net.au/publications/reports.

(BCA), and published in December 2011, shows that such a comparison of lower bound abatement pledges shows that Australia shoulders its fair share of emissions reduction. Australia's 5 per cent unconditional commitment implies a 40 per cent reduction in net emissions from a 'no pledge' baseline. This commitment is comparable with key economies such as Japan, the European Union (EU27), North America and China.

Importantly, however, DAE finds the economic impact of Australia's current abatement commitment is far more significant than these other economies, reflecting Australia's generally higher cost domestic abatement opportunities (and therefore higher marginal abatement costs).

Analysis of these impacts indicates that Australia's 5 per cent commitment leads to a loss in Gross National Income (GNI), a comprehensive indicator of economic welfare, of around 2 and 2½ times the global average at 2020 with trading and without trading respectively. Estimated impact on GNI is able to incorporate many different national circumstances of each country, including population, population growth, economic structure, economic growth, resource endowment and abatement opportunities.

APPEA recommends the *Final Report* provide a more complete analysis of the implications of the existing target for Australia's economic and social conditions. Such an analysis will show that most other advanced countries have to significantly increase their pledges if a future international agreement is to reflect a fair distribution of comparable effort from Australia's point of view. It does not support Australia moving away from its existing commitments.

SECTION 7.2.2 EMISSIONS REDUCTION ACTIVITIES AND THE ROLE OF POLICY

Any consideration of Australia's emission reduction opportunities must be broad-ranging and comprehensive and be developed through a comprehensive consultation process with industry.

Previous attempts to consider these issues, such as the ClimateWorks *Industrial Energy Efficiency Data Analysis Project*, suffer from a range of serious shortcomings – from both a methodological and data perspective – which mean (particularly for oil and gas) the analysis is of little use to the Authority for the purposes of this Review. It is disappointing, therefore, that the *Draft Report* references this work extensively in this section. For example, the errors in the draft analysis (identified by APPEA and subsequently confirmed by a report by WorleyParsons, commissioned by the Department of Industry) have resulted in it being withdrawn. The analysis is currently undergoing a comprehensive redraft.

The Authority should commission its own analytical work to inform its conclusions.

CHAPTER 12 AUSTRALIA'S EMISSIONS OUTLOOK

As the *Draft Report* notes on page 127, the level of future covered and uncovered emissions is uncertain.

It is the case however, as noted in various sections of the *Draft Report*, that Australia's LNG industry will in coming years see its contribution to Australia's emissions profile increase.

However, in considering Australia's emission reduction targets and indeed Australia's contribution to global emissions reduction efforts, it is important to acknowledge the positive contribution Australia's LNG exports make now and will increasingly make to that global effort.

Australia's LNG industry is in a unique position to contribute substantially to the economic development of the nation and reduce greenhouse gas emissions. Australia's vast resources of natural gas and proximity to growing markets make us well-placed to meet the global climate change challenge while substantially contributing to Australia's economic growth.

The *Draft Report* on page 131 claims:

> *Foreign demand for Australian resources, particularly LNG and coal, is projected to continue under all scenarios, even with strong global action on climate change.* [emphasis added]

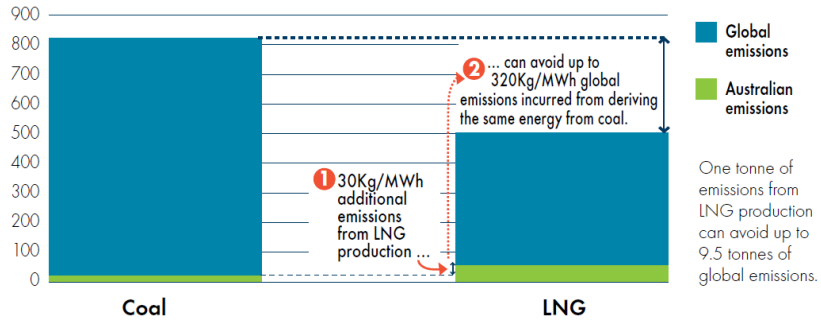
The statement does not accurately reflect the full range of drivers of demand for LNG. While the demand for energy as part of the industrialisation of key Asian economies is a key driver, the cleaner properties of natural gas as a lower emitting and cleaner burning fuel is also driving much of the foreign demand for LNG.

This should be recognised in the *Final Report*. Action on climate change is entirely consistent with strong demand for LNG.

A 2008 study by WorleyParsons[14], for example, compares lifecycle greenhouse gas emissions of Australian LNG exports from the North West Shelf Project with Australian east coast black coal exports in terms of lifecycle greenhouse gas emissions: from extraction and processing in Australia through to an end use of combustion (using different power generation technologies) in China for power generation. Figure 4 below is derived from data within the study, and shows that:

- For every tonne of CO_2-e emitted in LNG production within Australia, between 5.5 and 9.5 tonnes of emissions from the coal alternative can be avoided globally.
- LNG has a substantially lower greenhouse footprint associated with it compared to coal – not just in combustion emissions, but throughout its lifecycle.
- The lifecycle greenhouse intensity for LNG is about 50 per cent lower than that of coal.

Figure 4: Displacement of coal by LNG (kg/MWh CO_2-e by fuel source)



Source: Derived from data in WorleyParsons (2008; 2011).

[14] WorleyParsons (2008; 2011), *Greenhouse Gas Emissions Study of Australian LNG*, originally prepared August 2008; updated for public release, March 2011 (available at www.woodside.com.au/Our-Approach/Climate-Change/Pages/Benefits-of-LNG.aspx).

A similar 2011 WorleyParsons study[15] compared lifecycle greenhouse gas emissions of Australian LNG projects from Queensland using natural gas from coal seams as the fuel source with Australian east coast black coal exports. The analysis considered lifecycle greenhouse gas emissions: from extraction and processing in Australia through to an end use of combustion (using different power generation technologies) in China for power generation.

It found that, in the case of Queensland LNG exports:

- For every tonne of CO_2-e emitted in LNG production within Australia, between 2.5 and 4.3 tonnes of emissions from the coal alternative can be avoided globally.

- Considering savings from a 30 year 10 million tonnes per year (Mtpa) Queensland onshore gas LNG project, if this gas is combusted in a combined cycle gas turbine (CCGT) plant instead of a subcritical coal plant, the life cycle emissions are 42.7 Mt CO_2-e per year, the annual savings 37.2 Mt CO_2-e and the project life savings 1,114 Mt CO_2-e[16]. For combustion in a CCGT plant instead of a supercritical coal plant the annual savings and project life savings are 21.7 Mt CO_2-e and 652 Mt CO_2-e respectively.

- The lifecycle greenhouse intensity for LNG is about 40 per cent lower than that of coal.

There are significant benefits to Australia and internationally from the greater use of gas as a lower greenhouse gas emitting energy source.

Much greater use of Australia's extensive gas resources will be crucial in meeting the challenge of significantly reducing global greenhouse gas emissions at lowest possible cost whilst enhancing Australia's economic and export performance.

The *Final Report* should better recognise the global role LNG can play in global greenhouse emissions reductions.

APPENDIX D6 FUGITIVE EMISSIONS

The discussion in Appendix D6 on fugitive emissions associated with current and future oil and gas production is fundamentally flawed and requires correction before the *Final Report* is released.

In particular, the discussion on page 221 fails to acknowledge:

[15] WorleyParsons (2011), *Greenhouse Gas Emissions Study of Australian CSG to LNG*, April (available at www.appea.com.au/images/stories/steve_files/appea%20csg%20greenhouse%20gas%20emissions%20study%20executive%20summary.pdf).

[16] This compares to total Australian annual emissions (over the year ended March 2013) of 557 Mt CO_2-e (see www.climatechange.gov.au/climate-change/greenhouse-gas-measurement-and-reporting/tracking-australias-greenhouse-gas-emissions).

- Fugitive emissions from the extraction of oil and gas have risen by only 5.8 per cent between 1990 and March 2013 despite a 600 per cent increase in LNG production and a 107 per cent increase in domestic gas production[17].

- The industry measures, estimates and accounts for its emissions, including fugitive emissions, as required under the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act). The NGER Measurement Determination sets out the estimation, measurement and reporting requirements for oil and gas production, including the use of factors. The use of factors is widespread in the NGER Act and is not unique to oil and gas fugitive emissions[18].

- There is no Australian evidence to suggest that emissions association from the production of natural gas from coal seams or shales is more emissions intensive than production from other sources.

    - Numerous peer reviewed studies from the US in fact find that emissions are not significantly different. For example, Laurenzi, IJ and Jersey, GR present[19] results of a life cycle assessment (LCA) of Marcellus shale gas used for power generation. The analysis employs the most extensive data set of any LCA of shale gas to date, encompassing data from actual gas production and power generation operations. The results find little difference between shale gas fugitive emissions and fugitive emissions from other forms of natural gas production.

- The Climate Institute does not represent a credible source for estimating future fugitive emission levels. The Authority should, as it has in other areas, draw on credible sources, such as the emissions projection work conducted by the Department of the Environment[20]. The Institute's assertions should not be referenced in the *Final Report*.

- The work of Howarth et. al. has been fundamentally discredited by subsequent research[21] in the United States, and should not be referenced in the *Final Report*.

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[17] See www.climatechange.gov.au/climate-change/news-article/release-march-quarter-2013-national-inventory-estimates and www.appea.com.au/industry-in-depth/industry-statistics/annual-production-statistics-2012.

[18] The Authority should refer to www.climatechange.gov.au/climate-change/consultations/coal-seam-gas-enhanced-estimation-and-reporting-fugitive-greenhouse-gas-emissions-under-nger and particularly to www.climatechange.gov.au/sites/climatechange/files/files/consultations/NGA-FactSheet-7-CoalSeamGas-20120430-PDF.pdf for more accurate and complete information.

[19] Laurenzi IJ, Jersey GR (2013), *Life cycle greenhouse gas emissions and freshwater consumption of Marcellus shale gas*, Environmental Science and Technology, 7 May (available at www.ncbi.nlm.nih.gov/pubmed/23548112).

[20] See www.climatechange.gov.au/reducing-carbon/reducing-australias-emissions/australias-emissions-projections for a copy of this work.

[21] See, amongst others, Lawrence M Cathles III, Larry Brown, Milton Taam, Andrew Hunter, *A Commentary on "The Greenhouse-gas footprint of natural gas in shale formations" by R.W. Howarth, R. Santoro, and Anthony Ingraffea*, Cornell University and Electric Software, Inc. (www.cce.cornell.edu/EnergyClimateChange/NaturalGasDev/Documents/PDFs/FINAL%20Short%20Version%2010-4-11.pdf), Nathan Hultman, Dylan Rebois, Michael Scholtenand Christopher Ramig, *The greenhouse impact of unconventional gas for electricity generation*, University of Maryland (iopscience.iop.org/1748-9326/6/4/044008/), Mohan Jiang, W Michael Griffin, Chris Hendrickson, Paulina Jaramillo, Jeanne VanBriesen and Aranya Venkatesh, *Life cycle greenhouse gas emissions of Marcellus shale gas*, Carnegie Mellon University (iopscience.iop.org/1748-9326/6/3/034014/fulltext),Francis O'Sullivan and Sergey Paltsev, MIT Energy Initiative, Massachusetts Institute of Technology, *Shale gas production: potential versus actual greenhouse gas emissions*, Environmental Research Letters 7 (2012) 044030, (iopscience.iop.org/1748-9326/7/4/044030/), Timothy J. Skone, P.E., Office of Strategic Energy Analysis and Planning, *Life Cycle Greenhouse Gas Analysis of Natural Gas Extraction & Delivery in the United States*, US Department of

- The joint Department of the Environment / CSIRO project[22] that is underway to investigate fugitive emissions from production of natural gas from coal seams in Australia. The project is intended to provide preliminary data based on field measurements and modelling of methane emissions from a sample of production facilities in New South Wales and Queensland. Ultimately this research will lead to the development of suitable Australian-specific methods for monitoring and quantifying fugitive emissions from the production of natural gas from coal seams.

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[22] See www.csiro.au/Outcomes/Energy/Fugitive-emissions-from-coal-seam-gas.aspx. The lack of reference to this project is a very significant omission.