MINERALS COUNCIL OF AUSTRALIA

SUBMISSION
TO THE JOINT STANDING COMMITTEE ON TREATIES ON THE PARIS AGREEMENT 2015

OCTOBER 2016

CONTENTS

EXECUTIVE SUMMARY

The minerals industry supports the Paris Agreement of 2015, reached under the auspices of the United Nations Framework Convention on Climate Change as an important step forward in securing a durable path to progressively lower emissions.

As outlined in our oral submission to the Joint Standing Committee on Treaties last month, the minerals sector commends the constructive role played by successive Australian governments over many years to ensure that the deal included commitments from all major emitting nations.

This is a most important factor for, as the National Interest Analysis (NIA) prepared for this treaty correctly points out, the scale of the climate challenge is many times greater than Australia's annual emissions and any one country's capacity to act. In setting a common, multilateral platform for global action, this treaty will for the first time provide a path for all countries, including the major developing countries, without prescription. The NIA is correct in highlighting that collective global action is the most effective response.

Australia has made a strong contribution to the global response to climate change and is on track to meet its 2020 commitments.

For the past 25 years, Australia growth in total $CO_{2\text{-}e}$ emissions has been lower than most developed and major developing nations.

Under the Kyoto Protocol commitments, between 1990 and the average of 2008-2012, Australia's $CO_{2\text{-}e}$ emissions grew by just 3.6 per cent. In contrast, $CO_{2\text{-}e}$ emissions in the United States grew by 9.3 per cent. Canadian emissions grew by 41.2 per cent, New Zealand's by 11.4 per cent and Japan's grew by 5 per cent.[1]

Australia's carbon productivity ($CO_{2\text{-}e}$ emissions per dollar of gross domestic product) also improved faster than most economies. In particular, Australia's emissions per $ of GDP has improved by 50 per cent since 1990. This compares with a 40 per cent improvement in both the EU and the US. Canada's carbon productivity improved by 15 per cent over this period while Japan's improved by 11 per cent.[2]

Australia's total equivalent carbon emissions (kilotonnes) per million dollars of GDP are below the average of the G20 countries and are similar to Canada.

Australia's targets are ambitious and credible but not without costs because Australia's economic structure is distinctive amongst developed nations

National emissions comparisons are commonly cited on the basis of a carbon dioxide equivalent ($CO_{2\text{-}e}$) per capita metric. This approach is gravely flawed for two reasons. First, the resource and emissions intensity of our economy and trade, our relatively fast trend rate of economic growth and our fast population growth make Australia very distinctive among advanced economies. Minerals and energy exports, for example, account for nearly 60 per cent of Australia's merchandise exports, compared with the OECD average of around 11 per cent. This distinctiveness needs to be taken fully into consideration by Australia's policy makers in considering the review of Australia's emissions targets.

Second, the per capita approach assumes that the world's population is divided into roughly 200 units of identical geography and topography, resource endowment, stage of development, population growth, age composition, life expectancy, economic growth levels and prospects, access to technology, political structure and environmental amenity.

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[1] National Inventory Reports to the UNFCCC. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php . Australia and EU use average across 2008-2012; others use 2008-2011. Final report under the first commitment period due later in 2015. All figures except EU include land use, land use change, and forestry (LULUFC).

[2] N. Brown, M. Adams, R. Wickes, *Climate Policy and Australia's Resources Trade*, Report for the Minerals Council of Australia, 2015.

A focus on per capita emissions also ignores the complementarity that underpins global commerce. It fails to take account of the fact that many nations generate emissions in the production of goods and services consumed by others. It ignores the fact that if an exporting nation decides to end the production and export of certain products (in order to reduce emissions) then the consequences for both the exporting and importing nation could be significant. Over 30 per cent of Australia's emissions are generated in agricultural and minerals production the majority of which are exported.

As Deloitte Access Economics puts it: "Although widely used, $CO_{2\text{-}e}$/capita is a simplistic benchmarking metric, as it fails to adequately capture the complexities of the underlying drivers of carbon emissions such as the structure of a country's energy and economic systems". [3]

> "…These shortcomings are primarily due to the fact that while emissions themselves are related to productive activity, the relationship between productive activity and population of an economy can vary based on a number of factors unrelated to the generation of emissions. If emissions are to be expressed on a per capita basis, a country's carbon emissions should, at the very least, account for imported and exported emissions."[4]

It is also critical to remember that a key determinant of a nation's emissions footprint is population growth. Targets must take account of the great differences in projected population growth over the period to 2030. According to United Nations projections, Australia's population will *grow* by 16 per cent (3.8 million people) between 2015 and 2030. Over the same period, Germany's population will *fall* by 4.7 per cent (3.9 million), Japan's will fall by 6.7 per cent (8.4 million), Russia's by 6.5 per cent (9.3 million) and Italy's by 2.7 per cent (1.7 million).

Identical targets do not mean comparable sacrifice.

Sharp reductions in emissions will be difficult to achieve given that Australia's economic and population growth will far exceed many of our developed country partners over the next 15 years.

Analysis of previous Treasury modelling exercises over many years suggest the cost of abatement peaks at 50 per cent more than the cost for other developed nations under some scenarios. Abatement in Australia is harder than for other developed countries.

The principle that the economic costs of abatement should be broadly similar across advanced countries has guided Australia's approach to negotiations on climate change since the mid-1990s. It is important that this approach continue to frame Australia's approach.

A significant economic challenge for Australia's exporters.

Australia's minerals industry operates in a global context where investment opportunities exist in other resource-rich countries and where capital, skilled labour and technology are highly mobile. In taking on new domestic and international emissions commitments, it is critical that new layers of cost added to the economy through additional abatement commitments are roughly in line with the costs borne by comparable countries, including our major trading partners. Not to do this would damage major trade exposed, emissions-intensive industries like minerals and energy that account for more than half of Australia's total exports, and would have negative implications for the wider economy as well as for government revenue.

It is also fundamental to note that Australia competes mostly (though not exclusively) with developing nations, whose targets are defined in terms of their pressing economic needs. For example, in

- *global coal markets*: Australia competes with Indonesia, South Africa, the United States and Russia, with new competitors emerging in South America and Africa, as well as the largest global producer China
- *aluminium:* Australia competes with China, Russia, Canada and, increasingly, the Middle East

[3] Deloitte Access Economics, *Emissions Metrics: Australia's carbon footprint in the G20* at p.7 http://www.originenergy.com.au/content/dam/origin/about/investors-media/docs/emissions-metrics-australias-carbon-footprint-in-the-g20.pdf

[4] ibid., p. 1

- *other commodities:* Australia faces nations that are both partners and competitors. For steel this includes China, Taiwan, South Korea and Japan.

Across energy intensive commodities, Australia competes with 40 nations, three-quarters of which are developing economies.

The onus is on Australian governments to develop policies – economic, environment and trade – that contribute to improving levels of productivity, deliver more assured access to international markets, and deepen relationships. Climate policies, as part of this policy suite, must complement Australia's core strengths, and be internationally credible, while not compromising trade policy objectives.

As outlined above, the ensuring that the opportunities are realised depends on how policy deals with the macro-economic costs. At the macro-economic level it represents significant opportunity cost. As ex Reserve Bank board member and internationally renowned economics professor Warwick McKibbin, who conducted modelling on behalf of the Australian Government in 2015 noted in an radio interview:

> So, by the time you get to 2030, if you assume that the modelling projections on what GDP would otherwise be is roughly right, you are talking around $150 [billion] to $200 billion for the 26 per cent target, and you are talking for the larger target of 43 per cent, you are probably talking around $300 to $400 billion.[5]

There are also opportunities for Australia. The new generation of High Efficiency Low Emissions (HELE) coal use the higher quality coal that Australia produces. There is up to 220 tonnes of coal in large wind turbines. Fifteen minerals and metals go into the manufacture of solar panels. And new batteries technologies focus on a range of minerals products. The growth of nuclear power around the world means more demand for uranium. These opportunities for the mining industry are global; there are no guarantees for Australia. This means that policies should be set to ameliorate the macro-economic effects in order to take advantage of the microeconomic opportunities.

The mining industry is working to reduce emissions.

Coal companies are collectively investing up to $300 million in a range of low emissions projects including the further development of carbon capture and storage. All companies are examining the integration of cost-effective renewable energy in the suite of energy sources. Minerals companies account for 22 per cent of co-generation initiatives across the country.

Across the global the deployment of HELE generation id already reducing the carbon projections of many of our trading partners. The latest HELE coal plants (for black or brown coal) can produce low cost reliable power with up to 50 per cent lower emissions. There are already more than 700 such generation units operating in East Asia and another 1150 planned or under construction. Nineteen nations, accounting for 44 per cent of emissions, include HELE in their INDCs. The deployment of these plants in China, has already reduced its annual emissions footprint by 470 million of $C0_2$-e.

New plant designs are increasing CCS-ready, which will further reduce emissions as this already working technology matures and become cost-competitive. The Asian Development Bank estimates that China alone could be sequestering 2.5 gigatones of $C0_2$-e (on quarter of today's total global emissions) by 2050.[6]

These developments are largely industry driven. As the World Coal Association notes, using International Energy Agency and Global CCS Institute data, in the period 2007 to 2016 the value of global policy support for renewable energy deployment was around US$800 billion while the total value of policy support for deployment of CCS over all time is around $20 billion.

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[5] Interview, ABC Radio National Breakfast, 25 August, 2015.
[6] Asian Development Bank, Roadmap for carbon capture and storage demonstration and deployment in the People's Republic of China, 2015.

The Australian economy will continue to need baseload power into the future. At present 45 per cent of electricity demand comes from industry, 30 per cent from commercial and 25 per cent household. The industrial and some of the commercial demand cannot depend on intermittent technologies. Further, over-deployment of renewables in the grid is expensive. Based on international experience, as the proportion of renewables increases to between 30 and 40 per cent of the grid, the costs of managing intermittency (load management, system stability and transmission costs) rise by up to $45MW. At 100 per cent renewables, the increased cost is nearly $200Mw/h for intermittency management alone. Given this ongoing need for reliable, stabile, cost competitive energy, there is no why this new technology could not be deployed to provide the baseload energy needed.

The development of future policy will be an important medium term discussion.

The NIA notes that Australia has a range of policies in place and a capacity to evolve in the future. As noted in our oral evidence, some of the policies in place, such as the Safeguard Mechanism have only just commenced. Others, such as the outright ban on the development of nuclear power, are yet to be addressed. The Minerals Council of Australia will take part in the progressive development of policy to ensure that Australia meet our commitments.

A measured transition to a low emissions global economy will require a global agreement for greenhouse gas abatement that includes emissions reduction commitments from all major emitting nations; a range of well-designed market based measures to promote lowest cost abatement and, importantly, substantial investment in a broad range of low emissions technologies and adaptation measures.

In order to achieve this transition, the global framework must be comprehensive, effective and include commitments from all major emitters which take the global community on a pathway to limiting temperature rise to agreed levels. It must be dynamic and flexible, yet provide overall policy certainty. It must be technology-focussed and supportive of economic growth and prosperity.

Australia gains nothing in terms of jobs and higher living standards, and the world gains nothing in terms of either climate mitigation or well-functioning and secure resources and energy markets, if unnecessary regulatory hurdles (and therefore costs) are imposed on Australia's most efficient industries. This economic structure and role in global trade means the cost of abatement is high.

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1. A COMPREHENSIVE GLOBAL AGREEMENT

Climate change represents a compelling change confronting the global community. An effective response must not only be genuinely global in scale but also sustainable over the long-term.

Action by Australia alone will not solve the problem. Australia's emissions currently account for just 1.5 per cent of global emissions, a share expected to fall to about 1 per cent by 2050. This is not an argument for inaction. Indeed Australia has rightly played a leading role in the development of a new, genuinely comprehensive global framework that takes the global community on a pathway to limiting temperature rise.

Although developed nations are primarily responsible for the cumulative build-up of greenhouse gas emissions, action by developed countries alone in reducing future emissions will be futile. While leadership by developed nations will be indispensable, the key challenge will be to engage developing countries in global efforts to reduce greenhouse gas emissions.

The minerals industry welcomes the Paris Treaty as a comprehensive global framework that includes commitments from all major emitters. It is dynamic, flexible, technology-focussed and supportive of economic growth and prosperity.

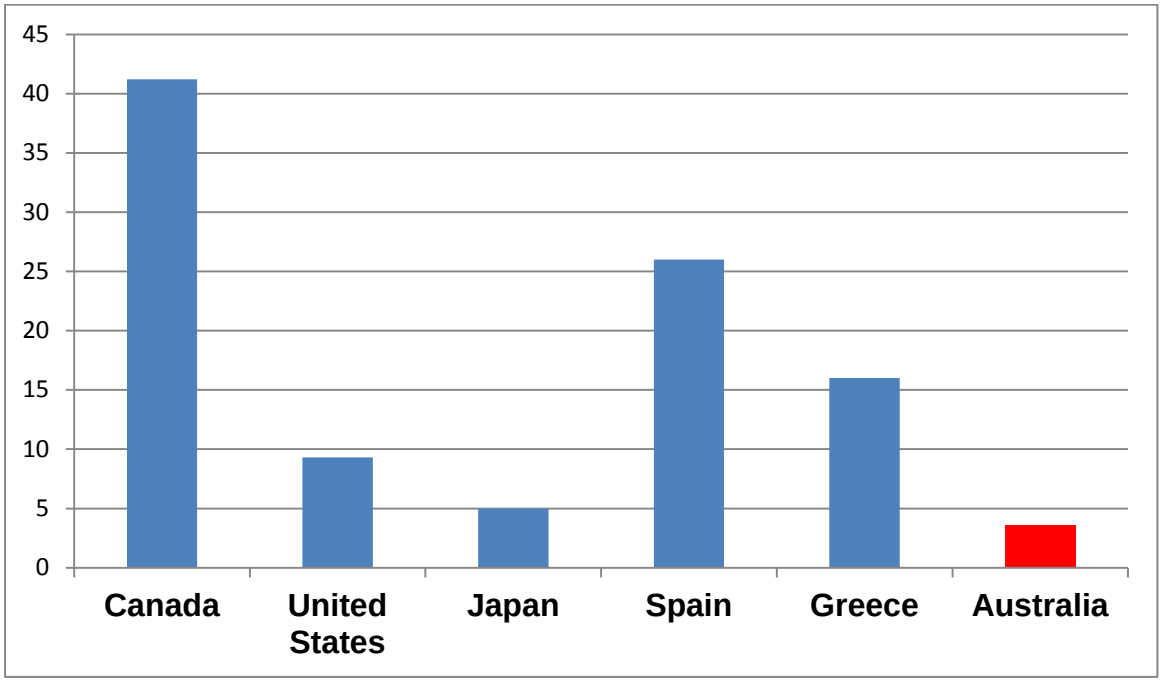
2. AUSTRALIA HAS MADE A STRONG AND FAIR CONTRIBUTION TO THE GLOBAL RESPONSE TO TACKLING CLIMATE CHANGE.

For the past 25 years, Australia's growth in total $CO_{2\text{-}e}$ emissions has been lower than most developed and developing nations.

Under the Kyoto Protocol commitments, between 1990 and the average of 2008-2012, Australia's $CO_{2\text{-}e}$ emissions grew by just 3.6 per cent. In contrast, $CO_{2\text{-}e}$ emissions in the United States grew by 9.3 per cent. Canadian emissions grew by 41.2 per cent, New Zealand's by 11.4 per cent and Japan's grew by 5 per cent.[7] The significant fall in the European Union's emissions can be mainly attributed to collapse of industry in East Germany following the collapse of the Berlin Wall. The same phenomenon was observed in former Eastern European states. Nevertheless, emissions in many developed European nations grew strongly over the two decades. For example, Spain's emissions grew by 26 per cent, Greece's by 16 per cent and Ireland's by 11.6 per cent.[8]

In the developing world, emissions grew exponentially as nations put economic development and the alleviation of poverty as the priority. China's $CO_{2\text{-}e}$ emissions grew by 339 per cent between 1990 and 2010, while India's doubled.[9]

Graph 1: Net emissions performance 1990 to 2008-12

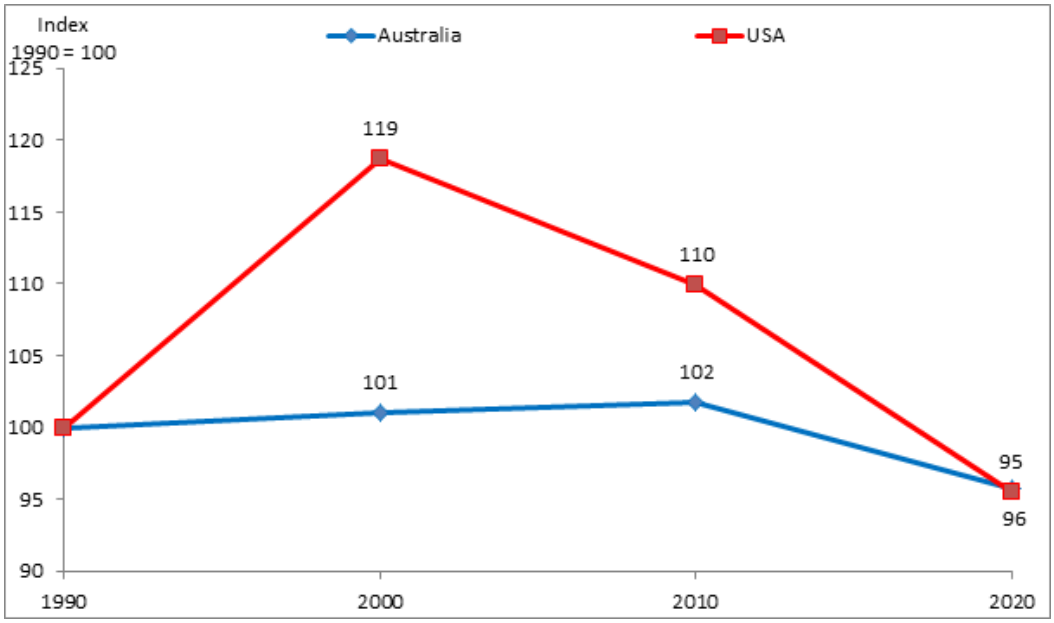


Sources: Climate Analysis Indicator Tools (CAIT), World Resource Institute, European Commission, BR CTF Submissions to UNFCCC

In the lead up to the Paris Agreement there were claims that Australia has been out-performed by the United States in its emissions reduction efforts. This is not correct when a common base year of 1990 is deployed. Between 1990 and 2005, $CO_{2\text{-}e}$ emissions in the United States grew by over 18 per cent before tracking down to 10 per cent in 2010.[10]

[7] National Inventory Reports to the UNFCCC. http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/7383.php . Australia and EU use average across 2008-2012; others use 2008-2011. Final report under the first commitment period due later in 2015. All figures except EU include land use, land use change, and forestry (LULUFC).
[8] National Inventory Reports to the UNFCCC using base year and average of 2008-2011.
[9] A. J. Leggett, China's Greenhouse Gas Emissions and Mitigation Policies, Congressional Research Service, July 18, 2011, p. 9; For India http://edgar.jrc.ec.europa.eu/overview.php?v=GHGts1990-2012 .
[10] United States submission to UNFCCC, Biennial Reporting – Common Tabular Format (BR CTF), 2014

Graph 2: Comparative Emissions Trends and Projections 1990 to 2020: USA and Australia



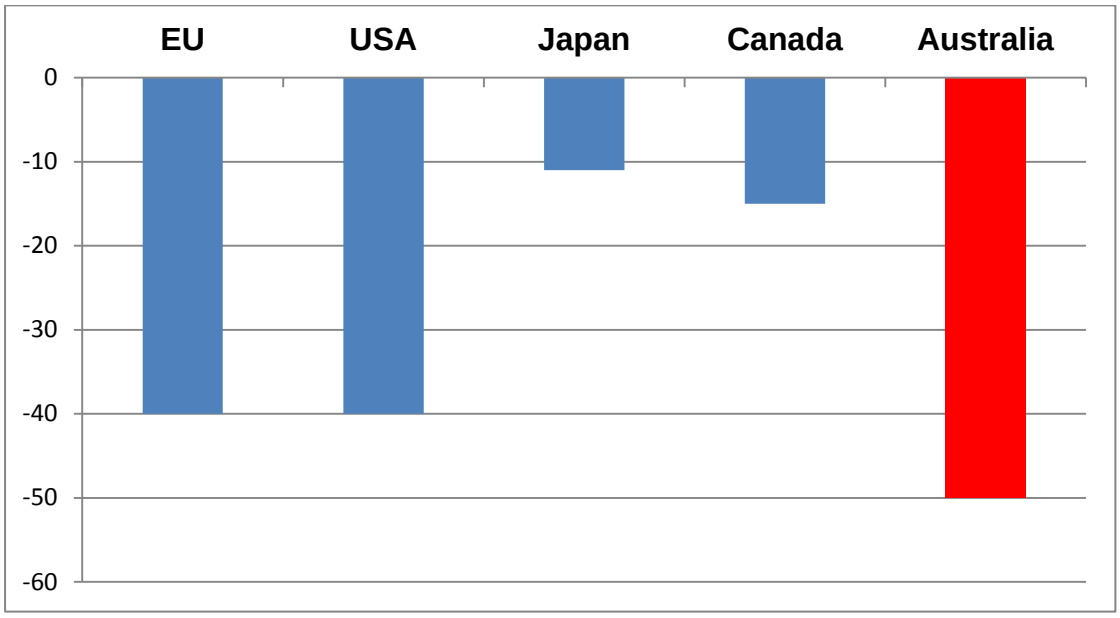
Department of Environment. US submission to UNFCCC (BTR1, 2014).

The bottom line is that Australia has performed *better* than the US in dealing with emissions since 1990, and will outperform the US in the period to 2020.

Australia's 'carbon productivity' ($CO_{2\text{-}e}$ emissions per dollar of gross domestic product) also improved faster than most economies. In particular, Australia's emissions per $ of GDP have improved by 50 per cent since 1990. This is projected to fall to as much as 70 per cent by 2020.[11] This compares with a 40 per cent improvement in both the EU and the US. Canada's carbon productivity improved by 15 per cent over this period while Japan's increased by 11 per cent.[12]

[11] Deloitte Access Economics, *Long term economic and demographic projections*, November 2011.
[12] N. Brown, M. Adams, R. Wickes, *Climate Policy and Australia's Resources Trade*, Report for the Minerals Council of Australia, 2015.

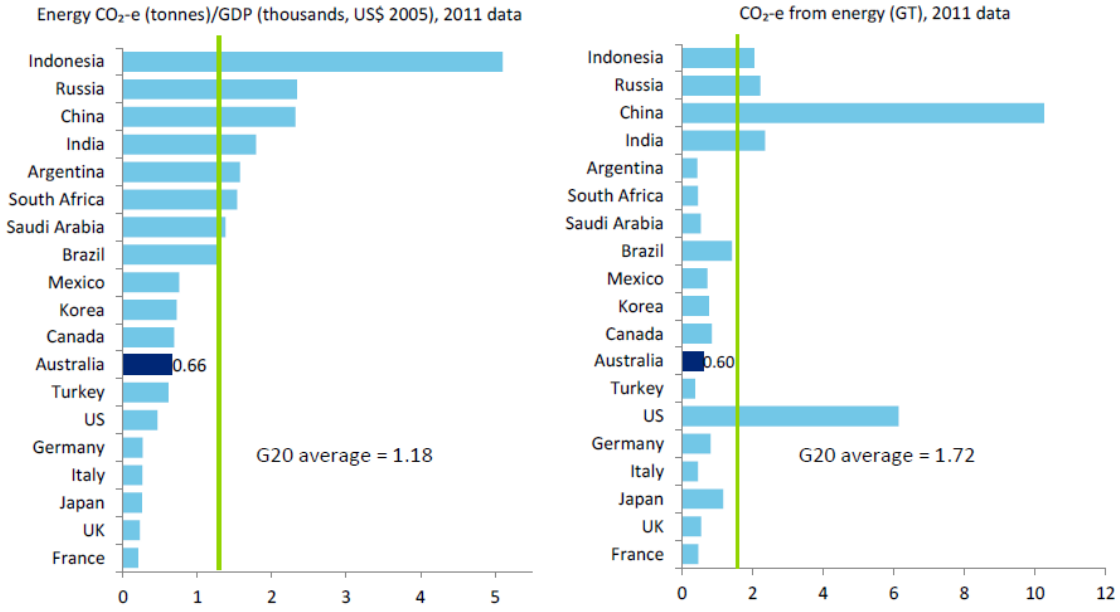
Graph 3: Carbon Productivity: Reduction in $CO_{2\text{-}e}$ per dollar of GDP between 1990 and 2008-12



Source: Brown, Adams and Wickes 2015

The emissions intensity of Australia's economy ranks favourably with most other major economies.

Graph 4: Emissions intensity performance: G20 nations



Source: World Resources Institute data, IEA data, Deloitte analysis

Note: Includes emissions from land use and land use change and forestry

3. ENSURING A FAIR AND COMPARABLE CONTRIBUTION TO GLOBAL EMISSION REDUCTIONS

The economic burden being borne by Australia in meeting its 2020 targets is greater than many of its developed country counterparts.

Analysis of published Treasury modelling over many years suggests that Australia's total cost of abatement is at least 50 per cent higher than the global cost, depending on the scenario.

In economic terms, effort can be understood as the resources foregone in order to achieve a particular abatement target (resources that had alternative uses in pursuing other economic objectives). These foregone resources can be measured as the cost of abatement, and so comparative effort involves, in part, understanding the comparative costs of abatement between countries.

A large part of choosing the target is therefore in understanding these comparative costs. Targets set without an understanding of costs is irresponsible and potentially self-defeating if costs are too large, misunderstood or not managed well.

The cost of a particular abatement target depends on a variety of factors that can be divided into three broad sets:

- the level of business as usual (BAU) activity; that is, the expectation of where growth would be without any abatement
- the ability of the economy (both technical and structural) to substitute into new, lower emission activities
- the magnitude of the abatement target relative to business as usual.

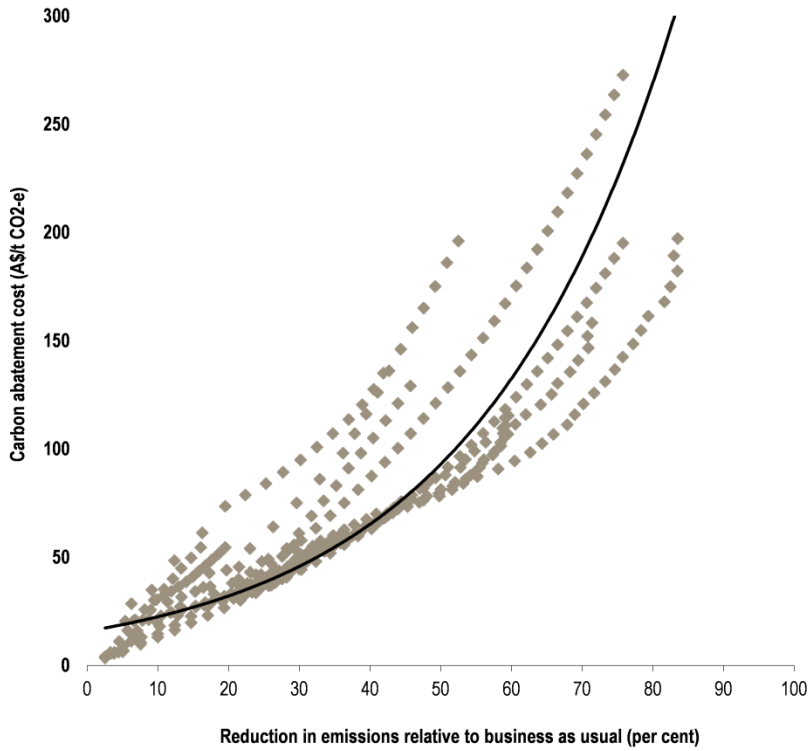
The comparative cost of abatement between countries will ultimately depend on the relative magnitude of these three sets of factors as they each develop over time.

The cost of abatement is itself a function of the extent of abatement to be achieved; generally the cost of abatement is expected to increase as the target increases, potentially at an accelerating rate.

In the context of an international agreement, costs must be understood in a comparative sense. Complex patterns of trade relations (the foundation of modern growth) mean that differences in costs between countries have trade implications and these implications may also run counter to the original objectives of attempts at emissions reductions.

The Centre for International Economics has charted the shape of Australia's abatement cost curve derived from a large number of recent modelling studies. The shape of the curve traced out by the different points from the various studies illustrates that abatement costs tend to increase more rapidly as the magnitude of abatement (relative to business as usual) increases.

Graph 5: Cost of abatement rise sharply with amount of abatement relative to BAU



*Note: The fitted solid line is of the form Y = A*EXP(B*Abatement). The coefficient for B is 0.035 with a standard error of 0.001.*

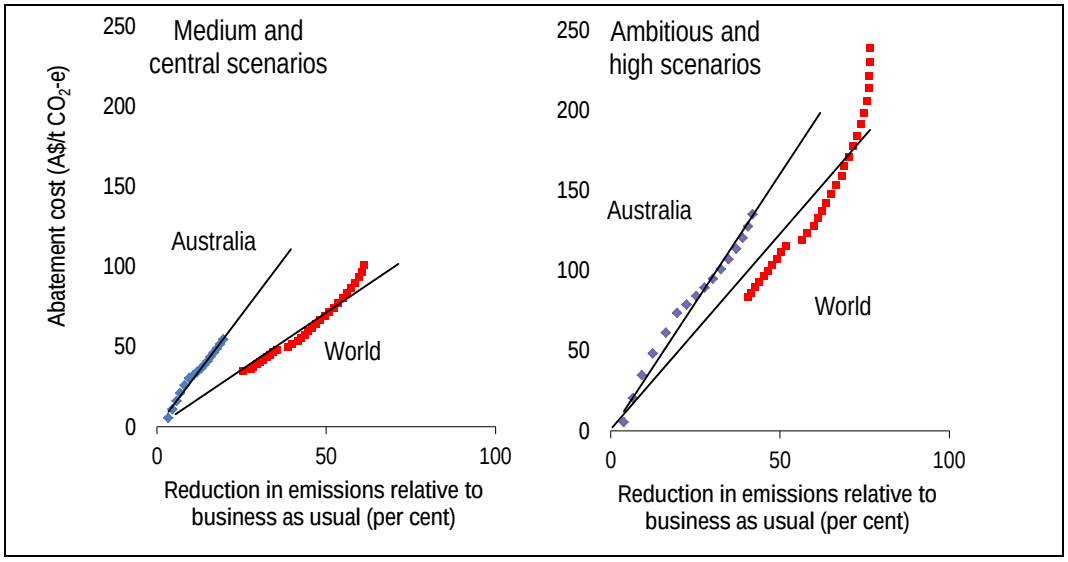
Data source: Modified and updated from Pearce, D 2012 'Empirical uncertainties in climate policy implementation' *The Australian Economic Review*, Vo. 45, No.1. Updated data from *CCMS* and from Jiang et al 2013 *Modelling the trade implications of climate mitigation policy* RIRDC Publication No. 12/104, July. Data modified to cover domestic abatement only.

The recent sequence of global and domestic model analyses provided by Australian Treasury provide a very strong indication that the marginal cost of abatement for Australia (at least over the relevant ranges covered by the modelling) is higher than international abatement costs.[13]

Graph 6 illustrates one way of looking at the Treasury results. It plots world and Australian abatement (defined as reduction in emissions relative to BAU) against the (marginal) abatement cost. It illustrates that for two sets of simulations (medium versus ambitious abatement scenarios) the Australian abatement cost curve is clearly higher than the world abatement cost curve.

[13] Details of all these studies are available online. They are *Strong Growth, Low Pollution: Modelling a Carbon Price* (referred to as *SGLP*) published in 2011 and available at http://carbonpricemodelling.treasury.gov.au/content/default.asp; *Australia's Low Pollution Future*, or *ALPF* published in 2008 and available at http://lowpollutionfuture.treasury.gov.au/lowpollutionfuture/default.asp; and *Climate Change Mitigation Scenarios* (*CCMS*) published in 2013 and available at http://www.climatechangeauthority.gov.au/targets-and-progress-review.

Graph 6: Comparative cost of abatement: Australia versus world



Note: Linear cost lines are: fitted from model data; indicative only; and have been extended beyond the data points for illustration. As the data points illustrate, cost curves are unlikely to be linear over the full range of abatement.

Data source: CIE derivation from *CCMS* charts 2.4, 2.6, 3.1 and 3.6.

This conclusion about the higher costs of Australian abatement is consistent with authoritative economic analyses.

First, in 2009, the Australian Treasury analysed the comparative costs of various nations' 2020 emissions reduction targets. While Australia's headline emissions reduction target was *lower* than other nations, the economic cost of those targets was *higher* than for most developed nations.

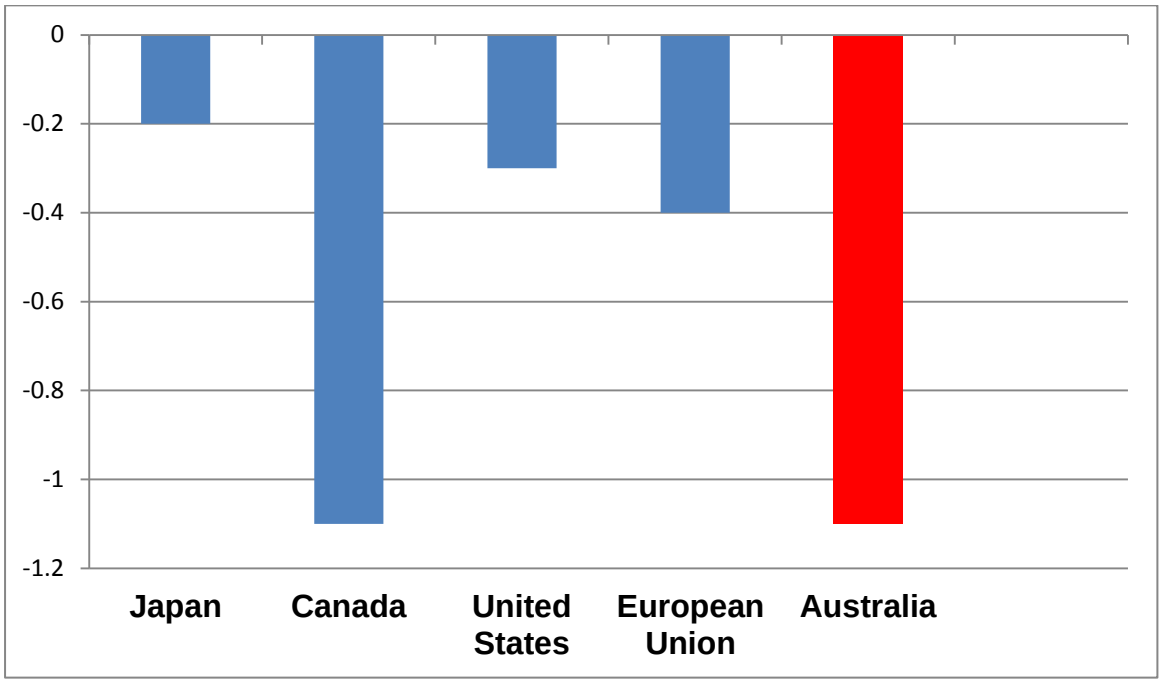
The Australian Treasury analysis concluded that:

> The analysis shows that Australia faces high economic costs, relative to most other developed countries, due to its large share of emission- and energy-intensive industries and a dominance of low-cost coal in electricity generation.[14]

The analysis showed that Australia's minus 5 per cent target would result in a loss of gross national product three times that experienced by the EU in pursuing a minus 20 per cent target. These findings reflect the fact that the costs of abatement in the Australia economy are high.[15]

[14] Australian Government, *Economic cost as an indicator for comparable effort*, Submission to the AWP-KP and AWG-LCA, May 2009.
[15] This has been recognised by Australia since the beginning of the Kyoto Protocol, See the Hon. Senator R. Hill, *Statement to the Fourth Conference of Parties to the UNFCCC,* Buenos Aires, 1998.

Graph 7: The economic impact of emissions reductions targets to 2020



Source: Australian Treasury. 2009.

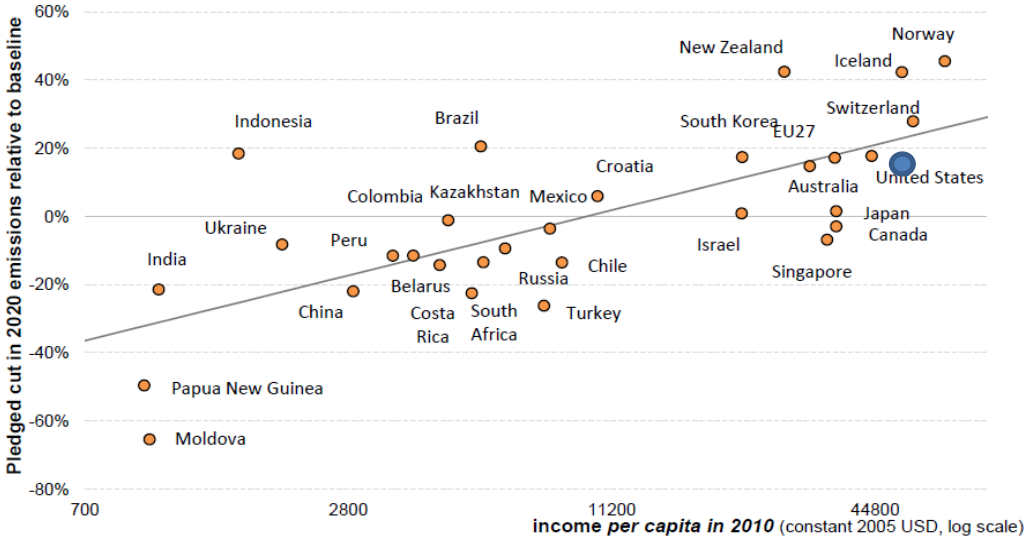
Second, economic modelling by prominent economist Warwick McKibbin in 2010 found that Australia's 2020 target (a 5 per cent reduction on 2000 levels), imposed higher economic costs on Australia than most of its counterparts nations in the developed world. The McKibbin analysis found that Australia's target would result in a 6.3 per cent reduction of GDP from business as usual levels (greater than the reduction for Japan, 5.1 per cent; the US 2.7 per cent; or the European Union 4.9 per cent).[16]

Third, analysis undertaken in late 2014 by former senior economic adviser to US President Bill Clinton, Jeffrey Frankel and Valentina Bosetti have sought to define 'comparative fairness' of national emissions targets using three metrics. These include that i) rich nations should be prepared to accept bigger cuts than developing nations, ii) that it is not reasonable to expect nations to agree to cuts that would impose disproportionately higher costs on them and iii) that countries with sharply rising emissions be expected to reduce them, but not practical for them to reverse them fully or instantly.[17] Frankel and Bosetti applied these tests to the 2020 emissions targets adopted by 30 developing and developed nations.

The analysis found that Australia's 2020 emissions reduction target is comparable in 'economic fairness' to key developed nations, including the European Union and the United States, and is more ambitious than many others including those of Canada, Japan and Singapore.[18]

[16] W McKibbin, A Morris, P J Wilcoxen, Comparing climate efforts: a model based Analysis of the Copenhagen Accord, The Harvard Project on Climate Agreements, June 2010 at http://belfercenter.ksg.harvard.edu/files/McKibbin-DP-June2010-final.pdf
[17] V Bosetti and J Frankel, A Pre-Lima Scorecard for Evaluating which Countries are doing their Fair Share in Pledged Carbon Cuts, Viewpoints, The Harvard Project on Climate Agreements, November 2014, http://belfercenter.ksg.harvard.edu/files/frankel_vp-nov2014_v2.pdf
[18] V Bosetti and J Frankel, A Pre-Lima Scorecard for Evaluating which Countries are doing their Fair Share in Pledged Carbon Cuts, Viewpoints, The Harvard Project on Climate Agreements, November 2014, http://belfercenter.ksg.harvard.edu/files/frankel_vp-nov2014_v2.pdf

Graph 8: The 'comparative fairness' of 2020 emissions reduction targets.



Notes: * Baseline = simple average of the country's actual emissions in 2005 and the level expected for 2020 in the absence of international action. Estimation formula is % cut = -1.29+ 0.14*ln(GDP pc) + e.

Source: Bosetti and Frankel, Harvard Project on Climate Agreements, Belfer Center for Science and International Affairs.

Australia's economy is distinctive amongst developed nations

The resource and emissions intensity of our economy and trade, our relatively fast trend rate of economic growth and our fast population growth make Australia very distinctive among advanced economies. Minerals and energy exports, for example, account for nearly 60 per cent of Australia's merchandise exports, compared with the OECD average of around 11 per cent.

Australia's minerals industry operates in a global context where investment opportunities exist in other resource-rich countries and where capital, skilled labour and technology are highly mobile. In taking on new domestic and international emissions commitments, it is critical that new layers of cost added to the economy through additional abatement commitments are roughly in line with the costs borne by comparable countries, including our major trading partners. Not to do this would damage major trade exposed, emissions-intensive industries like minerals and energy that account for the more than half of Australia's total exports, and would have negative implications for the wider economy as well as for government revenue.

It is also fundamental to note that Australia competes mostly (though not exclusively) with developing nations, who will be under less pressure to commit to ambitious targets.

For example, in global coal markets, Australia competes with Indonesia, South Africa, the United States and Russia, with new competitors emerging in South America and Africa, as well as the world's largest producer, China.

In aluminium, Australia competes with China, Russia, Canada and, increasingly, the Middle East.

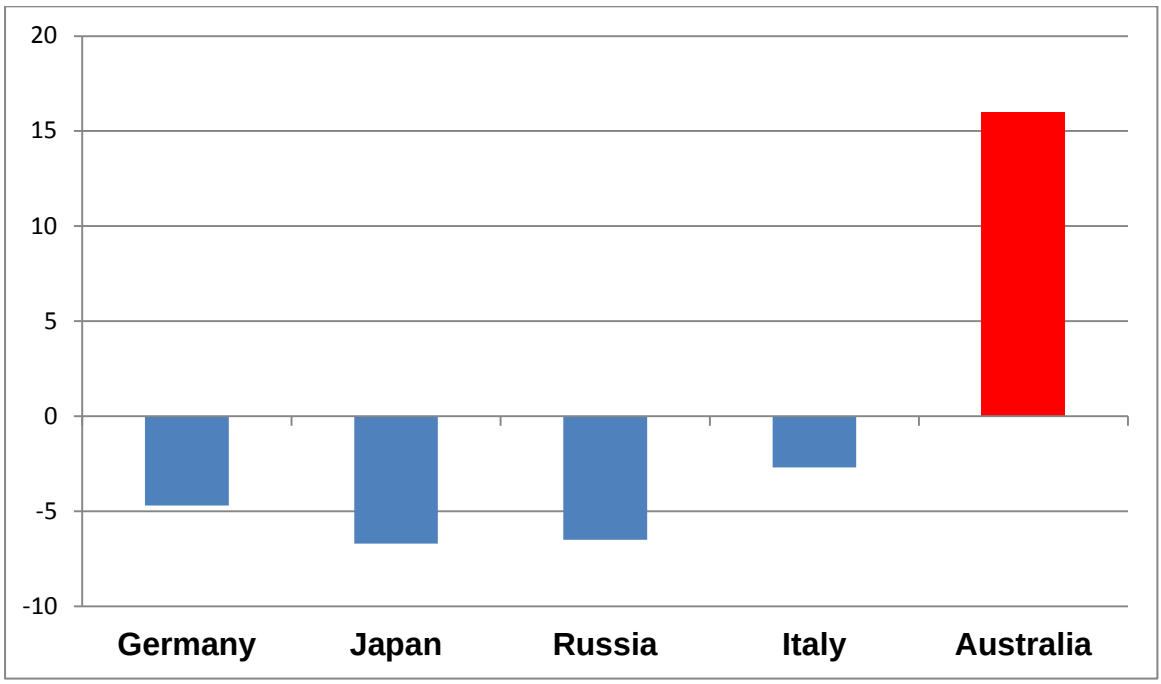
In other commodities, Australia faces nations that are both partners and competitors. For steel this includes China, Taiwan, South Korea and Japan.

Across energy intensive commodities, Australia competes with 40 nations, three-quarters of which are developing economies.

Australia's population growth is growing strongly, while falling elsewhere

One of the key determinants of a nation's emissions footprint is population growth. Targets must take account of the great differences in projected population growth over the period to 2030. According to United Nations projections, Australia's population will *grow* by 16 per cent (3.8 million people) between 2015 and 2030. Over the same period, Germany's population will *fall* by 4.7 per cent (3.9 million), Japan's by 6.7 per cent (8.4 million), Russia's by 6.5 per cent (9.3 million) and Italy's by 2.7 per cent (1.7 million).

Graph 9: Projected population growth 2015-2030 (per cent)



Source: United Nations Population Fund

4. AUSTRALIA'S 2030 TARGET SHOULD BE JUDGED ON COMPARABLE EFFORT, NOT IDENTICAL TARGETS

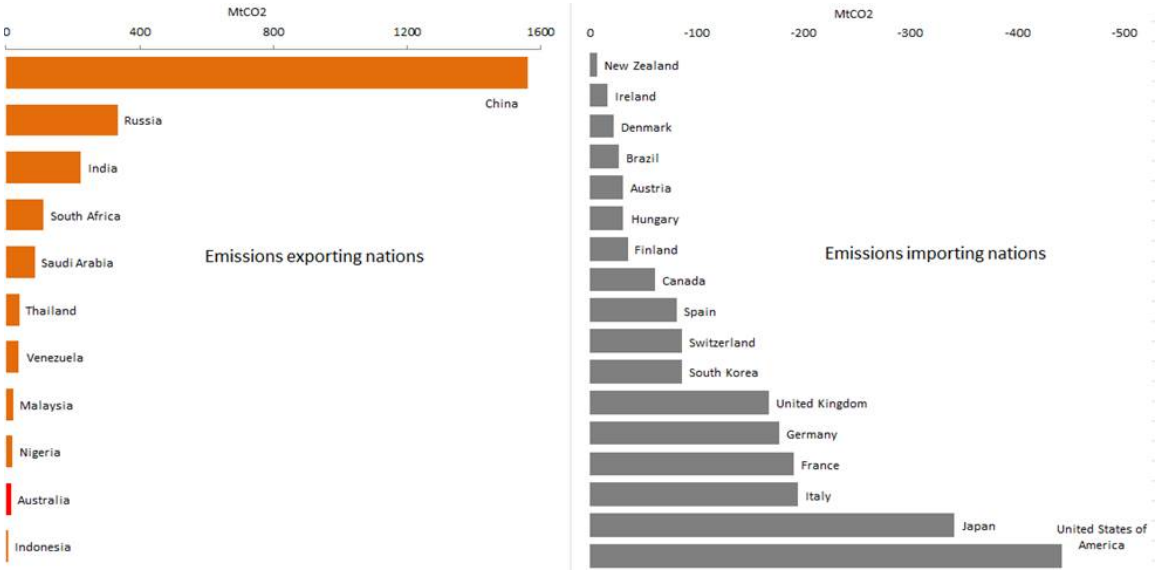
The 'per capita' emissions test needs to be handled with caution.

National emissions comparisons are commonly cited on the basis of a carbon dioxide equivalent (CO2-e) per capita metric. This approach is gravely flawed – it assumes that the world's population is divided into roughly 200 units of identical geography and topography, resource endowment, stage of development, population growth, age composition, life expectancy, economic growth levels and prospects, access to technology, political structure and environmental amenity.

A focus on per capita emissions ignores the complementarity that underpins global commerce. It fails to take account of the fact that nations generate emissions in the production of goods and services consumed by others. It ignores the fact that if nations decide to end the production and export of certain products (in order to reduce emissions) then the consequences for both nations could be dire. More than one quarter of Australia's emissions are generated in agricultural and minerals production, most of which is exported.

In effect, many developed countries 'outsource' their emissions to developing countries. This gives the misleading impression that developed countries are lowering emissions while developing nations (and major exporters like Australia) are increasing theirs. Graph 8 illustrates this point. The left side of the graph shows the emissions 'embedded' in exports – most of these nations are developing countries. The right side of the graph shows the nations that 'sub-contract' their emissions to other nations.

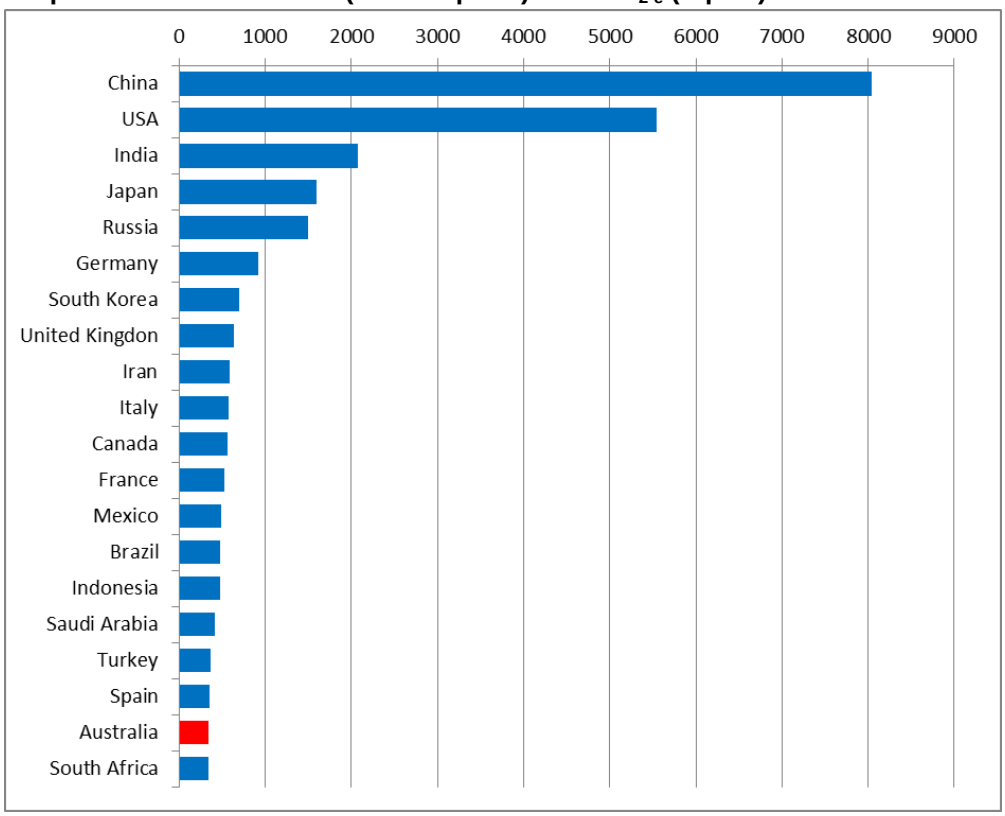
Graph 10: Emissions imports and exports



Source: Global Carbon Project

The same point is illustrated in a different way in Graph 9 below. It assess emissions where they are they are 'consumed', not where they are 'produced'. On this evaluation, Australia ranks well down the G20 scale.

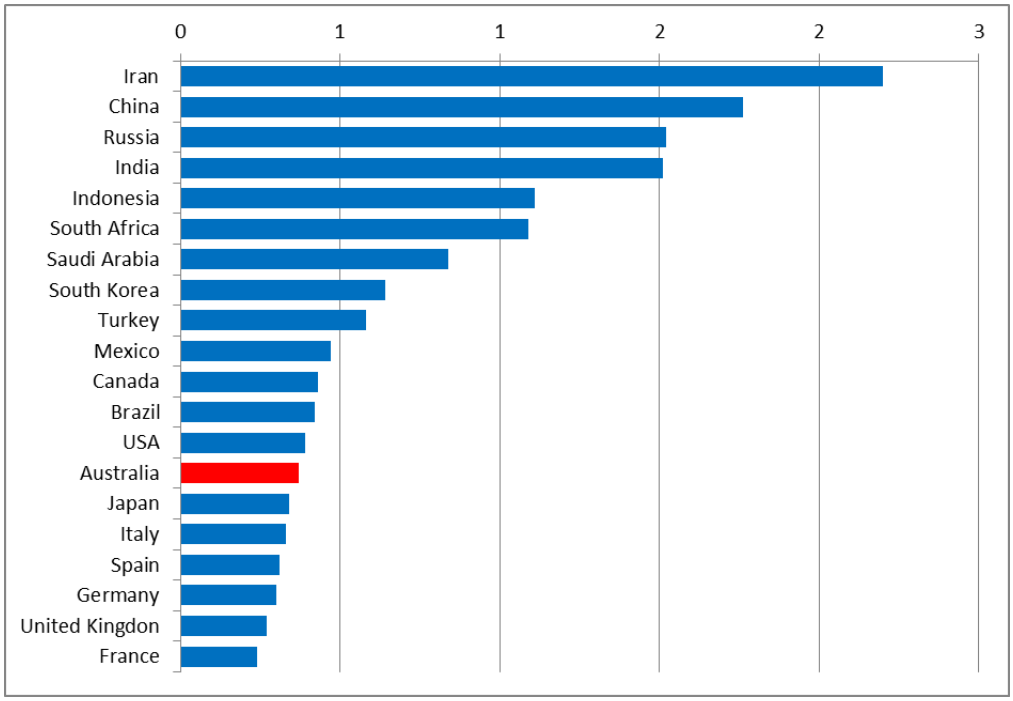
Graph 11: Total emissions (consumption) – Mt $CO_{2\text{-}e}$ (top 20) nations



Global Carbon Project; MCA calculations

In similar vein, Graph 10 analyses the relative performance of nations based on CO_{2e} *consumption* as a proportion of gross domestic product.

Graph 12: Consumption emissions/GDP – kg $CO_{2\text{-}e}$ /GDP (top 20) nations



Global Carbon Project; MCA calculations

Box 2: The importance of sound economic research

In its *Review of the Caps and Targets* in 2014, and again in the *Draft of its Special Review* released in April, the Climate Change Authority recommended that Australia consider emission reductions of between 40 and 60 per cent off 2000 levels by 2030. This recommendation has been used as a reference, including by the Australian Labor Party in the 2016 election.

Unfortunately, this recommendation did not give due weight to the domestic economic costs, specifically across sectors and regions, of Australia's *existing* abatement targets when it urged still deeper immediate cuts in the future. The CCA gave no weight to the domestic economic impacts of increasing the reduction targets past 2020. Instead the CCA took a top-down approach of allocating to Australia part of what the Authority defines as the global challenge while overlooking the relative cost to the Australian economy and it capacity to pay.

Former chair of the CCA, Bernie Fraser, noted in a Statement last year, that '[The] treasury modelling conducted for the Authority in 2013 did not project the costs to Australia of pursuing a 40 to 60 per cent emissions reduction target by 2030 (or any other target for that matter).[19]

The recommendation lacked a strong economic foundation and rigour. It was derived from a synthesis study which summarised an extremely wide range of results, with no guarantee of consistency across the different individual studies covered.[20] The results presented are so sensitive to specification that they are of very limited use. The authors themselves concede this is a major limitation of their analysis.

The study did not adequately capture the underlying economics of mitigation by different countries. The cost effectiveness criteria (which is a partial consideration of economic effects) only includes 4 studies (and only for the 2030 targets), none of which included Australia as a separately modelled economy. In addition, in these studies the sectoral aggregation was too broad to capture key Australian industries. The study failed to capture Australia's key economic features which would allow careful analysis of appropriate targets.

The CCA has not considered Australia's comparative advantage in agricultural and resources production and exports. It has not considered that many nations, not just in East Asia, rely on Australia for the steady and uninterrupted supply of coal, gas and uranium for energy production, livestock exports for protein and coking coal, metals and ores for infrastructure development. In effect, Australia provides these nations with the resources that they cannot provide themselves. As a result of these trade flows, Australia's emissions levels are higher, including in per capita terms. This is because the $CO_{2\text{-}e}$ emitted in the production and processing of packaged beef is counted against Australia, not the 57 countries that import it. Similarly the emissions generated in the extraction and processing of copper exports are counted against Australia not the 12 main receiving countries.

Failure to take account of the realities of Australia's economic structure – and the contribution Australia makes to regional economies as a major commodity exporter – will result in the choice of a target that will damage the Australian economy and the living standards of average Australians.

[19] http://climatechangeauthority.gov.au/publications/authority-observations-australias-2030-target
[20] N. Höhne, M. den Elzen, D. Escalante, Regional GHG reduction targets based on effort sharing: a comparison of studies. *Climate Policy*, Vol 14 Number 1 pp 122-147. Published online in October 2013.

5. FUTURE POLICIES

Climate change is a multi-faceted challenge and technology must form part of the solution. Future policy should be framed with a focus on research, development and deployment.

The coal sector has recognised this with the creation of its Coal21 Fund, and the ACARP research project, both supported by company levies.

The Government's Direct Action policy with its focus on incentives for abatement under the Emissions Reduction Fund is consistent with this approach. In the future there may be scope for new initiatives, such as requirements for ultra-supercritical (high efficiency, low emissions) coal-fired generation or nuclear power.

The minerals sector has a record of contributing to efforts to lower emissions. Over the past two decades the emissions intensity of its operations has halved, and while changes in geology (deeper deposits, lower grades, variable and unpredictable fugitive emissions) will make this more difficult in the future, a range of initiatives will be pursued to lower emissions. For example, investment in low emissions technology research, development and deployment will continue. Also, the proposed Safeguard Mechanism captures a higher proportion of mining companies than its share of national emissions. Other policies such as the Renewable Energy Target represent a tax on energy that mining companies are already paying.

Benefits of low emissions coal technologies

Coal is critical to the global economy. In 2013, 7.8 billion tonnes of coal was produced and provided 40 per cent of world electricity, 70 per cent of world steel and much of the world's cement. Coal will continue to be the building block for world development over the coming decades. Consequently reducing emissions through technology adoption will be a priority.

If Australia is to meet its emissions targets at the lowest cost the development and deployment of low emissions coal technologies is vital, including carbon capture and storage (CCS). Without CCS the costs of reducing global emissions more than doubles – 138 per cent higher according to International Panel on Climate Change projections.

The roadmap to a low emissions coal future is increasingly clear – increase the efficiency of coal use and capture greenhouse gas emissions through the utilisation cycle. This means:

- High efficiency, low emissions (HELE) coal-fired generation technologies should be deployed. They can achieve significant CO2 emission reductions of 20% to 25% compared with the average of the existing world coal fleet and up to 50% reductions compared to the oldest technology in place
- In parallel, develop CCS technologies so they can subsequently be integrated into HELE-enabled industrial plants, and reduce fugitive emissions from coal production.

The key to addressing global emissions ultimately lies in the uptake of HELE and CCS low emissions technologies by both developed and developing countries.

There has been significant progress in low emissions technologies over the past decade. Australia is contributing to the global effort through research into storage and the construction/operation of demonstration projects.

High efficiency, low emissions power generation

Improvements in the efficiency of coal-fired power plants can be achieved with technologies such as supercritical (SC) and ultra-supercritical (USC) boilers.

As illustrated in Graph 13, HELE technologies improve the efficiency of coal-fired power generation and in so doing deliver meaningful reductions in CO_2 emissions.

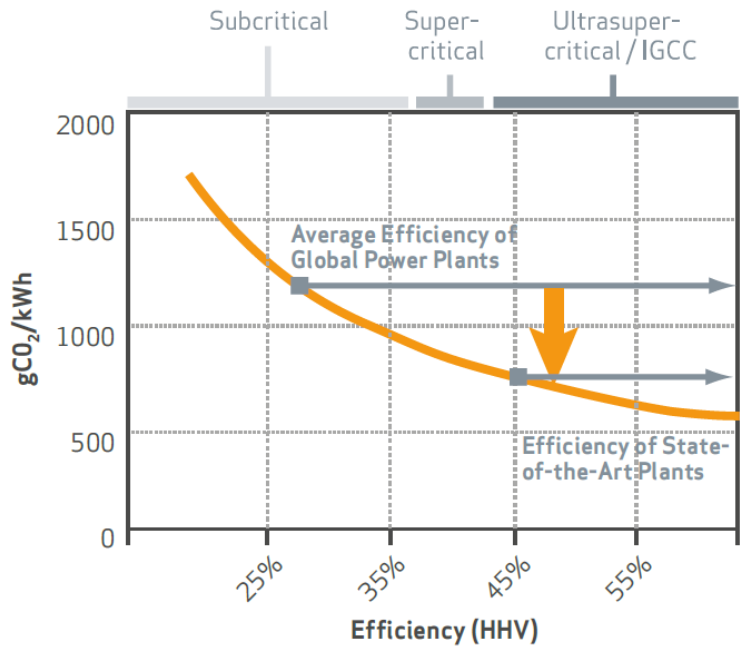
In fact, increasing the efficiency of coal-fired power plants by 1 per cent reduces CO_2 emissions by between 2 and 3 per cent. By reducing those emissions from a power station, HELE technologies reduce the cost of subsequent application of CCS and, therefore, provide greater scope for its deployment.

HELE technologies for power generation involve operation at higher temperatures and boiler pressures, which increases efficiency and reduce emissions per watt of electricity generated. The worldwide average efficiency of coal-fuelled power plants – mostly what are called 'sub-critical' generators – is 33 per cent. That is substantially below the current state of the art rate of 45-50 per cent (for ultra-supercritical plant in Japan).

The vast majority of coal fired plants in Australia are sub-critical units with an average efficiency across the fleet of 34 per cent compared with a Japanese average efficiency exceeding 41 per cent. Phased replacement of the ageing fleet of coal fired power stations would make a significant contribution to reducing domestic emissions. For example, it is estimated that replacing current sub-critical power generation assets over the period 2015 to 2040 with ultra-supercritical technology can deliver at least a 30 per cent reduction in CO_2 emissions from the coal fleet.[21]

Any new coal fired power station in Australia which may be required by 2025 should utilise HELE technology.

Graph 13: Reducing emissions through efficiency improvements



Source: International Energy Agency, Focus on Clean Coal, 2006.

Carbon Capture and Storage

The Australian coal industry is committed to playing its part in the global effort to reduce greenhouse gas emissions. In partnership with government, the Australian coal industry has so far committed over $300 million under the COAL21 Fund to:

- geological storage projects– which aims to find storage in a range of geological formations to build confidence in, and maximise opportunities for, storage

[21] IEA Clean Coal Centre, *Upgrading the efficiency of the world's coal fleet to replace CO_2 emissions*, London, July 2014, pages 28 to 33.

- research, development and demonstration of CO_2 capture as a contribution to the international effort.

Australia's progress so far includes:

- successfully sequestering 65,000 tonnes of CO_2 in a depleted gas field in Victoria's Otway Basin
- successfully capturing CO_2 at a coal-fired power plant near Biloela in Queensland. This is the world's largest demonstration of oxy-fuel technology to date and has run for two years, accumulating more than 10,000 operating hours, proving up technology that can be subsequently deployed in major projects around the world
- intensifying the search for storage sites for future CCS projects with exploration work underway or planned in Queensland, New South Wales, Victoria and Western Australia, including funding approval for the CTSCo project in the Surat Basin in Queensland.

Fugitive Emissions

The COAL21 Fund and the black coal industry's research program (ACARP) are working to develop ways to reduce methane levels in coal mines. This must be done with the highest care as methane is a significant safety hazard. To date the focus has been on the following technical issues:

- development of practical and cost effective methods of estimation/measurement of fugitive emissions from both open cut and underground operations
- development of improved gas drainage technology to maximise the amount of methane gas captured prior to mining and hence minimise the amount of gas released as fugitive emissions
- development of technology capable of safely treating the very low and highly variable methane levels in ventilation air from underground operations.

The COAL21 Fund, with co-funding from the Commonwealth, is undertaking a substantial program aimed at demonstrating the safe deployment of ventilation air methane (or VAM) abatement technologies at underground coal mines. Once that objective has been successfully achieved there may be opportunities to reduce fugitive emissions by deploying these technologies at operating coal mines in the period 2020 to 2030.

Coal policy settings

To build on the progress to date significantly more international effort is required to demonstrate CCS technology and provide a line of sight to commercial availability.

To help stimulate the investment necessary for the sustainable deployment of HELE and CCS technologies in our region, the Government should:

- adopt technology-neutral policies to ensure there is no bias against any fuel option for domestic electricity generation
- encourage a suite of options including fossil fuels, renewables and combinations of both
- continue to support CCS demonstration projects and underpinning research to reduce costs
- adopt neutral policies regarding both Australia's foreign aid and export finance insurance arrangements for investment in generation technologies in developing countries in our region.

Benefits of uranium / nuclear technologies in lowering emissions

Australia's rich uranium resources provide an opportunity for Australia to make a contribution to lower its own emissions and those of other countries.

Removing the barriers to uranium mining, including the invocation of the 'nuclear trigger' under the Commonwealth environmental laws, will allow Australia to capture a leading share of this opportunity.

The ban on nuclear power in Australia is hampering an open debate about future energy and climate change management and stands at odds with Australia's export uranium mining industry.

Mining

Uranium is Australia's second largest primary energy source in terms of energy units, behind black coal. It is a critical commodity for customer countries facilitating low emissions electricity generation. Australia receives virtually no recognition for this contribution to global low emissions electricity.

Substantial growth is forecast for Australian uranium production and exports through the remainder of this decade and into the 2020's. The Department of Industry's quarterly review forecasts uranium volumes are to rise from 6701 tonnes in 2013-14 to 9200 tonnes in 2019-20. It expects uranium exports to more than double in value from $622m in 2013-14 to $1.3b in 2019-20.[22]

Global nuclear power generation growth is largely focused in our region, particularly in our key growing trading partners in China, India and South Korea. Substantial opportunities exist to cooperate with these countries in the nuclear fuel cycle.

Growing uranium demand will not automatically translate to growing Australian exports and revenue without policy reform. Countries that are positioned to bring their projects on line in time to meet the demand will capture the growth. Growth will not come to Australia just because it has the largest resource base in the world.

Between 2002 and 2012, global annual uranium production grew by 62 per cent. Australian production however grew only marginally, by 2 per cent. Canada in 2002 was the largest producer in the world. However over the 10-year period it contracted by 22 per cent. Kazakhstan captured almost all the production growth and expanded its production by over 600 per cent through the period.[23]

The Australian Government's Energy Green Paper identifies that 'work to address issues impacting on Australia's uranium industry reaching its full potential is critical'. It suggests the government will review legislation and programs that place an unnecessary burden on business.

Fundamental to this objective is to amend the definition of nuclear actions in the *EPBC Act*. The discriminatory treatment of the uranium industry under the *EPBC Act* should be brought to an end.

The nuclear actions 'trigger' currently includes uranium mining and milling, rehabilitation and decommissioning, which carry no greater environmental risk than the mining of other commodities. The radiological risk to the environment from uranium mining is very low. The occupational radiation hazard is very low, similar to or less than in other industries that utilise radiation sources, and is amenable to control through well established and routine occupational hygiene practices. Uranium mining and milling are not 'nuclear' activities as there is no possibility of a fission reaction occurring.

Amendment of the nuclear actions definition will not increase environmental risk. Uranium mining activities with impacts on other Matters of National Environmental Significance such as World Heritage Areas or threatened species would still require referral under the *EPBC Act* similar to any other resources development.

[22] Resources and Energy Quarterly, March 2015 Quarterly, Office of the Chief Economist, Australian Government
[23] http://www.world-nuclear.org/info/Facts-and-Figures/Uranium-production-figures/

Other required regulatory reforms to remove unnecessary burden include:

- Amendment to the *EPBC Act* to ensure that nuclear actions can be integrated into the Commonwealth/state bilateral agreements on assessments and approvals in line with the government's commitment to delivering a 'one-stop shop' on environmental approvals. This will allow all states/territories to:
    - have responsibility for undertaking environmental assessment and approvals under the terms of the bilateral agreements and in line with agreed accreditation standards
    - seek to consolidate all jurisdictional approval processes into a single co-ordinated process
    - issue a consolidated set of conditions, incorporating all intra- government and inter-government requirements and
    - administer any offsetting requirements under the project conditions
- Reform requirements for uranium transportation to harmonise rules in different states and the Northern Territory. At present uranium oxide concentrates in Australia are only mined in South Australia and the Northern Territory, and product is shipped through Adelaide or Darwin. The transportation restrictions for uranium oxide concentrates in Australia are anachronistic. The product's qualities are well known and it is safely transported around the world on container vessels and trucks. There is no scientific basis for this discriminatory treatment within Australia.

These reforms will improve the uranium industry's capability to bring projects to market to meet demand by reducing approval times without compromising safety and environmental standards. They will also increase foreign investor confidence in Australia's uranium resource opportunities.

Nuclear power

A key theme of the Energy White Paper released in April is that energy policy should be pursued in a 'technology neutral' way.

The Government had already identified in its Green Paper that that 'legislation prevents the development of an Australian domestic nuclear energy industry' and suggests that 'removing legislative barriers to Australia using nuclear power for electricity, when there is an economic case for its deployment, would include amending the *Australian Radioactive Protection and Nuclear Safety (ARPANS) Act 1998* and the *EPBC Act*'.

This condition that there would only be legislative reform when there is an economic case is a self-defeating condition. No other energy technology is subjected to this kind of discrimination. This discrimination puts a globally established and mature energy technology at a clear competitive disadvantage in Australia. Nuclear energy currently supplies around 10 per cent of the world's electricity and 20 per cent of the OECD's.[24]

The effect of this legislative ban is two-fold:

- It acts as a disincentive for the development and deployment of potentially competitive nuclear energy sources in Australia and therefore potentially enshrines a higher Australian energy cost base.
- It puts Australia at a structural disadvantage with respect to carbon emissions minimisation in comparison with those countries adopting nuclear power in their energy mix. It will be effectively impossible for Australia to compete with other industrialised OECD countries such as United States, France and the UK in terms of emissions per unit of GDP given their extensive adoption of near zero emissions nuclear power technology.

[24] http://www.world-nuclear.org/info/Current-and-Future-Generation/World-Energy-Needs-and-Nuclear-Power/

The Australian Government should remove the ban on nuclear power as a first step in opening up the debate about the option of nuclear power in Australia. If nuclear power is ever adopted in Australia, the drivers will likely be either the need to reduce power costs further, the need to reduce emissions further, or a combination of both.

It is well recognised that developing a nuclear power sector would take a decade or more. Plants themselves take several years to build. Establishing a regulatory regime, construction and operating capability would also take several years and would need to be in place before construction of plants would even be considered.

If the government considers that the deployment of a civilian nuclear power program could be an option in future, then policy should set the framework to enable the consideration of the issue. Removal of the legislative ban on nuclear power would be a critical first step towards developing that option.

The flow through effects of removing the ban would be substantial:

- Technology suppliers interest – the global nuclear reactor industry is extensive with several reactor types being licenced in major markets, and many more designs and R&D underway on new reactors of various scale. Australia's legislative ban discourages the nuclear industry from considering Australia as a potential market or R&D partner in any meaningful time frame.
- Consultation with possible host communities – the ban acts as a disincentive for meaningful engagement with potential host communities. The development of a nuclear industry is a long-term process and success is contingent upon local community acceptance. The ban discourages local community interest in the possible economic benefits nuclear power can bring, and it discourages the investment of time and effort required to build local community support.
- Capability building – removing the ban on nuclear power will drive renewed interest by universities and students in the possible deployment of nuclear power in Australia and incentivise the development of skills, expertise, courses and programs with potential application in a domestic nuclear power industry.
- Foreign investment – removing the ban is a strong signal to foreign investors that Australia's attitude towards nuclear energy is maturing and that investment in the uranium sector and any subsequent nuclear fuel cycle or power industries would be considered on their merits by regulators.
- Exploration of specific applications – removing the ban on nuclear energy would encourage technology providers and local communities to consider potential nuclear power applicability in some of Australia's remote areas. Currently supplied generally by diesel power, modern small modular reactors (SMR's) can potentially offer long-term stable electricity supply to underpin household and industrial use in mining and other remote towns.
- Value-adding – Conversion, enrichment, fuel fabrication, and waste management are significant industries that could develop organically in Australia as nuclear power plants are built in our region.
- Uranium industry benefits – Australia's mature uranium industry would benefit from removing the ban as it would acknowledge that uranium mining and nuclear technology are established global industries (providing a fifth of OECD power) which can provide safe, low emissions, low environmental impact, affordable, base-load electricity.

The South Australian Royal Commission into the nuclear fuel cycle is playing playing an important role in identifying opportunities for investment and new industries in Australia in the fuel cycle. This effort should be recognised when Australia outlines its contribution to the post 2020 international framework.