

Garnaut Climate Change Review
Discussion Paper on Emissions Trading

Submission by ExxonMobil Australia Pty Ltd

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ExxonMobil Australia Pty Ltd is a subsidiary of Exxon Mobil Corporation. ExxonMobil Australia Pty Ltd has a number of subsidiaries with assets and operations in Australia many with names that include ExxonMobil, Exxon, Esso and Mobil. For convenience and simplicity in this submission those terms and the terms corporation, company, our, we and its are sometimes used as abbreviated references to a specific subsidiary or groups of subsidiaries in the ExxonMobil Australia Group of companies.

Background - The Garnaut Climate Change Review

The Garnaut Climate Change Review was commissioned by Australia's State and Territory Governments on 30 April 2007. The Prime Minister of Australia, the Honourable Kevin Rudd MP confirmed the support and participation of the Australian Federal Government in the Review.

ExxonMobil understands that the Review will examine the impacts of climate change on the Australian economy, and recommend medium to long-term policies and policy frameworks to improve the prospects for sustainable prosperity. As part of this review Professor Garnaut has also issued a public discussion paper on Emissions Trading and called for public comment.

ExxonMobil through its global affiliations has significant experience in climate change policy and is one of the few firms in Australia that have direct experience in the design, development and operation of a wide scale Emissions Trading System (ETS), namely the European ETS. ExxonMobil is therefore well positioned to draw on this experience as well as its local professional expertise and experience in making comment to the Garnaut Review. It is in this context that ExxonMobil Australia provides the following submission.

Executive Summary

- ExxonMobil recognizes that the risks of global climate change to society and ecosystems may prove to be significant. Our approach is to take sensible economic actions now to improve efficiency and reduce emissions while pursuing research designed to better understand scientific issues and to achieve technology breakthroughs that could dramatically reduce future emissions.
- Economic progress, especially in developing countries, will drive global energy demand and CO₂ emissions higher despite substantial efficiency gains. Oil, natural gas and coal will remain indispensable to meeting energy demand both globally and in Australia given their scope and scale.
- Given the forecast growth of emissions in the developing world it is important to understand that mitigating global CO₂ emissions growth requires participation of the developing world in any policy response. The scope and scale of the emissions challenge can not be met by Australia acting alone given our small contribution to global emissions (i.e. Australia's CO₂ emissions from fossil fuel combustion were ~1.4% of the world's total in 2005 and this share is forecast to decline.)
- Policymakers in Australia and globally are currently considering a variety of proposed regulatory options to mitigate GHG emissions. In our view, assessing these options requires an understanding of their likely effectiveness, scale and cost, as well as their implications for economic growth and quality of life. Within ExxonMobil, we analyse and compare the various policy options by evaluating the degree to which they:
 - ensure a uniform and predictable cost of reducing CO₂
 - maximize the use of market forces
 - promote global participation and consider priorities of developing world
 - minimize complexity and administrative costs
 - maximize transparency to companies and consumers
 - adjust in the future to new developments in climate science and the economic impacts of policies
- The most commonly canvassed 'market mechanisms' to address rising emissions fall into two specific areas - carbon trading (i.e. Emissions Trading Schemes or ETS) and a carbon tax. Each offers distinct advantages and difficulties. Effectively weighing these policy options requires understanding the scale, cost and economic trade-offs involved.
- Implementing a carbon price will not be a costless exercise for business or consumers. ExxonMobil agrees with Professor Garnaut that consumers could face significant increases in energy costs as the result of establishing a cost for carbon.

Box 1: \$50/tonne CO₂ in Australia implies: *

Petrol	up to 17 c / litre
Gas	up to \$1.25 / gigajoule
Electricity	up to \$40 / MWh
* based on publicly available price information	

- Many economists have recommended the establishment of a carbon tax as the more transparent, efficient, stable and administratively simple mechanism for managing emissions across the economy. This approach merits strong consideration.
- While we would not recommend an ETS, if policymakers choose to pursue emissions trading, some of the efficiency advantages of a carbon tax can be captured through the inclusion of a cost containment mechanism (safety valve) including a ceiling and floor price as well as allowing for banking and a limited capacity to borrow carbon credits.
- Inclusion of this mechanism should also be given a high priority by policy makers as it is an essential policy instrument that will protect the Australian economy and consumers from the significant price volatility inherent in carbon trading.
- ExxonMobil urges consideration of the following design features in any Australian ETS:
 - Auctioning of tradeable carbon credits on a single-price, single-round auction basis.
 - Recognition of trade exposed emissions intensive industries (TEEI) i.e. LNG and refining.
 - Free permit allocation to TEEI but with no ability to trade such permits.
 - A well designed penalty fee for non-compliance that is contained within clearly defined legal frameworks and which is significantly higher than the cost containment mechanism.
 - Development of internationally consistent standards for offsets
 - There are significant risks for Australia to unilaterally implement an emissions trading scheme in the expectation that such a scheme will ultimately merge into a well constructed and agreed global trading regime.
- The economic burden of a carbon price can be mitigated by effective use of auction revenues. The government will generate significant funds through an ETS - probably more than A\$5 billion in the first year. ExxonMobil's view is that this should be returned to tax payers preferably through a broad-based reduction in a current tax on labour or capital, which would not impact incentives to reduce emissions.
- Meeting the emissions challenge will require widespread introduction of innovative, currently noncommercial technologies. As such a focus on technology must remain a major element of any long-term plan to addressing growth in emissions. A portion of revenue raised through an ETS should be considered being directed toward the development and deployment of low emissions technology.
- It must be recognized that Australia will be imposing an additional cost burden on its energy intensive trade exposed industries that its main competitors will not face. This has the potential not only to make Australian companies less competitive but will place greater pressure on energy intensive industries to relocate investment outside Australia.

- If an ETS is to be started in 2010 then very serious consideration should be given to phasing in the implementation of the scheme as was done in Europe, with the first phase of the implementation being a test period to ensure systems are working correctly and have been properly designed, and that expected benefits of sustaining and/or modifying the system justify the expected costs..
- Particular consideration should be made for gas and fuel supplies and other essential services where reliability and continuity of supply are paramount and consequently opportunities to shutdown for maintenance need extensive planning to avoid impacts on supply.
- Currently there is an array of energy and fiscal policies at the state and federal level that if left in place would undermine the efficacy of any carbon price signal. In particular we would identify several areas that require specific review – mandated energy efficiency programs, mandated technological requirements to mitigate emissions, mandated quotas for different energy sources and fiscal disparities (taxes and/or subsidies).

Note: *an ETS should not be a goal in itself, but one of several potential means to an end - in this case facilitating the achievement of a reduction in the global growth of greenhouse emissions. It is important to recognise that many companies in Australia advocating the adoption of emissions trading are intending to pursue it as an active business in and of itself or have other significant commercial interests they wish to pursue in the development of such schemes. In contrast ExxonMobil uses emissions trading solely as a means to achieve compliance with obligations in an economically efficient fashion.*

About ExxonMobil

ExxonMobil Australia and its subsidiaries (ExxonMobil) has had a significant role in the development of Australia's oil and gas resources and has a business history in this country stretching back more than 110 years.

ExxonMobil is Australia's largest integrated petroleum company. Our activities cover exploration and production of oil and gas, petroleum refining and marketing of fuels (including natural gas), lubricants, bitumen and chemical products.

ExxonMobil is a substantial investor in the Australian economy and a major contributor to the wealth of the nation. Annually ExxonMobil pays around A\$800 million in taxes to local, State and Federal Governments. Our cumulative investment in Australia exceeds A\$13 billion and we provide direct employment for around 1700 people and indirect employment for many thousands more.

Enabling Economic Progress in Australia

ExxonMobil's Bass Strait (Gippsland) operations have produced almost two-thirds of Australia's cumulative oil production and almost 30 percent of Australia's gas production. Just how significant Bass Strait has been in underpinning the economic growth of Australia is seen in the following figures. Oil and gas production in Bass Strait has:

- contributed over \$200 billion to Gross Domestic Product (GDP) over its life or some \$2.2 billion per annum in nominal terms;
- has stimulated approximately 50,000 permanent additional jobs in Victoria (14,000 in regional Gippsland alone); and
- generated approximately \$300 billion in Federal Government revenues in real terms (2.1 percent of all Government revenues collected in the last 40 years).

Exxon Mobil Corporation

Globally, Exxon Mobil Corporation – the parent company of ExxonMobil Australia - is the world's largest publicly quoted oil and gas company and the world's largest corporation in terms of market capitalisation. Worldwide the company and its subsidiaries produce more than 4.5 million oil-equivalent barrels of energy resources every day from some 1600 fields and operate in over 200 countries. Exxon Mobil Corporation is also the world's largest non-government marketer of natural gas and in our global downstream business the company has interests in 38 refineries in 21 countries and over 32,000 service stations world-wide.

ExxonMobil's approach to climate change

There is increasing evidence that the earth's climate has warmed on average about 0.7 degrees C in the last century. Many global ecosystems, especially the polar areas, are showing signs of warming. CO₂ emissions have increased during this same time period — and emissions from fossil fuels are one source of these emissions.

Climate remains today an extraordinarily complex area of scientific study. Nonetheless the risks to society and ecosystems from increases in CO₂ emissions could prove to be significant, so it is prudent to develop and implement strategies that address the risks, keeping in mind the central importance of energy to the economies of the world. This includes putting policies in place that start us on a path to reduce emissions, while understanding the context of managing carbon emissions among other important world priorities, such as economic development, poverty eradication and public health.

While this long-term objective is pursued, near-term objectives should include supporting climate research while pacing policy responses such as promoting energy efficiency, deploying existing technologies that reduce greenhouse gas emissions, and supporting research and development of new, low-GHG technologies.

Policymakers in Australia and globally are currently considering a variety of proposed regulatory options to mitigate GHG emissions. In our view, assessing these options requires an understanding of their likely effectiveness, scale and cost, as well as their implications for economic growth and quality of life. Within ExxonMobil, we analyse and compare the various policy options by evaluating the degree to which they:

- ensure a uniform and predictable cost of reducing CO₂
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- adjust in the future to new developments in climate science and the economic impacts of policies

ExxonMobil scientists have undertaken climate change research and related policy analysis for 25 years and their work have produced more than 40 papers in peer-reviewed literature. In addition, our scientists participate in the United Nations Intergovernmental Panel on Climate Change (IPCC) and numerous related scientific bodies.

Over the years the company has supported major climate research projects at such institutions as the Massachusetts Institute of Technology, Stanford University, the Australian Bureau of Agricultural and Resource Economics, Princeton University, the Hadley Centre for Climate Prediction, the International Energy Agency Greenhouse Gas R & D Program, Yale University, and the Lamont Doherty Earth Observatory at Columbia University.

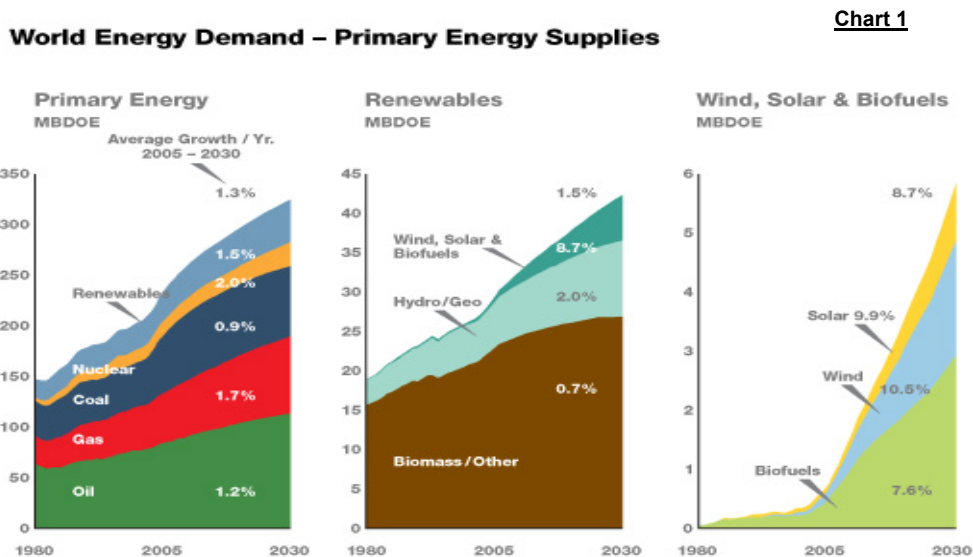
1. The global energy outlook

To assess the scope and scale of future emissions growth and the challenge it represents to policy makers, it is important to understand the expected contribution of all primary energy sources in the near to medium term. ExxonMobil has developed a global energy outlook that examines these trends – in this case out to 2030.

The series of graphs illustrated in Chart 1 shows world energy demand as forecast by ExxonMobil. The first graph shows total energy demand with oil consumption, driven by transportation and industrial demand, increasing at 1.2 percent per year. Gas consumption is expected to grow at 1.7 percent per year, driven by demand for power generation using this efficient fuel, which has relatively low carbon intensity. Demand for coal — with its high carbon intensity — is likely to continue to rise but at less than 1 percent per year, driven by demand primarily in the emerging economies. Nuclear is also expected to grow, particularly beyond 2020.

Renewables (shown across the top of the first graph, and in more detail in the second) are expected to gain an increased share of the energy market, with a total growth rate of 1.5 percent per year over the period. The most significant fuel in this segment is expected to be traditional biomass — wood, charcoal, dung — with relatively slow growth. Hydroelectric and geothermal energy are projected to increase at close to 2 percent per year — limited by the availability of suitable development sites.

“Modern” renewables — wind, solar and biofuels — (shown across the top of the second graph, and in more detail in the third) are expected to grow rapidly, supported by government subsidies and mandates. Biofuels, mainly ethanol, will grow at about 8 percent per year, and wind and solar at about 10 percent per year. These high growth rates will make these technologies more prominent than they are today. However, even with the expected high growth rates, wind and solar combined will account for only about 1 percent of global energy demand in 2030. Adding biofuels will bring the total contribution of these “modern” renewables to a total share of approximately 2 percent.



Global CO₂ emissions

The world energy demand outlook can be used to develop a forecast of energy-related CO₂ emissions. Using the ExxonMobil forecast we estimate that global energy-related CO₂ emissions will increase at about 1.2 percent per year to 2030, reaching an annual level of close to 37 billion tonnes. This forecast includes the aggressive assumptions for energy intensity improvements arising from the expected improvements in energy efficiency and the expected increase in the use of “modern” renewables, nuclear generation and natural gas included in the world energy outlook.

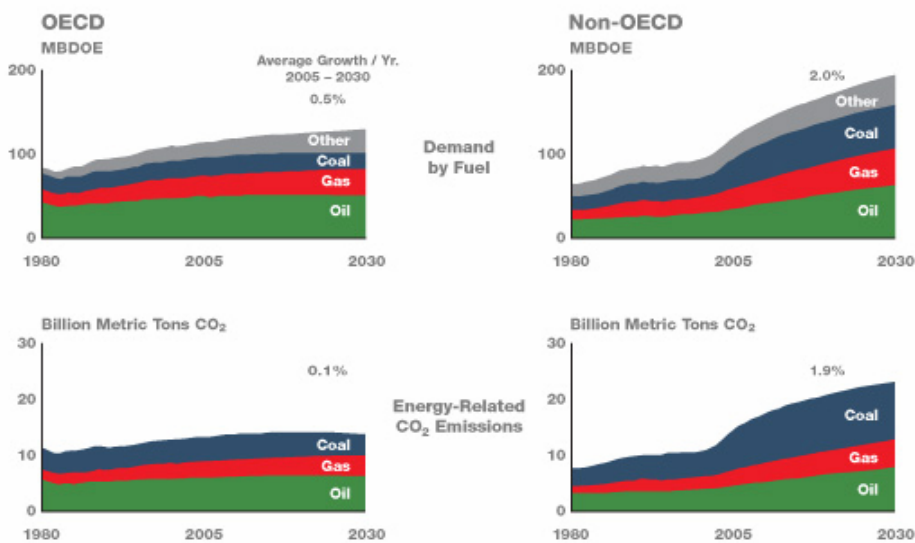
Chart 2 shows the total energy-related CO₂ emissions growth across the period to 2030 and highlights that this growth will be much more pronounced in the non-OECD countries, reflecting the large population base with rapidly rising economic prosperity in these countries. Given the anticipated fuel mix powering this economic expansion, global CO₂ intensity is not expected to improve significantly.

In the OECD (Organisation for Economic Cooperation and Development) member countries, overall energy demand growth (top left on chart) is expected to be relatively modest at 0.5 percent per year. It is also expected that the use of coal will decline in these economies. Consequently, energy-related CO₂ emissions in OECD countries are anticipated to be almost flat with growth in energy demand expected to be nearly offset by a decrease in overall carbon intensity of energy use.

In the non-OECD countries, energy-related CO₂ emissions are expected to increase at a rate of almost 2 percent per year, reflecting their tremendous need for power generation, transportation and industrial fuels — and the strong growth in all fossil fuels. As a result, non-OECD countries will represent close to 95 percent of the growth in energy-related global CO₂ emissions out to 2030.

World Energy and CO₂ Emissions

Chart 2



Australian energy demand and emissions

The Australian energy outlook shows similar directional trends to the global picture. Out to 2030 – we project energy growth of around ~37 percent above 2005 levels – or just slightly lower than the nearly 40 percent increase expected globally from 2005 to 2030. While renewable energy has an important place in the overall energy mix for Australia and will grow rapidly, it is limited in scope and size in terms of the contribution it can make in the Australian context. Even with expected strong growth in wind and solar, their share of total energy supply is expected to be ~0.5 percent of the total Australian energy supply by 2030.

Given the anticipated fuel mix for Australia, energy-related CO₂ emissions are expected to increase but the total contribution to global emissions will remain small. In fact Australia's global share of energy-related CO₂ emissions will decline over the period, as world emissions grow at ~1.2 percent annually from 2005-2030 compared to ~0.9 percent annual growth in Australia.

Scope and scale of the global CO₂ emissions challenge

Having established an outlook for energy-related CO₂ emissions we should take a moment to examine the scope and scale of the challenge presented when considering options available to offset the expected CO₂ emissions growth. Chart 3 below examines some key transportation and power generation “sensitivities” to illustrate the significant challenges — and the practical realities – the world faces in reducing energy-related CO₂ emissions.

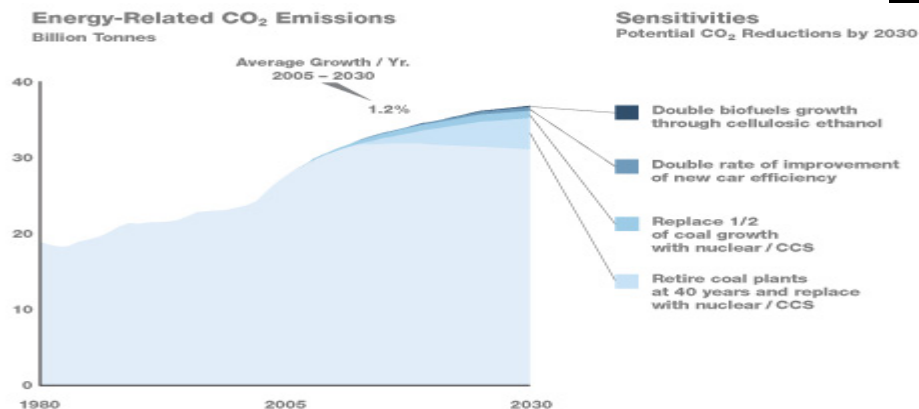
One of the transportation fuel options frequently discussed relates to the development of cellulosic ethanol. To address this possibility a sensitivity has been examined that doubles the growth of biofuels supply, enabled by a cellulosic ethanol breakthrough. As shown, the impact of such a breakthrough would be minimal, reducing expected CO₂ emissions by only about 0.5 percent in 2030.

Another transportation sector related initiative would be to double the expected rate of improvement in new vehicle fuel economy; this could reduce CO₂ emissions by about 1 percent in 2030. This relatively small impact reflects the time it takes for new vehicles to penetrate the market and begin to materially affect the performance of the total global fleet of vehicles.

Turning to the power generation sector, we have reviewed the effect of replacing one-half of the expected growth in traditional coal-fired power plants with “low carbon” alternatives, either nuclear or Integrated Gas Combined Cycle (IGCC) with carbon capture and storage. Such a change would reduce expected CO₂ emissions in 2030 by about 3 percent. To put this in perspective, replacing all this new coal capacity with nuclear plants would require adding 125 more nuclear plants before 2030 in addition to the roughly 170 new plants already projected to be built in this timeframe. The effect of this change would be greatest in the non-OECD countries where traditional coal use is growing for power generation.

Global CO₂ Emissions

Chart 3



Clearly these and other dramatic measures are required if the expected growth in CO₂ emissions is to be reversed. Such a measure may be to consider retiring all existing coal plants at 40 years. This has been reviewed as a sensitivity to the outlook with all such plants replaced by “low carbon” alternatives — nuclear or IGCC-CCS. This measure would reduce CO₂ emissions by about 10 percent in 2030. Again, for perspective, achieving this result by substituting nuclear plants in place of this coal capacity would require adding another 500 nuclear plants to the outlook by 2030. That is more than the number of nuclear plants that exist worldwide today.

To offset the expected CO₂ emissions through 2030 would require that all the measures listed above are taken — even though each of these is highly unlikely. The challenge is further heightened when considering any objective that would seek to reduce CO₂ emissions below current levels, let alone below levels existing in previous periods. This analysis is not undertaken to suggest that any of these, or other possible measures should not be considered, but only to simply highlight in a realistic way the scope and scale of the challenge.

1. Key Conclusions

- Economic progress, especially in developing countries, will drive global energy demand higher despite substantial efficiency gains - trends which are mirrored in Australia.
- Oil, natural gas and coal will remain indispensable to meeting energy demand both globally and in Australia, even with rapid growth in renewables.
- Given the forecast growth of emissions in the developing world it is important to understand that significantly impacting global CO₂ emissions growth requires global participation and inclusion of the developing world in any policy response.
- Even assuming major efficiency and technological improvements in transport and power-generation reducing emissions growth poses a significant technical, commercial and practical challenge.

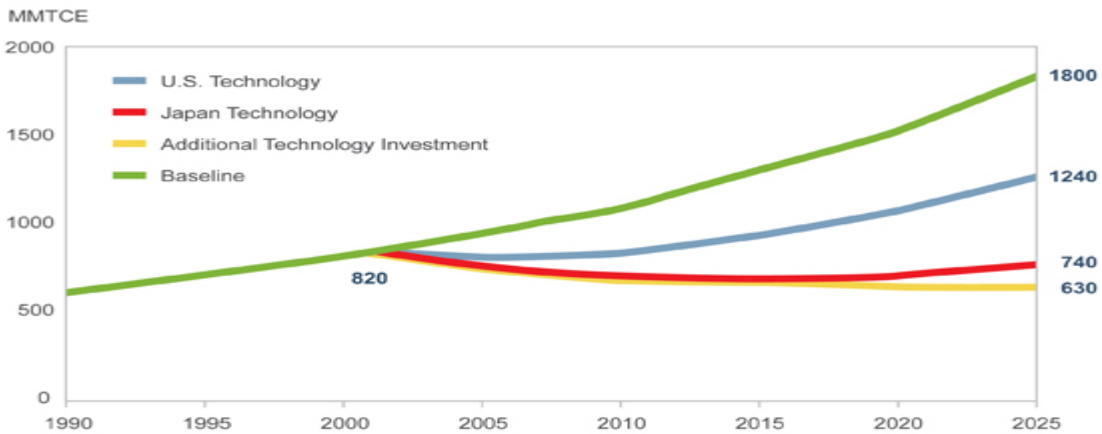
2. Technology's vital role

The sensitivities reviewed in the previous section highlight that applying the most recent technologies available can reduce CO₂ emissions. Such technology, which is generally available in OECD countries, if applied in developing economies could significantly reduce carbon emissions. In China, for example, investments being made today have on average significantly lower energy efficiency and higher greenhouse gas emissions than equivalent investments being made in OECD countries. A recent study by Bernstein, Tuladhar and Montgomery has shown that by adopting today's U.S. or Japanese technology in future investments in China could reduce China's anticipated 2025 carbon emissions by more than 30 percent (see Chart 4).

Furthermore, if policies to increase R&D investment could increase the rate of improvement in energy efficiency in China's economy to twice today's levels, then emissions could decrease to around 65percent of anticipated 2025 emissions and result in a continuous decrease in China's future emissions. The study also concluded that "the potential for reducing emissions through changing technology in developing countries over the next 15 years is estimated to be of similar magnitude to the reductions in emissions that would be achieved if all Annex B countries were to achieve their Kyoto Protocol emission caps." It should also be noted that such an initiative would also significantly improve the health outcomes within these countries as the older technologies used within those countries not only emit more CO₂; they also generally emit environmental pollutants that have negative health effects. One significant barrier identified to the deployment of technology in non-OECD countries is the issue of protection of intellectual property.

Existing Technologies Offer Significant Potential
Projected Chinese Emissions with Enhanced Technology⁶

Chart 4



Source: Bernstein, Tuladhar, Montgomery

The need for innovative technology

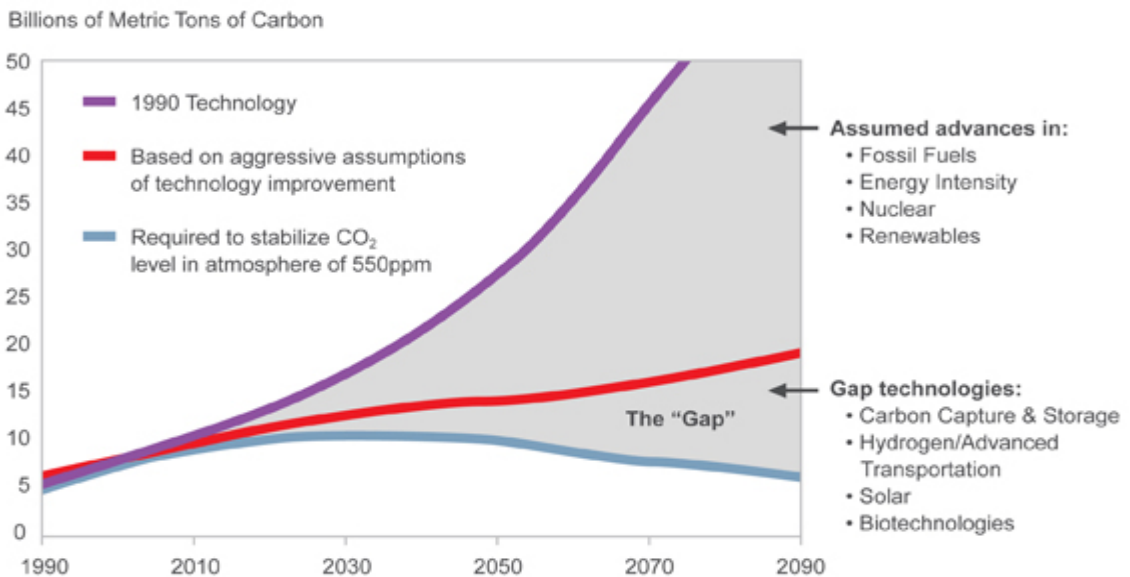
As noted above worldwide carbon emissions are expected to grow rapidly over the next 25 years, even with significant technology advances. On Chart 5 the middle curve (red line: from the Intergovernmental Panel on Climate Change 1992) shows projected growth in greenhouse gas emissions over the coming century. The IPCC projection assumes major ongoing improvements in the efficiency with which energy is supplied and used from oil, coal and gas, as well as enhanced penetration of nuclear and renewable energy.

Without technological improvements, emissions would be much higher, as shown in the top curve (purple line) where energy is supplied and used with efficiency at 1990 levels. The lowest (blue) curve illustrates one emissions trend corresponding to stabilizing CO₂ concentrations at 550 parts per million (ppm).

Reducing emissions to the lowest trend line would require widespread introduction of innovative, currently noncommercial technologies to fill the remaining gap. These "gap" technologies include carbon capture and storage, hydrogen production and use, advanced solar technologies and biotechnologies, all of which require fundamental breakthroughs in research to overcome barriers including cost, performance, safety and public acceptance before they could enter widespread use.

The Need for Innovative Technology⁵
Carbon Emissions

Chart 5



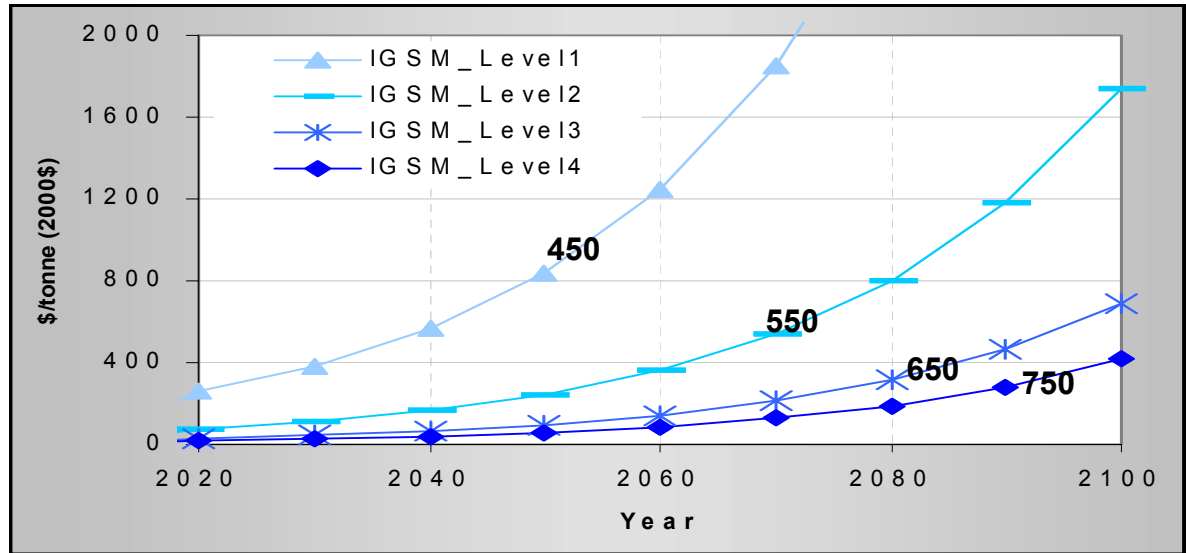
2. Key Conclusions

- Development and deployment of new energy efficient technologies can enable lower energy consumption without damage to economic growth.
- Applying OECD country technology to developing economies could dramatically reduce emissions.
- However stabilisation of atmospheric Co₂ at 550 parts per million would require widespread introduction of innovative, currently noncommercial technologies.
- Therefore a focus on technology must remain a major element of any long-term plan to address growth in emissions. This includes not only encouragement of research and development to create the commercially viable, low emissions technologies that will be essential to manage long-term risks, but also efforts to encourage the utilisation and transfer of existing efficient technologies now.

3. Stabilisation, Co2 price and the cost of energy

Under any stabilisation scenario implementing a carbon price on the global or Australian economy will not be a costless exercise for business or consumers. The following chart shows different scenarios for stabilising global CO₂ emissions as produced by the MIT Joint Program on global climate change. What the chart shows is that price rises with higher reference case emissions, with time, and with more stringent stabilisation targets.

Stabilization Scenarios MIT Joint Program on Science and Policy of Global Change **Chart 6**



While the costs can vary between models as is illustrated in the following table comparing the work of MIT with other globally renowned modelling organisations (EPRI and Battelle) the general trend is clear. Stabilising CO₂ emissions under any scenario requires a carbon price that rises steeply as time progresses.

Price \$/tonne Carbon (Note: for price of CO₂/tonne divide by a factor of 3.5) **Chart 7**

	Year	Battelle	EPRI	MIT
450	2020	94	112	259
	2050	435	589	842
	2100	676	1000	6053

	Year	Battelle	EPRI	MIT
550	2020	17	8	75
	2050	99	37	245
	2100	330	440	1743

	Year	Battelle	EPRI	MIT
650	2020	4	3	30
	2050	18	14	97
	2100	217	160	686

These modelling exercises are directionally consistent with the international literature and recent work undertaken by the IPCC. In addition they are consistent with the modelling work undertaken by Access Economics and Charles River and Associates for APPEA (please refer APPEA submission for more detail on the CRA findings). Studies suggesting that deep cuts in emissions can be achieved with a carbon price that flattens out over time are theoretically flawed.

The implications of these results for Australian consumers of energy is illustrated in Box 1 which shows that a \$50/t CO₂ price applied both downstream and upstream could result in increases in petrol, gas and electricity prices.

Box 1: \$50/tonne CO₂ in Australia implies: *

Petrol	up to 17 c/ litre
Gas	up to \$1.25 / GJ
Electricity	up to \$40 /MWh

** based on publicly available price information*

3. Key Conclusions

- Stabilising CO₂ emissions requires a carbon price that rises steeply as time progresses.
- Implementing a carbon price will not be a costless exercise for business or consumers.
- ExxonMobil agrees with Professor Garnaut that consumers will face increases in energy costs on petrol, gas and electricity as the result of establishing a cost on carbon.

4. 'Market mechanisms' for reducing Co2 emissions – an overview

The most commonly canvassed 'market mechanisms' to address rising emissions fall into two broad areas – carbon trading (ETS) or a carbon tax. Such market mechanisms have been implemented in Europe in the case of an ETS and in British Columbia (Canada) in the case of a carbon tax. Similarly the US is considering a range of different legislative proposals in each of these categories. Each offers distinct advantages and difficulties depending on the design features incorporated. Effectively weighing the policy options requires understanding the scale, cost and economic trade-offs involved. Each policy category is dealt with in turn below.

Emissions Trading Schemes (ETS)

While there are a range of proposed ETS both at a global, national, and sub-national government level it is useful as a scene set to understand what an ETS involves in its most basic form. In its simplest definition an ETS involves rationing a firm's ability to emit carbon dioxide (and other greenhouse gases, calculated in tonnes of carbon dioxide equivalent, tCO₂e) usually under a targeted cap on overall emissions.

In keeping with economic theory, an ETS assumes a competitive and liquid trading system through which emission permits will flow (i.e. purchased in the market place) to the emitters that value them most highly. Therefore marginal abatement costs across stakeholders will be equalised, and the targeted level of emissions abatement will be achieved at least cost since the price of permits will equal the marginal cost of abatement. In theory by establishing a fixed cap on emissions, an ETS (subject to compliance) will also guarantee that a given reduction target will be met. In short, the quantity of abatement is certain but the price of carbon will vary pending supply and demand.

Policy makers need to be aware that carbon trading systems come in a variety of types. Most notably there are those that apply at the source of emissions (downstream, such as the EU-ETS) and those that apply to fuels that will ultimately be combusted (upstream, such as several under consideration in the United States and Australia). The detailed design features incorporated in any one model are of consequent importance and have ramifications in terms of equity and efficiency. Each of the key design features will be discussed later in this paper.

Carbon Tax

In short a carbon tax seeks to place a levy on GHG emitters to pay a specific price on each tonne of emissions released. The carbon tax seeks to set the price of the environmental externality but does not guarantee the quantitative impact on emissions. The main benefit of a tax is that it offers certainty, stability and transparency about the price of an activity, and therefore provides clear and reliable signals for current and future behavioural and investment decisions that affect GHG emissions over time. Like an ETS there are also important design features that need to be considered in the implementation of a carbon tax. These include the choice of the rate, the tax base, point of application and coverage of emissions.

A Carbon Tax versus an ETS – Efficiency Implications

This section draws from a recent research publication produced by the United States Congressional Budget Office (CBO) examining the efficiency implications of a carbon tax versus an ETS. The paper concludes that a tax would be a more economically efficient policy for reducing CO₂ emissions than an ETS with an inflexible cap (with “inflexible” meaning a cap the level of which was not affected by the price of emission allowances).

In summary the CBO argues that if government wanted to maximize expected net benefits, it would need to set the level of a cap or a tax in a given year on the basis of its best estimate of both the costs and benefits of reducing emissions in that year. However, actual costs in any year are likely to differ from the best estimate, sometimes exceeding it and sometimes falling below it. Because a tax would motivate only emission reductions that cost less than the tax rate, it would automatically adjust the quantity of emission reductions to keep their costs in line with their anticipated benefits, whereas a cap would not.

When analysts take into account the degree to which costs are likely to vary around a single best estimate, they conclude that a tax could offer much higher net benefits than a cap. A range of empirical studies support the CBO conclusions. A study by economist William Pizer (2000) suggests that the net benefits of a worldwide tax on CO₂ emissions in 2010 would be more than eight times larger than those of an equivalent inflexible cap. If the policies are assumed to be set in place for 100 years, the efficiency advantage of a tax declines to a factor of five.

Another study by Hoel and Karp (2001) concluded that a tax could offer up to 16 times greater expected net benefits than a cap under some assumptions. A third study by Newell and Pizer (2002) examined outcomes when cost shocks were assumed to be correlated across time—that is, an unusually high cost of meeting the cap in any given year increases the likelihood of a higher than average cost in the following year. Using their base-case parameter estimates for factors that might affect costs (such as baseline emissions and changes in technology) and assuming a 10-year policy, those researchers estimated that the net benefits of a tax would be roughly five times higher than those of a cap.

Taken together, the CBO concludes that the net benefits of a tax could be roughly five times those of an inflexible cap —assuming that both policies were designed to balance expected costs and benefits. Viewed another way, any long-term emission-reduction target could be met by a tax at a fraction of the cost of an inflexible cap-and-trade program. That cost savings stems from the fact that a tax could better accommodate cost fluctuations while simultaneously achieving a long-term emission target. It would provide firms with an incentive to undertake more emission reductions when the cost of doing so was relatively low and allow them to reduce emissions less when the cost of doing so was particularly high.

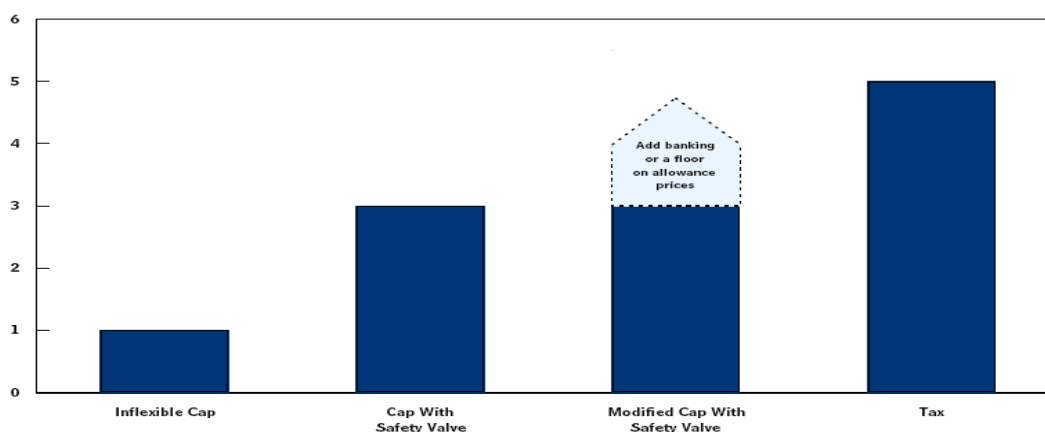
The CBO study also explores ways in which policymakers could preserve the structure of a cap-and-trade program but capture the efficiency advantages of a tax. Specifically it concludes that policymakers could take one or more of the following steps to improve the efficiency of a cap-and-trade program – Each of which are also illustrated in chart 8:

- Establish a cost containment mechanism — sometimes referred to as a safety valve — by setting a ceiling and a floor on the price of emission allowances. The government could maintain a ceiling by selling companies as many allowances as they would like to buy at the containment price which might be say 2x the high end of the price the government has predicted for the program. The government could maintain a price floor by selling allowances in an auction and specifying a reserve price, which is set to maintain emission restraining activities.
- Permit firms to transfer emission-reduction requirements across time—by “banking” allowances in one year for use in future years or by “borrowing” future allowances for use in an earlier year. Firms would have an incentive to bank allowances when the cost of cutting emissions was low (relative to anticipated future costs) and to borrow allowances when costs were high. ExxonMobil would propose only a limited ability to “borrow” allowances be considered in order to avoid excessive allowance price volatility until companies gain experience with emissions accounting and the marketplace.
- Modify the stringency of the cap from year to year on the basis of the price of allowances. Policymakers could loosen the cap if the price of allowances rose too high, or they could tighten the cap if the price fell too low. Some analysts have suggested the use of a “circuit breaker” that would halt the gradual tightening of the cap if the price of allowances exceeded a specified trigger price. The cap would resume its decline if the price of allowances eventually fell below the trigger price. Loosening or tightening the cap could be achieved indirectly by altering conditions under which firms could bank or borrow allowances.

Economic Efficiency of Various Policies to Reduce CO2 Emissions

Chart 8

(Source: CBO February 2008)



Source: Congressional Budget Office based on estimates of the relative magnitude of the net benefits of various policies found in William A. Pizer, "Combining Price and Quantity Controls to Mitigate Global Climate Change," *Journal of Public Economics*, vol. 85 (2002), pp. 409–434, and in Richard G. Newell and William A. Pizer, "Regulating Stock Externalities Under Uncertainty," *Journal of Environmental Economics and Management*, vol. 45 (2002), pp. 416–432.

Notes: The net benefits of each policy are shown in relationship to each other with the net benefits of an inflexible cap set equal to one. The inflexible cap and the tax are assumed to be set at the most efficient level—that is, at the point at which the expected marginal cost of complying with the policy would be equal to the anticipated marginal benefit of reducing emissions.

The net benefits of a cap with a safety valve (a ceiling on the price of emission allowances) are based on the assumption that the cap would be set at the level of the most efficient inflexible cap and the safety-valve price would be set at the level of the most efficient tax. Banking would enable firms to save unused allowances from one period to use in a future period.

The net benefits of a cap-and-trade program with a circuit breaker (not shown in the figure) would be greater than those of an inflexible cap and less than those of a cap with a safety valve; however, CBO lacked sufficient information to determine how much greater or less they would be.

A cap-and-trade program that included a safety valve and either a price floor or banking provisions could be significantly more efficient than an inflexible cap, although somewhat less efficient than a tax.

CO₂ = carbon dioxide.

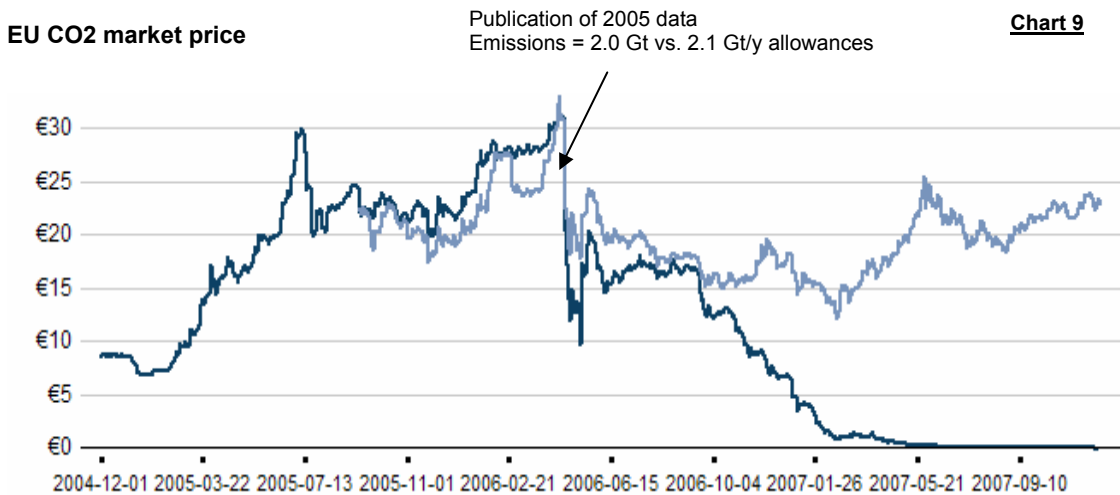
The Impact of Price Volatility – ETS v Tax

Volatile allowance prices can have disruptive effects on markets for energy and energy-intensive goods and services and make investment planning difficult. The smoother price path offered by a CO₂ tax would better enable firms to plan for investments in capital equipment that would reduce CO₂ emissions.

The flexibility in reducing emissions that a tax affords is important because the cost of cutting emissions by a given amount could vary from year to year depending on such factors as the weather, the level of economic activity, and the availability of low-carbon technologies. A tax would provide a steady, predictable price for emissions. An inflexible cap, however, could result in volatile allowance prices, making a cap-and-trade program more disruptive to the economy than a tax would be.

Experience with cap-and-trade programs has shown that price volatility can be a major concern when a program's design does not include provisions to adjust for unexpectedly high costs and to prevent price spikes. For example, one researcher found that the price of sulfur dioxide allowances under the U.S. Acid Rain Program was significantly more volatile than stock prices between 1995 and 2006.

Experience with allowance prices in the European Union's (EU's) Emission Trading Scheme (ETS)—a trading program that covers CO₂ emissions from roughly 12,000 sources across 27 countries— seem to reinforce the inherent volatility in carbon trading programs. In fact allowance prices fell drastically when it became evident that policymakers had over allocated emission allowances as illustrated in chart 9 below. The initial European experience is instructive in assessing a limited, downstream carbon trading system. It is noteworthy that even in its first years of operation the EU ETS can be characterised as being administratively complex, subject to carbon price volatility, with little observable impact on Europe's overall emissions profile, and with some indication that energy intense industries are cautious about expanding capacity through investment in Europe. (See The European Environment Agency's December 2006 report showing GHG emissions well off track to meet 2008 - 2012 targets).



(Source: PointCarbon)

Price volatility could be particularly problematic with CO₂ allowances in economies like Australia's that are particularly reliant on fossil fuels both domestically and as a major generator of export income. Given this exposure policy makers need to be aware that volatility in CO₂ allowance prices will impact energy prices, inflation rates, and the value of imports and exports.

However a cap-and-trade program that included the key design features of a cost containment mechanism and banking and borrowing may help overcome price volatility issues and related investment planning concerns and protect the Australian economy from unintended consequences particularly in the early years of system implementation. This price volatility will be potentially exacerbated through international linkages of ETS systems. In particular there is potential for Australia to import the EU (or any other linked jurisdiction) emission price path and volatility. We therefore urge extreme caution about linkage to other international programs.

4. Key Conclusions

- The most commonly canvassed 'market mechanisms' to address rising emissions fall into two specific areas – carbon trading (ETS) and a carbon tax. Effectively weighing the policy options requires understanding the scale, cost and economic trade-offs involved.
- Many economists have recommended the establishment of a carbon tax as the more efficient, stable and administratively simple mechanism for managing emissions. This viewpoint merits strong consideration.
- Policymakers can preserve the structure of a cap-and-trade program but capture some of the efficiency advantages of a tax through the inclusion of a cost containment mechanism (ceiling and floor price) on carbon and allowing banking and borrowing of carbon credits.
- Inclusion of a cost containment mechanism should also be given a high priority by policy makers as it is essential in protecting the Australian economy from the consequences of unexpectedly high market prices for allowances or greater price volatility.
- Price volatility will be potentially exacerbated through international linkages of ETS systems. In particular there is potential for Australia to import the EU (or any other linked jurisdiction) emission price path and volatility.

5. What effective trading requires

In addition to the design features that could improve the efficiency of an ETS – i.e. cost containment and banking and borrowing – the practical development of a broad based carbon trading system requires decisions by policy makers on the rules that will govern a significant number of complex procedures and systems. The following represent the key design criteria for an ETS:

- Measurement, reporting, and verification protocols
- Allocation procedures among and within sectors, e.g., auctioning of allowances
- Creation of trading rules/regimes
- Treatment of offsets, e.g. through foreign investments
- Procedures related to penalties, enforcement, and liability

In the following paragraphs we have set out the key issues under each of these headings and provided a summary of ExxonMobil's position.

Measurement, reporting, and verification protocols

It is widely accepted that credible and reliable greenhouse gas (GHG) inventories are fundamental to the effective operation of an emissions trading system, yet, it is also apparent that such systems are complex and, as experienced in Europe, have been difficult to develop. Likewise it is fundamental to the successful functioning of the petroleum industry that credible and reliable measurements are made of the materials that are handled by the industry (i.e. hydrocarbon fuels and associated products). Sophisticated systems in combination with complex measurement facilities have been implemented in the petroleum industry over many years to achieve the required measurement standards in the industry.

Given this background it could be construed that establishing the required GHG inventories for the petroleum industry will be readily achievable within the timeframe being imposed by government for the implementation of an ETS in 2010. This would not be a proper conclusion and it should be recognised that there will need to be considerable changes made to facilities and systems across the petroleum industry to collect, report and verify the data required to establish the GHG inventory for the proposed ETS.

While significant work has been done through the development of the National Greenhouse and Energy Reporting Scheme (NGER), there has not as yet been sufficient time to understand the full implications of these new requirements let alone develop an adequate appreciation for the challenges of meeting the potentially more rigorous requirements of an ETS. Probably the most significant complexity associated with measuring emissions from petroleum production and refining operations relates to the vast array of substances and their related emissions that need to be dealt with in the industry. This variety arises from the broad range of geological circumstances from which hydrocarbons are recovered, the number and type of unprocessed or semi-processed gases that are used as fuels and lost to flare, the broad range of natural resource characteristics and their potential to lead to carbon dioxide emissions, the wide range of end-product

specifications required for different markets, and the variety of facility configurations that are used to achieve the various functions in process plants such as refineries.

Oil and gas processing plants and refineries utilise many unprocessed or semi-processed substances as fuels. These fuels can be drawn from multiple points in the process and as such will have a variety of compositions and other physical properties. Further, in the absence of an ETS these streams have limited economic value, in many cases being by-products of the process and as such metering systems for such fuels are generally basic systems and are not appropriate for measurements with direct fiscal implications. Such facilities will need to be reviewed and possibly upgraded to achieve the performance desired for an ETS. This will inevitably take time and add cost. All plants in the industry include flare systems that are an essential safety feature of oil and gas processing plants and refineries. It is inherent that these systems see widely varying flow rates and fluid properties. Such flare streams are notoriously difficult to meter accurately because of this variability, as such emissions from such systems will not be capable of being measured to a high degree of certainty. To attempt to do so will be prohibitively expensive if not technically infeasible.

The preceding discussion has focused on the measurement of CO₂ emissions, however, the Australian Government is proposing to include non-CO₂ GHG emissions in the ETS. These gases, such as N₂O and methane fugitives, add more complexity to establishing a credible and reliable measurement system and GHG inventory. The complexity (and additional expense) arises because further systems and equipment will be required to measure these emissions. This added complexity and cost can be minimised with the use of estimation methods, generally involving agreed factors. It is recommended that a "factors approach" be adopted if the Government's expectation for starting an ETS in 2010 is maintained. Notwithstanding this simplification it will still take considerable time and effort to establish standard, accurate, equitable and transparent means to quantify the emission of these non-CO₂ GHG components. Additional consideration will need to be given to tracking such components associated with emissions reduction projects.

Given the above factors, considerable effort is required to ensure that GHG inventories have integrity and genuinely reflect the GHG emissions produced through an activity. Specifically, GHG inventories must:

- have a clear legal framework which is sufficiently detailed to ensure consistency within and across industries and applications;
- be clearly defined in scope to ensure that emissions are not double counted or omitted;
- include de minimis or materiality criteria so as to avoid accounting for liability protection when environmental impacts or benefits are marginal; and
- be capable of verification by suitably qualified parties.

Each of these aspects for establishing a reliable GHG inventory is discussed in more detail below.

Clear Legal Framework for GHG Inventories

Requirements for the measurement and monitoring of GHG emissions sources, calculation methodologies and /or uncertainty tolerances must be clearly defined and appropriate for all industries and applications. It is recommend that adopted methodologies build on existing GHG emissions reporting protocols such as the *World Business Council for Sustainable Development* publication, *The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard* and industry specific protocols such as the International Petroleum Industry Environmental Conservation Association's (IPIECA's) *Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions*, and the *American Petroleum Institute Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry*.

Credible and reliable GHG inventories for industrial processes involving fossil fuels require the following key components to be defined:

- Calculation / estimation methodologies
- Estimation techniques for fugitive emissions from a range of sources
- Uncertainty requirements (OR metering and sampling standards)
- De minimis or materiality criteria

In addition, each GHG emitting entity will require:

- Robust and calibrated metering, or appropriate and agreed estimation criteria
- Stream compositions (or defined emissions factors for streams with standard composition)
- Combustion efficiencies to cover the range of different applications and machinery
- Detailed understanding of GHG emission mechanisms including fugitives and the contribution of non-CO₂ GHG emissions

The Australian Government has acknowledged the need for the development of credible and reliable GHG inventories through the National Greenhouse and Energy Reporting (NGER) System. The NGER System defines equations for GHG emissions calculation and provides emissions factors for a number of standard fuels. However, as mentioned above it remains unclear as to what modification to these standards will be required to develop robust GHG inventories for all the components to be tracked within the scheme.

ExxonMobil favours an approach to GHG inventory development under an ETS similar to that utilised in the European Union. In this approach, uncertainty requirements are specified dependent on the nature of the emission source, for example, fuel gas usage for onshore and offshore applications, and the combustion of hydrocarbons in flares. The requirements are also a function of the significance of a source magnitude, with larger emissions requiring more certainty. The uncertainty requirements should be agreed with industry prior to the implementation of the ETS to ensure they are appropriate for the application and technically feasible. The uncertainty parameters should be more relaxed in the initial phase of the ETS to allow industry to adjust to the new regime and provide time for facilities and systems to be modified. If the first phase of the ETS commencing in 2010 is treated as a test then these uncertainty criteria can be trialled in a manner that reduces risk and ultimately enhances certainty across the scheme.

The overall uncertainty of the GHG inventory will be the product of the uncertainties associated with each of the components of the inventory - metering accuracy, sampling for compositions, combustion efficiencies and estimation methodologies. We would recommend that individual companies be given the freedom to choose the most efficient way (facilities or systems) to reduce the uncertainty associated with the individual components of GHG emissions and that regulations be focused on establishing the broader question of the overall uncertainty associated with the total emission of a facility. For example, the most efficient method of reducing uncertainty in a given application could be to increase the frequency of sampling for composition, or alternatively it could be to upgrade meters or increase the calibration frequency. Such choices should be left for the facility owner to make.

In regard to establishing the required uncertainty levels, the regulator should define these requirements having regard to giving industry sufficient time to design and implement the necessary hardware and system changes to meet the standard. This is particularly important given that some facility changes may require plants to be shutdown for modification to occur. Some changes may not be able to be implemented until the next scheduled maintenance shutdown which could be several years away. Particular consideration should be made for gas supply and other essential services where reliability of supply is paramount and consequently shutdown opportunities need extensive planning to avoid impact on customers. These practicalities associated with making changes to major facilities also support broader, or relaxed, uncertainty standards in the initial, or test, phase of the ETS.

Setting uncertainty requirements for emissions sources should be undertaken after consultation with industry and should take into consideration the practicalities of facility modifications and metering in sites that are relatively expensive and difficult to access, such as offshore oil and gas installations.

Scope of GHG Inventories

Under an ETS which requires permits for both industrial GHG emissions and upstream permits for emissions from fuel sales (such as natural gas, LPG, diesel and petrol) there is considerable scope for double counting. For example, oil and gas processing facilities and refineries produce direct GHG emissions from combustion of 'own-use' fuel, but they also purchase diesel, natural gas and electricity from other service providers. Although electricity is singled out as a Scope 2 emission, diesel and natural gas are Scope 1 and therefore not differentiated from own-use fuels. Since purchased diesel and natural gas should already have permits, purchase of a second permit should not be required and as such, needs to be differentiated from those emissions for which permits are required. This increases the complexity of the GHG accounting system and increases the risk of double counting.

Materiality Criteria

It is recognised that GHG inventories need to be sufficiently comprehensive to provide an accurate representation of GHG emissions for the purposes of an ETS. However, practicalities associated with the technical limits inherent in metering and the complexity of the processing facilities dictate that the legal framework for GHG inventories includes a materiality or de minimis criteria. These criteria should be set in a manner that is consistent with the overall uncertainty levels established for the inventory. Such an approach

will avoid regulatory and industry resources, including expenditures, being diverted unnecessarily to legal protectionism or unrealistic efforts to quantify relatively minor GHG emissions.

Industrial facilities and processing plants are complex and often generate GHG emissions from a variety of sources. In oil and gas processing facilities and refineries GHG emissions are produced from the combustion of multiple non-standard fuels and multiple flare streams as well as methane fugitives from processing facilities and storage tanks. In addition, GHG emissions can arise from venting, treatment of oil contaminated water, on-site treatment of sewage, associated car and other vehicle use and other activities from which emissions may occur.

Verification by Third Parties

To achieve credible and reliable GHG inventories ExxonMobil recognises that it is important to have verification systems in place that ensure compliance with the measurement, calculation and accounting requirements of the system. Verification mechanisms are also conducive to creating a “level playing field” for ETS participants.

Measurement and calculation of GHG emissions are science based and technical in nature and therefore, verification of emissions inventories should be separated from verification of the financial aspects of the ETS such as permit purchases and accounting. Accordingly, verifiers must be appropriately qualified in metrology and the procedures and facilities associated with the specific industry in which they operate. Substantial verification systems already exist that service the petroleum industry. It is strongly recommended that an ETS draw on these existing systems.

In Australia, critical metering and sampling systems are already subject to verification through the National Association of Testing Authorities (NATA). NATA can grant accreditation to facilities and laboratories that are deemed competent in specific types of testing, measurement, inspection and calibration. Accreditation is usually reviewed on a two-yearly basis to ensure ongoing competence. To maximise the use of existing systems and to ensure third party verifiers are appropriately qualified, NATA accreditation should be used for GHG emissions inventory verification. Use of this system should reduce the burden on government as GHG emitting entities with a high degree of sophistication could be granted NATA accreditation. Various facility operators currently hold NATA certification for the verification and operation of metering and sampling procedures and facilities associated with their facilities. It is recommended that these NATA certified entities also be recognised as verifying agencies for the purposes of the ETS. This approach will leverage a system that has existed for many years and is consistent with the approach to other significant government imposed regimes such as petroleum royalty and excise determinations.

We recommend that each emitting facility develop and have approved (by a regulatory authority) a monitoring protocol, which spells out the processes by which the facility will measure its GHG emissions. Once the monitoring protocol is approved by the regulatory authority, the verifier’s task should be limited to ensuring that the facility has achieved what it said it was going to do in its monitoring protocol. If facilities do not have the capacity to develop and verify the protocol, within requirements that satisfy NATA certification, then suitably

qualified third party verification agencies with NATA certification should be used to develop and verify the GHG emissions monitoring protocol. Verification of permit purchase and financial accounting procedures is a function that can be undertaken by government or accounting firms in a manner that is consistent with current financial audit procedures. Segregating ETS verification in this way mirrors the existing system for measurement and accounting of oil and gas production where NATA accreditation is used to verify the accuracy of oil and gas production from reservoirs, while financial auditing is completed, up to the point of NATA accreditation, for taxes and financial accounting.

Allocation of Allowances

There are various possibilities for allocating emission permits among participants, i.e., grandfathering, benchmarking, auctioning, or hybrids. It is from the careful consideration of the advantages and disadvantages of each of these measures that one can make a properly informed decision concerning which method is best suited for an ETS in Australia. Grandfathering or benchmarking imply the free distribution of permits to participants with the inherent effect of minimising the immediate cost to ultimate energy consumers, but the consequential disadvantage of deferring the carbon price signal that is being sought to reduce emissions. Moreover, these allocation mechanisms have proven to be complex and difficult to implement.

Of these two allocation methodologies grandfathering presents the least difficulties given that it can be based on recent historical emissions for which there is reliable data. Benchmarking is more difficult to implement. This complexity arises because processing plants generally are an amalgamation of numerous technologies implemented over many years, often decades, which must be characterised in a manner that reflects current and potential emissions performance. Benchmarking therefore is a very complex and imprecise exercise having to evaluate not only what is installed but also what can economically be upgraded. In Australia this exercise will be further complicated by the scale of our industry and the potential lack of many suitable analogues.

Auctioning will impose an immediate cost signal. The most significant advantage offered by auctioning is that it is simpler to implement than the other options mentioned above. With suitable attention to the rules auctioning provides an “even playing field” for participants because market forces should direct the allocation of permits to the most efficient user. Consequently, if an ETS is to be implemented ExxonMobil would prefer a system of auctioning for the allocation of all relevant permits. Clear rules for the auction must be carefully established to ensure that appropriate governance requirements are met.

There are two broad categories of auctions for the simultaneous sale of identical items: single-round and multiple-round, each with subcategories concerning single-price (a.k.a. uniform price) and multiple-price (a.k.a. pay-as-bid). It is generally accepted that all such auctions are conducted via sealed bids. The auction system design for GHG permits must be carefully considered to ensure economic efficiency and administrative simplicity.

Economists generally support single-pricing as more efficient than multiple-pricing, where efficiency is defined as getting the price closest to the bidders' internal value. Simplistically, bidders tend to be more cautious in a

multiple-price auction for fear of paying too much for the initial increments of their bid. Single-round auctions are more easily administered than multiple-round auctions. For these reasons U.S. Treasury bills are auctioned in a single-price, single-round auction with sealed bids.

There is some support in the economics literature to suggest that ascending-clock multiple-round auctions may be more “efficient” than the single-price single-round auction. While such positions are acknowledged it is unclear that the possibly improved “efficiency” of this multi-round arrangement is sufficient to compensate for the certain additional complexity. If an ETS is to be implemented, ExxonMobil favours single-price, single-round auctions with sealed bids because of the administrative simplicity and “efficiency” of such arrangements. We acknowledge that ascending-clock multiple-round auctions may also be “efficient”, but we believe this is not sufficient to justify the additional complexity of such systems.

It is clear that the implementation of an ETS with auctioning will raise substantial revenue for the government (probably more than A\$5 billion in the first year). The ETS will create substantial cash flow movements that may have significant financial consequences for energy industry participants. The implication of these new cash flows should be studied carefully so as to ensure they do not create unintended consequences for these companies and by extension the security of energy supply to the nation. The viability of some participants may be threatened by the additional costs associated with these cash movements.

It has been suggested that auctioning may commence ahead of the formal commencement of the Australian ETS. It is acknowledged that such a measure may improve the adoption of the ETS, however, suitable arrangements will need to be established in respect of tax laws and other market regulations to ensure there are no unintended impediments to the market and related business activities such as product pricing and cost sharing arrangements. Failure to have these arrangements in place has the potential to create significant cash flow and tax liability concerns.

Another consideration associated with the allocation of emission permits relates to the treatment of Trade Exposed Emission Intense Industries (TEEI's). Such industries have little if any opportunity to recover additional costs imposed by the ETS. It is widely recognised that the competitive disadvantage associated with the unilateral (non-global) implementation of an ETS should not be borne by these industries. To expose these industries to this disadvantage would not only harm the economic prospects of Australia but would also undermine the very objective of the ETS which is to reduce emissions. With this in mind the question arises as to how to allocate permits to the TEEI's in a manner that is consistent with the structure of the ETS.

There may be several options, however it would appear the simplest approach would be to issue sufficient permits calculated by reference to the grandfathering process to cover the direct and indirect emissions of the industry concerned. For new TEEI facilities, or expansions to existing facilities, the basis for quantifying the permit allocation may involve a benchmarking approach that is linked to current good industry practice in countries that do not implement valid ETS programs.

To ensure the ETS market structure is not distorted by the allocation of these permits, TEEI's should be excluded from trading their allocated permits until such time as secure global ETS arrangements are in place for the markets in which such industries operate. There should be no requirement for a TEEI facility to match permits with emissions, other than to ensure that emissions and allocations remain within acceptable and agreed boundaries. Mechanisms to encourage continuous improvement in the emissions performance of these facilities should be investigated, but only in the context of ensuring that such industries are not put to a competitive disadvantage when compared again to good industry practice for facilities operating in countries that do not implement valid ETS programs.

Finally, detrimental trade exposure is not limited to plants that are fully committed to supplying international markets such as LNG plants that have no domestic output. Some facilities, such as oil refineries, are trade exposed by competition with imports to Australia from countries that do not implement an ETS. In the specific case of an oil refinery the imposition of additional emissions costs arising from direct emissions from the refining facilities creates a competitive disadvantage when compared to imports of refined product from countries with no or lesser emissions burdens. Left unadjusted this reduces the viability of refining in Australia, with attendant energy supply implications. A mechanism should be investigated and implemented to outset this competitive disadvantage.

Offsets

ExxonMobil supports development of internationally consistent standards for the development of such mechanisms. We note that the current Kyoto framework on recognition of international offsets (including CDM offsets at this time) is cumbersome, has been subject to serious effectiveness criticisms and is inadequate as it does not recognise key items like carbon capture and storage projects. In addition we believe to offer offset credits as a positive incentive prior to ETS start up without an appropriately established methodology for verifying emissions would undermine system integrity and increase the risk of gaming.

Procedures related to penalties, enforcement, and liability

ExxonMobil is committed to meeting all the regulatory requirements in the countries in which we operate. We also strongly support the creation of "level playing fields", in this context for an ETS, and as such we do not oppose well designed and considered punitive measures that are contained within clearly defined legal frameworks. Such frameworks will reasonably include specified penalties for defined non-compliance events.

To create and operate an efficient and effective ETS the relevant legislation must establish clear requirements for the reliable monitoring and reporting of GHG emissions, as well as clearly understood market rules for the trading, distribution and surrendering of related permits. Non-compliance with these legislative requirements should then be transparently linked with appropriate penalties that are applied having regard to the usual legal processes, including independent judicial review and appeal.

One important consideration when framing compliance standards is to address the materiality of any deviation, particularly in regard to de minimis emissions that may have been overlooked or are technically difficult to monitor. Pursuing such minor deviations has the potential, particularly in the early phases of ETS, to divert

both regulatory and industry resources to investigations and defences that may not ultimately advance the environmental outcomes being sought.

As such, close consideration should be given to establishing reasonable reporting thresholds with the focus of attention being on major emission sources. These thresholds (generally expressed as a fraction of a facilities overall emission) should be broader in the early phase of the ETS implementation and reduced as experience is gained, technology advances and further emission reduction demands. This approach was effectively applied with the introduction of the ETS in Europe and we would recommend a similar approach here in Australia.

We recognise that the implementation of an ETS in Australia will engender a "learning period" following commencement of the scheme wherein a large number of industries will have to come to terms with the details of their new obligations under the scheme. There likely will also be a degree of clarification needed to assist participants to fully understand and comply with the new requirements. Indeed, it is likely the requirements themselves may need some adjustment. With this backdrop, it is recommended that the regulatory approach should be one of providing assistance to understand and achieve compliance, with penalties applying only to cases of significant and intentional breaching of regulations.

As with any deterrence mechanism, to be effective at promoting compliance, the severity of penalties should be greater than the costs of complying. Notwithstanding this, paying penalties should also not be seen as a substitute for compliance and as such we would support the inclusion of "make-good" provisions in the ETS regulations. Following on from this we would also see it as a necessary design feature that the penalty fee would in fact be higher than any cost containment price.

Creation of a credible trading regime

Credibility of the market has at its foundation reliable, steady and transparent operating rules. This begins with early development of clear rules, well publicised and in advance of the scheme commencing. We would argue that there should be no special rules, concessions or exemptions for participants actively trading in the scheme and where possible scheme design must promote a level playing field. However given the lack of a global scheme in place it is important that Australia recognizes the risks to its competitiveness from unilaterally placing an additional cost burden on its trade exposed industries and as such we have argued that TEEI's should be excluded from trading their allocated permits (an issue we have discussed in detail above). Equally while market liquidity is an important factor in establishing the credibility and efficiency of international commodity markets, linkages with other international jurisdictions has the potential to import price volatility and erode Australian sovereignty.

Annual reconciliation of liability

ExxonMobil supports annual reconciliation of GHG emission liability and surrendering of the required permits. At the end of the year, sufficient time is required for companies to finalise estimation of the total GHG emissions, for the external verifiers to complete their work and the companies to advise the regulator of their

emissions for the prior year. Europe allows 3 months for this work to be completed and a further month for companies to acquire and remit the required permits to the Regulator.

Upstream Acquittal – capturing emissions from gas and transport fuels

The overarching criteria and guiding principles which need to be applied when determining where in the supply chain, the supplier becomes liable for the purchase and acquittal of permits to cover the consumers' emissions from the end use of the fuel are:

- Overarching Criteria:
- Simple and robust
 - Maximum transparency to consumers (industry and individuals)
 - Maximum use of existing systems (government & industry)
 - Low cost (government & industry)
- Guiding Principles:
- Direct acquittal responsibility i.e. retain liability
 - Acquittal point for small users resides with supplier
 - Liability should be based on actual energy delivered
 - Existing transfer meter is the means for determining amount of energy supplied

The oil and gas industries are currently working with the Department of Climate Change (DCC) through the industry associations APPEA and AIP to develop simple and robust proposals for acquittal points. The natural gas and liquid fuel markets are structured very differently and the recommended liability point is different for the two sectors.

ExxonMobil does not oppose the option of allowing large users to be liable for purchasing and acquitting carbon permits for the fuel they use provided:

- A “water tight” system can be designed that is not too complicated and costly.
- In the case of liquid fuels, it is in a 2nd or subsequent phase of ETS roll out to allow sufficient time to fully design and implement the new systems (i.e. capture all fuel, avoid rorting or gaming which may prevent suppliers from recovering the carbon price in the market place.)

If these criteria can not be met, then suppliers should retain the liability for the end use of all fuel sold for inland use. Large users must be required to register before being allowed to acquit for own fuel use and should not be allowed to opt in or out at will. The New Zealand Government is proposing to require companies who wish to opt into the ETS, to remain liable for their own emissions for a minimum of four years before they can opt out again.

Natural Gas

The recommended liability point should rest with the party who sells to the end consumer i.e. the Retailer or the Producer in the case where Producers sell direct to end consumers. In the case of Producers, the customers are likely to be classified as large users. Since the natural gas industry does not involve the sale of gas from one wholesaler to another, it is relatively straight forward for large users to be allowed to be

responsible for the liability and acquittal of permits associated with emissions from their end use of natural gas. This is not the case with liquid fuels. Essentially, the natural gas retailers are combined wholesalers, distributors and retailers. This proposal has been discussed within the natural gas industry by APPEA and is accepted by all sectors of the industry.

Liquid fuels

For the inclusion of transport emissions within the AETS, then we recommend that the point of liability and acquittal point for the "end use" of inland liquid fuels should be the point where the fuel "enters home consumption" or "enters domestic market" which for liquid fuels is also the point at which excise is paid.

Products which should not be liable for acquitting carbon permits include:

- Exports
- Products not used as fuel
- International bunkers (aviation and marine)

These categories of products are not subject to excise and this makes the excise point a logical liability point. In addition, there are existing extremely robust government and company systems in place which enable the systems to be audited and make it extremely difficult for the system to be gamed.

In the liquid fuels industry, it is relatively common for one or more distributors to be in the supply chain in between the primary supplier and the consumer and Large Users are not necessarily direct customers of a primary supplier. This makes it difficult for the primary supplier who has the "upstream" liability for the end use of the fuel to know whether or not they require permits for the fuel being sold. It also makes it extremely difficult for Government to audit to ensure that permits have been surrendered for all of the fuel consumed. ExxonMobil recommends that large users not be liable for the end use of liquid fuels they consume until the 2nd or subsequent phases to allow time to investigate whether it is feasible to develop low cost robust systems to allow large users to participate directly and be liable for their own emissions and for the systems to be developed and implemented.

Revenue recycling

As noted already the implementation of an ETS with auctioning will raise substantial revenue for the government. Careful consideration needs to be given to the use of this revenue. It would be contrary to the design objectives of an ETS to use these revenues to generally offset fuel price increases, to do so will substantially obviate the purpose of the ETS. As a guiding principle government should seek to return these revenues to the economy with the least distortion of economic activity possible. Funds received through taxation should be returned to the economy preferably through a broad-based reduction of a current tax on labor or capital. This will be a critical aspect given the size of the potential economic distortion - (probably more than A\$5 billion in the first year). Additionally disbursement of funds should not be tied to energy use because this would defeat the desired effect of encouraging efficiency through higher energy cost. A portion of revenue could also be allocated for the development and deployment of low emissions technology.

5. Key Conclusions

- There are significant risks for Australia to unilaterally implement an ETS in the expectation that such a scheme will ultimately merge into a well constructed and agreed global trading regime.
- ExxonMobil urges consideration of the following design features in any Australian ETS:
 - Auctioning of tradeable carbon credits on a single-price, single-round auction basis.
 - Recognition of trade exposed emissions intensive industries (TEEI) i.e. LNG and refining.
 - Free permit allocation to TEEI but with no ability to trade such permits.
 - A well designed penalty fee for non-compliance that is contained within clearly defined legal frameworks and which is significantly higher than the cost containment mechanism.
 - Development of internationally consistent standards for offsets
 - Given that natural gas and liquid fuel markets are structured very differently the recommended liability point for each are different :
 - For gas the recommended liability point should rest with the party who sells to the end consumer i.e. the Retailer.
 - For liquid transport fuels the recommended point of liability point should be at the point where the fuel "enters home consumption" or "enters domestic market" which for liquid fuels is also the point at which excise is paid
- As a guiding principle government should seek to return these revenues to the economy with the least distortion of economic activity possible. Funds received through taxation should be returned to the economy preferably through a broad-based reduction of a current tax on labor or capital. A portion of revenue could also be allocated for the development and deployment of low emissions technology.

6. Implementation issues and timing

The Australian Government has set itself and consequently the whole community an aggressive schedule for implementing an ETS in Australia. This approach stands in stark contrast to the preparation and implementation of the only broad based ETS that has been undertaken internationally, namely that in Europe. The EU commenced its planning for ETS in 2000 and continued planning for five years before then implementing a "trial" system that was undertaken for a further three years. This was a planning process and trial that experienced significant difficulties across its entire implementation, even up to the closing months of that trial in 2007. The lessons from the European experience may not even now be fully understood. Despite this example the Australian Government is proposing to implement an ETS in just over 2 years.

Although it can be argued that in the Australian context ETS may be less complex without the multi-jurisdictional circumstances of Europe, and that we may learn from the EU experience, the Australian system as currently proposed is more comprehensive in scope, including transport fuels and potentially the full array of GHG contributors. Further, it remains unclear as to the issues that may be raised by the various states concerning transitional arrangements associated with their policies and schemes that they have implemented over recent years. Moreover, it may be that with ambitions to improve on the EU ETS model, the current proposals concerning our ETS will include new systems and features which have not yet been tested in any other jurisdiction. Such additions will need to be implemented in a manner that does not jeopardise the ability to link the Australian system with international ETS. These factors can only add to the complexity of implementing an ETS in Australia.

If the desire of the Australian Government continues to be the pursuit of an ETS then that system should be imbued with those characteristics that make its implementation as simple and predictable as possible. Serious consideration should also be given to a phased approach similar to that used in the EU in which the early years of the proposed scheme are implemented fully but considered a trial to ensure that the mechanisms chosen are appropriate and do not do undue harm to the Australian economy and the well being of its citizenry. In a trial, market stabilising measures such as a cost containment mechanism may also be tested to determine their effectiveness in reducing the risks and uncertainties associated with the ETS. A trial period through to the end of the first Kyoto round in 2012 would appear to be allowable and appropriate, particularly if trends continue to indicate that Australia will meet its commitment at that time. Such phasing will also allow industry time to make the substantial physical and systems changes that will be required to operate within an ETS.

As previously touched upon it should also be recognised that the implementation of an ETS will require industry to install new equipment and business systems that currently do not exist, or make modifications to equipment and systems not currently suitable for use with an ETS. For example, current measurement standards required under the various emissions reporting mechanisms in Australia are not at a level suitable for application with an ETS, as such substantial work will be required to improve the performance of metering equipment to meet more stringent requirements. Changes to measurement systems and the design and implementation of associated reporting and verification schemes will take time. In the case of hardware changes (such as metering) this will in some cases require the shutdown of facilities in order to facilitate safe access to the equipment. Particular consideration will need to be given to gas supply and other essential services where reliability of supply is paramount and consequently shutdown opportunities need extensive planning to avoid impacts on supply to customers. As such some shutdowns may not be able to be implemented until after the proposed start up of the ETS in 2010.

In the particular case of oil and gas processing plants and refineries, these facilities utilise unprocessed or semi-processed gases as fuels. These gases are sourced from multiple off-takes at various points in the process and therefore can have a variety of compositions. Although most of these fuel streams are metered, these meters may not have been designed with accuracy criteria suitable for use in an ETS. Some fuel streams may not be directly metered and the meters associated with other streams may not have been included in rigorous maintenance and calibration programs.

As such one necessary activity will be to complete a detailed survey of all fuel sources and their metering facilities. This will need to include the condition of meters, suitability for service given current flow rates, accuracy range and physical accessibility. Once surveyed some meters may require calibration, maintenance, upgrade or replacement, connection to a control system, development of a calibration and maintenance program, and reissue of relevant maintenance and procedural manuals. Given that an oil and gas processing facility can have a multitude of fuel streams, this is likely to be a time consuming and expensive process. A very preliminary review of the scope of all such work indicates that it would take no less than two to three years to complete the required tasks for a project such as that in Bass Strait.

In addition to considering fuel systems, further consideration will be required for the review and modification of flare systems. These are key safety features of oil and gas processing plants and refineries being designed to respond to emergencies that can arise from time to time. Flare systems also provide the means to control plants during routine start-up and shutdown periods. Equipment throughout petrochemical and other hydrocarbon processing facilities is fitted with pressure safety valves (PSVs) which direct flammable gases from the equipment to the flare systems where the gas is burned in a controlled manner. Flare systems are very different from fuel systems because, as a safety system, they are connected to nearly every part of the process and as such are fed from hundreds of locations with varying compositions.

Moreover, the throughput of flare systems ranges from very low flow to keep air from entering the system, to flow rates that may well exceed the capacity of the plant, for a short period, in an emergency situation. This presents a challenging technical problem given that flow meters are generally accurate only within a limited range. In some cases flare systems currently do not have meters because of their infrequent use. Modification to flare systems will be particularly challenging, given they are vital to the safety of any facility. As such changing out or installing new meters will likely require the full shutdown of the plant. For these reasons flare metering is a particularly challenging technical area for which there will need to be considerable discussion between the interested parties as we work to achieve appropriate levels of accuracy and uncertainty in measuring emissions from these systems.

In addition to the hardware changes outlined above various procedures and systems will need to be developed and documented throughout businesses to support the flow of information to the ETS. These procedures and systems range from meter calibration procedures, to sampling schedules, developing appropriate data capture and calculation software, accounting systems and internal processes to ensure that appropriate audit trails and verification are achieved. These developments will take time and may not be fully functional before 2010.

6. Key conclusions

- The Australian Government has set itself and consequently the whole community an aggressive schedule for implementing an ETS in Australia.
- The EU commenced its planning for ETS in 2000 and continued planning for five years before then implementing a “trial” system that was undertaken for a further three years. This planning process and trial experienced significant difficulties across its entire implementation,
- If an ETS is to be implemented then very serious consideration should be given to phasing in the implementation of the scheme as was done in Europe, with the first phase of the implementation being a test period to ensure systems are working correctly and have been properly designed.
- Implementation of an ETS will likely require changes to necessary hardware and systems some of which may require plant to be shutdown. Some changes may not be able to be implemented until the next scheduled maintenance shutdown which could be several years away.
- Particular consideration should be made for gas supply and other essential services where reliability of supply is paramount and consequently shutdown opportunities need extensive planning to avoid impacts on production.

7. Non-complementary policy settings

ExxonMobil urges policy makers to review existing policy settings when considering the development of a comprehensive climate change policy. Currently there is an array of energy and fiscal policies at the state and federal level that would undermine the efficacy of any carbon price signal and are a dead weight loss on the Australian economy. In particular we would identify several areas that require specific review / rationalisation. These include mandated energy efficiency programs, mandated technological requirements to mitigate emissions, mandated quotas for different energy sources that compete in the energy supply market and fiscal disparities (taxes and/or subsidies) which create distortions between competing energy sources. This section discusses an example of each of these policy positions although it is by no means an exhaustive list.

Mandated Energy Efficiency Programs

While recent legislative initiatives from Federal and State Governments (i.e. EEO and Victoria's EREP) have sought to help industry identify energy efficiency opportunities, or in Victoria's case actually mandate energy efficiency investments, for the most part such initiatives only attempt to duplicate or crudely intervene in business processes that ExxonMobil (and many other companies) already undertake on a global basis. It is therefore critically important that Governments recognize that producers, refiners, distributors, and end users in the chain are best placed to take responsibility for managing and accounting for the emissions they generate. With the onset of an Australian ETS such mandated energy efficiency programs, will not be necessary to provide an incentive for business to undertake cost savings measures through abatement activities. As a result we recommend their review and phasing out post ETS start up for all sectors included within the ETS.

Mandated Technology 'Solutions'

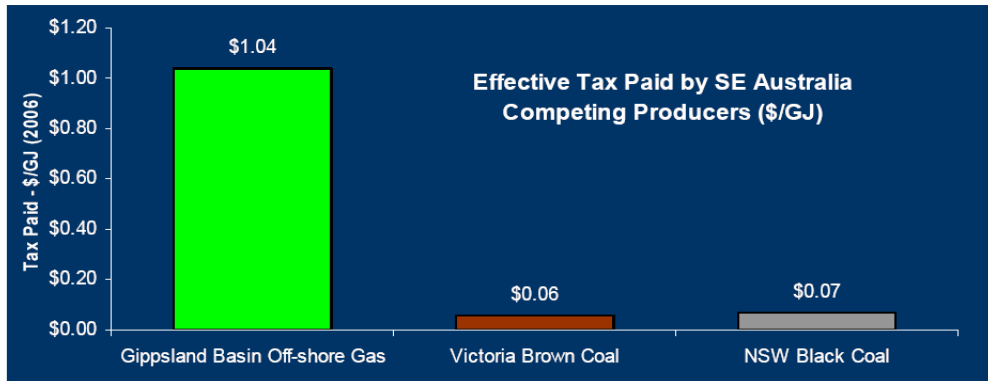
The practice of governments mandating specific technological solutions to achieve emissions abatement is antithetical to the goals of an ETS – which is premised on allowing firms to achieve the least cost outcome within a market framework. If governments choose to intervene within the emissions market they themselves establish and mandate specific technologies (such as CCS) they run the risk of undermining the scheme and producing sub-optimal outcomes. We note that while the Federal Government does not have in place any technology mandates some state governments have exercised this practice. For example the Western Australian Government which has mandated the proponents of the Gorgon LNG Project to undertake CCS before the project can proceed.

Tax distortions between competing fuel sources

One major example of a fiscal distortion that is impeding emissions mitigation is the relative cost of the tax burden that applies to gas compared to coal. More specifically the interaction of state and federal taxation and royalty regimes introduces a distortion in the electricity sector on the east coast of Australia that prevents the operation of market forces and the greater penetration of cleaner burning natural gas into power generation. The following chart shows the relative disparity of the tax burden as applied to Gippsland gas.

Gippsland gas taxed nearly more than 20 times coal

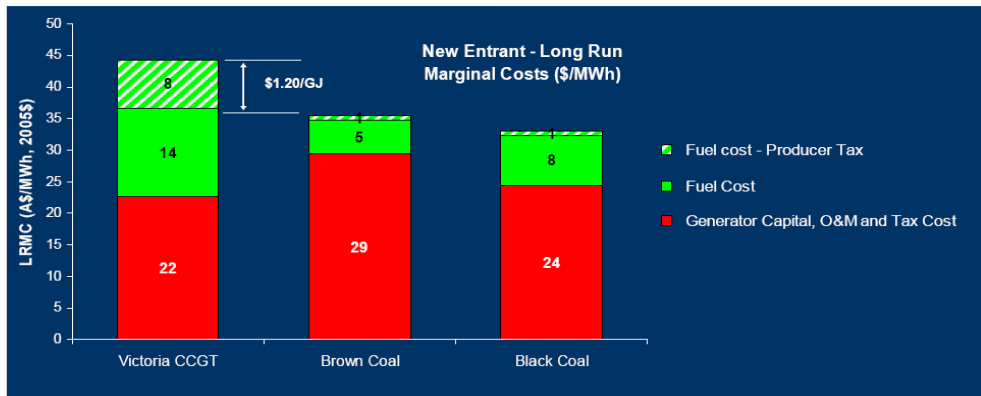
Chart 10



The next chart illustrates the explicit economic disincentive facing potential new entrants into the market wishing to build base load gas fired generation as opposed to coal is illustrated. The chart shows the long-run marginal cost distortion is about equivalent to the tax differential applied to offshore gas versus coal. Such distortions have the potential to undermine the efficacy of a carbon price signal and lead to unintended and sub-optimal outcomes. We therefore recommend the urgent review of such secondary taxation distortions.

New entrant LRMC – gas v coal

Chart 11



Mandatory Renewable Energy Target

Intuitively the notion of government setting a mandated target for any particular source of energy is inconsistent with the underlying principle of an ETS – which is to set a price on carbon and allow the market to determine the appropriate energy mix under a carbon constraint. By extension of this point a mandated target is also counterproductive to the efficacy of an ETS.

In this context APPEA engaged Access Economics and CRA to model and report on the efficiency implications of establishing a 20 per cent mandatory renewable energy target (MRET) in conjunction with an ETS as proposed by the current government. What the analysis showed is that the combination of both policy instruments results in less efficient outcomes than just the implementation of an ETS.

In summary to reach an emissions abatement target of 67 Mt CO₂e in 2020, the modelling shows that the combined ETS + 20 per cent renewable energy target policy:

- costs Australia \$1.8 billion more in 2020 than a pure ETS policy in terms of economic welfare (GNP) losses;
- costs Australia \$1.5 billion more in 2020 than the ETS output (GDP) losses;
- results in the loss of 3 600 full time equivalent jobs (FTE) in 2020;
- causes substantial switching away from gas fired generation compared with an ETS in the order of 12.6 TWh per year by 2020;
- results in electricity prices rising by 6 per cent more than would be the case than under an ETS alone – the price rises 24 per cent under the combined policy approach, and by 18 per cent under an ETS that delivers an equivalent emissions abatement.

A mandated renewable energy target is less efficient at achieving a given environmental outcome because it forces higher cost renewable energy into the electricity generation mix at the expense of exploiting lower cost emissions abatement opportunities elsewhere in the economy. Contrary to the popularly held belief that such mandated targets generate jobs, the overall effect on the economy is the generation of less jobs than otherwise would have occurred and a loss of output in the economy as a whole as compared to the outcome with a well designed emissions trading scheme. The Productivity Commission has reached a similar finding stating that an MRET operating in conjunction with emissions trading "would be unlikely to achieve extra abatement, it would constrain the choice of abatement options (which could potentially cost billions of dollars) and reduce the incentive to use other new low-emission technologies".

7. Key Conclusions

- Policy makers need to review existing policy settings when considering the development of a comprehensive climate change policy.
- Currently there is an array of energy and fiscal policies at the state and federal level that would undermine the efficacy of any carbon price signal
- In particular we would identify several areas that require specific review – mandated energy efficiency programs, mandated technological requirements to mitigate emissions, mandated quotas for different energy sources that compete in the energy supply market and fiscal disparities (taxes and/or subsidies) which create distortions between competing energy sources.
- An MRET operating in conjunction with emissions trading would be unlikely to achieve extra abatement, it would constrain the choice of abatement options (which could potentially cost billions of dollars) and reduce the incentive use other new low-emission technologies.

8. Assessing Participation in a Global Carbon Trading Scheme

ExxonMobil believes that many issues will need to be resolved to ensure global participation in a carbon trading scheme. Foremost among them are the means to induce participation, before nations will agree on a global GHG allowance trading system. There are significant risks for Australia to unilaterally implement an emissions trading scheme in the expectation that such a scheme will ultimately merge into a well constructed and agreed global trading regime. From a design perspective the creation of a national scheme not linked with an agreed regime globally, leaves Australia at risk of not being able to easily transition to a global scheme if and when one were put in place.

As well the price volatility inherent in any domestic ETS will be potentially exacerbated through international linkages of ETS systems. In particular there is potential for Australia to import the EU (or any other linked jurisdiction) emission price path and volatility. We therefore urge extreme caution about ad hoc and bi-lateral linkage to other international programs. Australia must therefore think carefully about how such systems might deliver in the near term and merge into a broader international scheme in the long term.

More importantly if unilateral action is taken in isolation from our major trading partners, Australia would be imposing an additional cost burden on its energy intensive trade exposed industries that its main competitors would not face. This has the potential not only to make Australian companies less competitive but will place greater pressure on energy intense industries to relocate investment outside Australia.

8. Key Conclusions

- ExxonMobil believes that many issues will need to be resolved, foremost among them means to induce global participation, before nations will agree on a global GHG allowance trading system.
- There are significant risks for Australia to unilaterally implement an emissions trading scheme in the expectation that such a scheme will ultimately merge into a well constructed and agreed global trading regime.
- Unilateral action taken in isolation from our major trading partners, would result in Australia imposing an additional cost burden on its energy intensive trade exposed industries that its main competitors would not face. This has the potential not only to make Australian companies less competitive but will place greater pressure on energy intense industries to relocate investment outside Australia.
- Price volatility inherent in an ETS will be potentially exacerbated through international linkages. In particular there is potential for Australia to import the EU (or any other linked jurisdiction) emission price path and volatility. We therefore urge extreme caution about linkage to other international programs.