Doctors for the Environment Australia

Policy

# Energy

## Summary

Doctors for the Environment Australia (DEA) has a deep interest in energy policy because it is the major determinant of reduction in greenhouse gas emissions which via climate change present a significant threat to human health. Climate change will bring many adverse health consequences to Australia including: threats to food and water supplies; decreased land mass; an increased burden of heat stroke; injury from fire and storm; infectious diseases; social disruption and mental illness. In the developing world it will bring famine, water shortage and population dislocation. Furthermore, many of the widely-proposed solutions for reducing greenhouse gas emissions have significant risks to human health. However, some of the solutions to climate change are also health promoting – such as active transport options to reduce fossil fuel use.

It is clear that the risks of uncontrollable climate change are increasing more rapidly than the Intergovernmental Panel for Climate Change (IPCC) reports estimated. There is an urgent need to reduce emissions now and this Policy will emphasise actions that can deliver this outcome.

This policy has been crafted with human health and wellbeing at the forefront of each consideration. In summary, the health considerations are: -

Greenhouse emissions from fossil fuel are driving climate change, which is the biggest global health threat of the 21st century.[1] The urgent reduction of emissions is therefore a public health intervention.

Fossil fuels have additional health impacts by causing significant morbidity and mortality from cardio-respiratory diseases and cancer. In addition, they are adding to pollution from mercury throughout the world which is contaminating fish stocks. Fossil fuel industry is water intensive in a water poor continent. Depletion of our hydrocarbon reserves will place a burden on future generations who will also need them for agriculture, plastics and pharmaceuticals.

Coal is the most costly form of energy when the environmental, direct and indirect health impacts are accounted for. DEA believes that it is an important health measure that no new coal power is initiated in Australia and we suggest that this will become possible by the urgent institution of the measures recommended in this policy.

Our policy recognises that Carbon Capture & Sequestration ("clean coal") technology on a large scale is experimental and may never succeed. It has not yet been demonstrated on a commercial scale. In any event its implementation is likely to be too late to prevent further significant worsening of our greenhouse emissions situation. There are possible health and safety considerations related to sustained storage and the continued release of existing toxic pollutants. Research into clean coal must not be expanded at the expense of funding for renewable technologies.

Wind, wave and solar power are environmentally clean and offer new employment opportunities, particularly in rural areas, which will benefit from stabilisation of incomes and self sufficiency, both important measures in improving the health of communities.

Fossil fuel usage in transport can be curtailed by the accelerated development of public transport. This confers distinct health benefits by discouraging private transport usage and by increasing exercise[2]. Direct damage to health from particulates particularly in cities is responsible for a heavy burden of cardio-respiratory disease.

We do not favour the development of bio-fuels from crops that utilise food producing land.

We do not support the development of nuclear power in Australia. There are significant health and security hazards with nuclear power generation, notably waste disposal. In the short term nuclear energy is unable to provide sufficient emissions abatement because of the long development time of power stations, and in the long term, it is unnecessary as Australia has vast renewable resources to capitalise upon.

DEA's Energy Policy is partly based upon the Australian situation of "Healthy Solutions for the Low Carbon Economy. Guidelines for Investors, Insurers and Policy Makers". This document from the Harvard Medical School Center for Health and the Global Environment by Paul Epstein and colleagues was published in July 2008.[3]

DEA supports the view of Professor Garnaut (and Nicholas Stern) that any short-term pain to the Australian economy will be outweighed by medium to long-term benefits These are the development of valuable, exportable new technologies; reduced dependence on diminishing oil supplies; **direct human health benefits such as cleaner air** and a less "obesity-generating" environment; reducing the risk of dangerous climate change.[4]

Our policy is based upon three equally important pillars, all of which will reduce emissions. All of these will reduce emissions now, all are complementary and all can be concurrently introduced and/or expanded as required.

An Emissions Trading Scheme (ETS) is the first pillar of Policy. DEA supports in principle the Australian Government's initiative to introduce an emissions trading scheme (ETS). The scheme must be effective and its implementation must be immediate. Emissions targets must be science based to minimise the risk of significant climate impacts (arising from dangerously high atmospheric greenhouse gas concentrations).

**DEA supports a target of reduction on 1990 levels of between 25% and 40% by 2020 with every effort made to attain the upper end of this range**.

The second pillar of emissions reduction is energy efficiency and conservation. There are many opportunities to reduce emissions, nearly all of which will result in cost savings. Whilst government has commenced this process, the existing regulatory and policy framework falls far short of requirements. We need to expand rapidly the energy efficiency of Australian homes and businesses as well as health care facilities. This requires policies and programmes that will overcome barriers to energy efficiency and improve minimum energy and greenhouse performance. Important energy conservation measures include reliable and efficient public transport networks, disincentives to use cars and appropriately designed buildings.

The third pillar of emissions reduction is the production of renewable energy. We conclude that renewable energy is a reliable, currently available means of supplying energy and reducing emissions. Renewable energy is decreasing in cost and creates many more jobs per equivalent amount of power than does fossil fuel generation.[5] Australia needs policies

to drive a rapid expansion in the deployment of these technologies. **Renewable energy needs a strong renewable energy target of at least 30% by 2020 backed up by feed-in tariffs to further support specific technologies.** There should also be an efficient electricity network. An emphasis on renewable energy will develop technological industries that provide Australian leadership and partnerships to the developing countries of the Asia Pacific region.

# Introduction

Here we will review the main issues that should determine policy.

## Human health needs

Human health is inextricably linked to the environment. Doctors for the Environment Australia's (DEA's) Energy Policy for Australia is based upon health and principles of social and environmental sustainability.

An ecologically sustainable global society is necessary for sound human health. Climate change is but one of numerous interlinked human-caused phenomena which threaten sustainability. All are described in many international studies: desertification, inadequate fresh water and food supplies, deforestation, over-exploitation of natural resources, and pollution. In concert, all these activities termed Global Ecological Change are leading to world-wide ecological collapse. An Australian example is the Murray Darling river system.

Climate change is the greatest threat to human health globally. The World Health Organization (WHO) chose "protecting health from climate change" as the theme for World Health Day on April 7 2008. This theme was selected in recognition that climate change is posing ever-growing threats to global public health security. The health consequences for Australia have been reported by DEA in Climate Change Health Check 2020[6] and by Woodruff and Colleagues[7]. Health is inextricably linked to the sustainability of the global society. DEA accepts that sustainable health cannot be achieved by an energy policy alone. Other issues are very important and DEA stresses that a slowing in the rate of global population growth is particularly important to maximise sustainability, through reduction in carbon emissions and consumption of resources. In turn these aims cannot be attained without increased global fairness and a wider dissemination of education and opportunity.

## Emission reduction

There are growing worries that the pace of climate change is accelerating, and that climate change will have a more severe impact than earlier estimates at whatever level $CO_2$ and other greenhouse gases finally peak.[8] The level of $CO_2$ which signifies "dangerous" climate change is unknown. This depends on the population affected and the definition. It also depends on the climate "sensitivity", that is the magnitude of climate change for a degree of atmospheric change not only of the climate,[9] but of other interrelated elements of the Earth's ecological system[3]. To date it has been argued that a temperature rise of 2 degrees Centigrade should not be exceeded and that this equates to an atmospheric carbon dioxide concentration of no more than 450 ppm. However, many experts including James Hansen[10] now support a target of 350 ppm. (present concentrations are approximately 380 ppm).

Professor Garnaut has suggested that an interim target of 25% reduction on 2000 levels by 2020 as being the most appropriate target for Australia. However, the probability of exceeding 2°C rises to 53–87% if global emissions are still more than 25% above 2000

levels in 2020 (around 40% of 1990 levels)[11]. Based on the scientific evidence we suggest that the target should be higher to attain an atmospheric level of $C0_2$ of 350 ppm as soon as possible.[10]

Therefore DEA, taking all current science into account, supports a reduction of between 25% and 40% of 2000 levels by 2020 with every effort made to attain the upper end of this range.

It follows that to delay action on an ETS until others have taken the plunge is spurious. Australia is lagging behind the European Union, which has been operating an emissions trading scheme now for a number of years. New Zealand is introducing a system. The United States has a number of large regional emissions trading policies being developed as well as legislation underway for a national scheme.

We strongly support Professor Garnaut's words "International cooperation is essential for a solution to a global problem. However, such a solution requires the resolution of a genuine prisoner's dilemma: each country benefits from a national point of view if it does less of the mitigation itself, and others do more. If all countries act on this basis, without forethought, communication and cooperation, there will be no resolution of the dilemma." [4]

Furthermore, the case has been made for developed countries making larger cuts than the global average: "Climate change requires two possibly conflicting actions. Carbon emissions must be reduced to avoid the worst outcome of climate change. Poor countries need rapid economic development so that no country, community, or individual is too poor to adapt to climate change. The concept of contraction and convergence, developed by the Global Commons Institute, considers the need to pursue both these actions simultaneously. Contraction and convergence reduce overall carbon emissions to a sustainable level but do so according to an equal share of emissions per person globally. Industrialised countries would dramatically reduce their emissions whilst developing countries would increase theirs to allow for, and stimulate, development and poverty reduction." [1]

In making our recommendations on targets, we accept that uncertainties remain, but these uncertainties tend to dictate that the targets should be even greater. Even if carbon dioxide emissions peak soon, the peak atmospheric concentration is unlikely to be reached for many decades. The IPCC (2007) indicates: "About 50% of a $CO_2$ increase will be removed from the atmosphere within 30 years, and a further 30% will be removed within a few centuries. The remaining 20% may stay in the atmosphere for many thousands of years." Archer[12] puts the $CO_2$ lifetime in the 1,000's – 100,000's of years because at some point the oceans cannot absorb more $CO_2$, and a complex modelling system from the Carnegie Institution also indicates a stay of many centuries.[13] In summary there is increasing evidence that humanity needs to move to zero carbon emissions urgently.

## "Tipping points"

A further factor of concern in assessing the threat to humanity is the stability of the Earth's carbon "sinks" (in the soil, forest, tundra and oceans) as $CO_2$ level increases warm the Earth[14,15,16]. If these sinks release carbon dioxide then the biospheric emission of $CO_2$ could exceed that from the combustion of fossil fuels leading to runaway $CO_2$ accumulation and disastrous climate change. For example, the $CO_2$ emissions from the Indonesian fires of 1997 (mostly from the burning of peat) have been estimated at 13-40% of the emissions from the burning of fossil fuels globally in the same year.[17]

## Economic and leadership considerations

DEA recognises Australia's interdependence with the rest of the world and sees a need for Australia, as a wealthy and developed country, to play a leadership role in addressing global problems. Any short-term pain to the Australian economy from leadership over climate change will be outweighed by both short and long-term benefits in health and new technologies. By becoming leaders in new technologies, Australia could create new industries and export these technologies. Furthermore, important opportunities exist for coalitions between developed and developing countries, particularly to roll out new carbon-sparing technologies in developing countries.

Investing in a portfolio of greenhouse-sparing and renewable energy technologies is safer and more risk-averse than focusing on one or two 'silver bullet' solutions. Much of the difficulty the world faces in reducing carbon emissions comes about as a result of over reliance on coal for power generation and oil for transportation.

In Australia, unlike in Europe, domestic and industrial energy consumers have been overprotected by low prices, so focus on energy conservation has lagged behind the rest of the world. Put simply, Australians have had little incentive to conserve energy.

Although state and federal governments have long been aware of the need for energy conservation and for renewable energy development, support for promising technologies has been piecemeal and until now inadequate. DEA maintains that there is a need for Australia to provide greater incentives, to encourage households and businesses to become more energy-conscious and efficient. Recommended strategies include more energy-efficient buildings, better urban design and much greater investment in public transport. Smaller, fuel-efficient cars using hybrid and other energy-sparing technologies also have a role. While many such developments are now occurring in embryonic form, there is an urgent need to convert them into major programmes.

There is also a need to accelerate the installation of wind, solar and other sources of renewable power and to expand research into other renewable energy technologies, not only to reduce carbon emissions, but also to conserve diminishing supplies of oil and gas for future generations.

Professor Garnaut and his teams have examined the scientific background to the reality of climate change and have gauged its negative implications for Australia. Garnaut, as a respected economist, has analysed the economic costs of inaction and outlined the economic benefits and imperatives for tackling greenhouse emissions.

The biggest objection raised by government and business to investing in sustainable energy policies is the claim that reducing Australian reliance on fossil fuels will result in higher power costs, thus making Australian industries uncompetitive compared to the same industries in countries that continue to be heavy emitters of greenhouse gases. In the short run it is undeniable that some energy costs for business may increase. However, we are being placed in danger of acquiescing to the most minimal change possible in which any virtuous no-emissions energy supplier is inhibited from competing in the market place because the current fossil fuel-focused system lacks a full and proper accounting of hidden costs, such as greenhouse gas emissions and the health hazards of air pollution.

There is a universal scientific consensus that stabilising climate change requires an enormous effort. The task of researching, developing and commercialising carbon-free primary power technologies on a scale capable of ameliorating the progression of climate change by the mid-twenty-first century has been likened to the challenge of the Manhattan Project and the Apollo space programme. Alarmingly, since that analogy appeared in the journal *Nature*[18], carbon dioxide levels have increased from 366 to 387 parts per million (ppm). Lack of progress in establishing the other conditions needed for a sustainable

future, such as increased international equity and a dramatic slowing in population growth, is of equal concern. It is in Australia's interest to do what it can to support developing nations in initiating sustainable practices.

## Greenhouse gas emissions in Australia

Australia's National Greenhouse Accounts record Australia's greenhouse emissions in 2007 as 597 million tonnes ($CO_2$-e). (-e indicates greenhouse gases other than $CO_2$ are included) This represents an increase of 26% from 1990, the Kyoto protocol starting date. However, due to our allowance for reduction in land clearing under Kyoto, the adjusted increase is 6%.

Stationary energy has increased 49% over this interval and the transport sector by about 27%. Land clearing still accounts for 13% of Australia's total emissions. 424,700 hectares of land was still being cleared across Australia in 2004.[19]

The Australian Greenhouse Office has calculated that about one fifth of all greenhouse emissions are generated directly by householders (approximately 15 tonnes of $CO_2$ per household per year) of which 34% is attributable to individuals' transportation expenditures, 26% from the use of various electrical goods (of which fridges and freezers are the greatest emitters), 16% from heating water, 11% from heating or cooling the house, 5% from lighting, 5% from waste and 3% from cooking.

# Coal and natural gas

Australia has abundant resources of coal – so much so that it is the world's largest coal exporter by a considerable margin. Coal exports generate over $20 billion each year. The importance of coal as an export commodity has delayed recognition by government and business of the dangers and business opportunities that climate change represents.

The coal-fired power stations that produce 84% of Australia's stationary power are potent emitters of greenhouse gases. In developed countries, modifications to coal-fired stations have resulted in a ratcheting decline in emissions of sulphurous and nitrogenous gases, and of particulates. These improvements were achieved without cataclysmic financial results (despite predictions by business of the contrary), using innovative market methods, including a 'cap and trade' market mechanism to lower sulphur emissions. However, the economies in poorer countries such as China, India and Brazil have been less able and willing to invest in less pollution-intensive coal-fired plants. Many forms of pollution, including greenhouse gases, are increasing with an adverse impact on surrounding countries as well as on the health of their own citizens.[16]

Australia also has very large resources of natural gas. In terms of $CO_2$ and particulate emissions, gas is preferable to coal, being only about half as polluting. Until 'clean coal' (carbon-captured and sequestered) power plants are widely in use or are replaced by renewables, gas should be the preferred fuel for new stationary power plants in Australia. In this respect the export of Gorgon gas represents a missed opportunity to bring less pollution to the production of electricity in Australia

For similar reasons, there is a strong case to convert the national vehicular fleet to run on gas, at least as a transitional stage until fossil fuel dependency can be entirely phased out.

# Fossil fuels and human health

The burning of fossil fuels impacts on health both directly and indirectly. Climate change resulting from the burning of fossil fuels has significant health impacts. All coal-fired power stations produce some emissions of injurious gases and particulates. Sulphur oxides combine with water vapour in clouds to produce sulphuric acid. This forms acid rain, which is responsible for extensive forest damage in the northern hemisphere as well as acidification of lakes and rivers that poisons animal and plant life.

Apart from environmental damage, fossil fuel usage has direct effects on human health. Particulates are inhaled and enter the human body through the lungs to cause both respiratory and cardiac disease. Nitrogen and sulphur oxides are respiratory irritants and predispose to bronchitis. The economic cost of respiratory disease is substantial.

Even in developed countries such as the USA, there is a significant burden of disease with 23,000 deaths each year being attributed to pollution from power plants.[20] Air pollution in the USA is estimated to account for 5% of male cancer deaths and 3% of female cancer deaths between 1970-1994. Most of this pollution is from coal-fired power stations.[21] Data from Australia is not available but there is no reason to believe that the situation in the LaTrobe or Hunter has been materially different.

One of the most concerning pollutants from coal is vaporised mercury which is accumulating widely in the environment. 2,503 tonnes of mercury released into the atmosphere each year comes directly from anthropogenic sources. This is about a third of all mercury emitted to the atmosphere. Fossil fuel power plant emissions contribute 1,422 tonnes per year. China and India account for 62 per cent of mercury emissions from fossil fuel burning whilst Europe and USA account for 23 per cent.[22] Figures for Australia are not available. It persists and accumulates in the aquatic chain rendering fish consumption unsafe for pregnant women.[23] The health impacts are universal.[24] Improvements in coal power station technology, as practised in Australia, increasingly remove these pollutants. However, much of the coal exported by Australia is used in developing countries without such technology. Small amounts of uranium are present in some coals and this can become a pollutant in the fly ash from poorer stations; it has been responsible for birth defects, physical and mental abnormalities in the children of Punjab, India.[25]

The world's coal mining industries are responsible for thousands of accidental deaths per year.

In assessing the relative costs of fossil versus renewable energy, governments should provide a reasonable estimate of the health and environmental costs that are not accounted for in the pricing of these commodities. These 'hidden' costs are called negative externalities by economists. They are significant and would make it likely that fossil fuels are more expensive than renewable energies. Whilst the world continues to use fossil fuels, every effort must be made to improve the technology to reduce pollution.

# Emissions Trading Scheme

An Emissions Trading Scheme (ETS) recognises that historically, businesses that pollute have not had to pay for their pollution. The polluters are able to pollute without having any penalty imposed. This example of an economic activity that indiscriminately imposes a cost on to others (in this case the cost of greenhouse gases, cardio-respiratory and other diseases) that is not factored into its price, is a negative externality. The ETS seeks to redress this failure of the normal market system. The ETS incorporates the true cost of $CO_2$ emissions via the price of carbon permits. The cost of these permits is then passed on

to the consumers of each product. Goods and services that result in more $CO_2$ emissions (more carbon intensive) will become relatively more expensive. In particular, electricity generated from coal would have a significant increase in price.

An ETS has significant advantages over a carbon tax or other economic tools that could be used to incorporate the price of $CO_2$ emissions. The major advantage of an ETS is the ability to set a "cap" on the total allowable emissions and enforce it by only granting that amount in carbon permits. The available permits can be reduced over time to achieve progressively lower total emissions. The "carbon price" for these permits will adjust accordingly. By contrast, under a carbon tax, the price of carbon is set centrally and the government must estimate the effect this will have on the volume of emissions. Further reductions would require increasing the tax rate which is difficult to achieve politically. Nevertheless it is possible that a carbon tax could be used in addition to an ETS. A further advantage of an ETS is its ability to trade equivalent permits internationally.

In principle, DEA supports the ETS proposed by the Rudd federal government, as part of its Carbon Pollution Reduction Scheme (CPRS). At present we have reservations about its effectiveness because of concessions given to polluters.

# Energy efficiency

Energy efficiency is crucial in emissions abatement. Australia has many opportunities to improve energy efficiency that could be capitalised upon compared with other abatement measures, and with a favourable cost/ beneficial ratio. Energy efficiency activities have the added benefits of improving our energy security by reducing our reliance upon fossil fuels and for social welfare through helping citizens to reduce their spending on energy and improve the comfort of their homes. An important example of energy efficiency is provided by Cogeneration. Currently two-thirds of energy generated from burning coal are lost or wasted as heat. For example cogeneration, where heat and electricity are generated and used locally, reduced emissions by 77% and costs by over 50% in the town of Woking in the UK.[26]

The relative ease of improving energy efficiency in Australia has been well documented. Australia's energy efficiency performance has been relatively poor over the past few decades and lags behind many other

OECD countries.[27] While this is unfortunate it means that Australia has numerous opportunities with which to make rapid and significant energy and cost savings.

McKinsey and Company have studied Australian abatement opportunities and have modelled the potential volume of abatement and cost per tonne which is as yet untapped. They have concluded that if Australia fully exploited the opportunities available then we could reduce our emissions by 30 per cent below 1990 levels by 2020 at a modest annual household cost of $230. The reason for this is that we have a large volume of abatement available through energy efficiency measures that actually save significant costs. These savings counteract the costs incurred through other forms of abatement such as forest management and land-use changes and renewable energy.[28] So why has Australia not capitalised on these?

Allen Consulting Group[27] identified several barriers: "Market failures", "Behavioural, cultural and organisational barriers" and "Other".

**Market failures** include: *Lack of or imperfect information* leading to opportunities being missed; *Split incentives* - where the person making the decision does not stand to benefit, such as builders choosing not to install solar water heating because it costs more upfront

and the house owner reaps the long-term benefits, or landlords choosing not to invest in their properties as the tenants reap the benefits; failures also include organisations where a government department which covers the capital cost is separate from the department reaping the ongoing savings; *Adverse selection* where customers are reluctant to pay the higher price-premium of higher efficiency products. Access to certain energy efficient product alternatives can also be a challenge in some places.

**Behavioural , cultural and organisational barriers** include: *trust in the product and source of information* - that the product will perform as anticipated; *inertia* – creating a bias against energy efficiency because it requires a departure from the status quo and may require extra decision-making; and *organisational limits on individuals decision making or monitoring ability* – this may include unofficial limits resulting from workload and priorities or it may be formalised limits in the role descriptions; also *strict investment criteria* in organisations - such as requiring prohibitively short payback period of less than two years.

So there are various barriers to improving energy efficiency. Education campaigns alone can improve understanding of the opportunities. Emissions trading will raise the cost of energy and thereby provide incentive for energy efficiency. However, many energy efficiency opportunities are already financially attractive and are not utilised. These measures must be accompanied by complementary regulatory measures designed to overcome the barriers.

Many opportunities are available in households, business and industry. Each of these sectors face different barriers and will require different supporting measures – in other words energy efficiency is not a "one size fits all" policy approach. McKinsey lists some of the opportunities as: improving efficiency of motor systems; commercial and residential heating, ventilation and air-conditioning; car fuel economy; commercial and residential lighting efficiency – i.e. use of fluorescent lamps and Light-Emitting Diodes (LEDs); residential water heating efficiency; residential stand-by power savings – i.e. turning off appliances or using appliances with minimal stand-by power consumption; and improving appliance efficiency - in particular that of refrigeration.

Australian state and federal governments have introduced some policies and programmes which have begun to successfully target certain sectors and groups of technologies. Examples include: the NSW and ACT Greenhouse Gas Abatement Scheme; various state and federal solar water rebate schemes; improvements in state building regulations for new houses such as BASIX in NSW and "5 star" in Victoria; the Australian Building Greenhouse Rating – a voluntary rating scheme for commercial buildings and tenancies. However these policies need to be built upon, preferably in a co-ordinated national response and many more will be needed. In the past, the state by state approach has created unwarranted costs for both business and government. Governments should be more willing to recognise and implement successful schemes trialled in other jurisdictions, rather than constantly reinventing the wheel.

DEA calls for the following:

The expansion of the planned Victorian and NSW Energy Efficiency Target schemes to a **National Energy Efficiency Target Scheme** with eligibility for both the residential and commercial sector.
Rapid scaling up and rolling-out and of the upgraded **Minimum Energy Performance Standards** for all commonly used appliances so that they lead minimum performance in the market, rather than follow.

Continuation and expansion of **Energy Labelling** to new appliances.

**Mandatory measuring and disclosure of greenhouse and energy performance of buildings** – including commercial buildings and residences - upon sale or lease.
Modification of the **Energy Efficiency Opportunities** programme to mandate that large energy users perform efficiency upgrades with a three year or less payback period.
An **Energy Efficiency Action Fund** – funded by the Australian Government's proposed Climate Change Action Fund – for industrial energy efficiency project with long payback periods. Such a fund should be non-competitive and have clear eligibility guidelines.

More robust minimum energy performance standards in all **state building codes**.

**Household rebates for fittings/appliances** as necessary to support the roll-out of technologies which are not supported through the National Energy Efficiency Target. In particular, incentives for low-income households and for landlords may play an important role.

**Ongoing public education** of the available opportunities, actions and supporting government programmes.

Together these measures raise the standards for minimum energy and greenhouse performance through regulation. They also raise the "ceiling", that is, they encourage better practice across the board by providing incentives for business and individuals to do more than the minimum though providing incentives to go further.

The Australian Government has indicated an intention to pursue some of these actions, including Greenhouse and Energy Minimum Standards, fast-tracking new standards, continually reviewing standards, accelerating the introduction of the 1 watt standard for stand-by power and improving the current six-start Energy Rating Label. We endorse this approach and encourage the Government to prioritise these activities.

# Renewable energy

Renewable energy sources can contribute significantly more energy to Australia, cost effectively and safely, while reducing emissions and improving energy security.

**Renewable energy is available now –** There is an array of technologies which are already being deployed and which can contribute much more energy to Australia without the need for technological breakthroughs.
**Renewable energy is reliable** – A diversified and distributed network of energy generation can reliably meet Australia's energy needs without the need for storage. Even large-scale wind power from geographically dispersed wind farms, can be made as reliable as base-load coal or nuclear power by adding a little peak-load power (e.g. hydro or gas turbines) which does not have to be operated frequently.[29]

**Renewable energy is decreasing in cost** – As renewable energy technologies are more widely deployed, there is expertise developed that ensures their marginal costs are continually reduced. Solar photo-voltaic technology in particular is currently falling steeply in price.

**Renewable energy is employment intensive –** Renewable energy technologies provide many more jobs per MW installed capacity than gas or coal-fired generation.

**Distributed renewable energy supports regional areas -** Distributed energy resources are a positive for social welfare and health as they tend to distribute employment opportunities to regional and rural centres.

Renewable energy sources already operating in Australia include: hydro and wind power, bagasse (i.e. sugar cane waste), methane from landfill and sewage, other biomass resources including black liquor, wood and agricultural wastes, solar photovoltaic, wave and geothermal energy.[30]

In 2004-05 Australia sourced nearly 8% of its power from renewable sources (ABARE). This was dominated by large-scale hydro which accounted for 85% of renewable power production followed by wind and then bagasse.

# Forms of renewable energy

## Hydro

Using the gravitational potential energy of water as it courses downhill to turn turbines is Australia's most well-utilised renewable energy source. Unfortunately, dams do have some detrimental environmental effects, such as loss of ecology caused by reduced water flows and the inundation of fertile land. In Australia, rainfall in the southern two-thirds of the country is in decline as a result of climate change, further reducing flows. Dams have high capital costs and a limited life-span. Generally speaking, Australia has capitalised on this resource and its ability to further develop hydro-power is limited.

## Wind

Wind power is the most mature of the renewable energy technologies but accounts for less than 1% of energy production in Australia. This compares unfavourably with a much larger and increasing market share in Europe. For instance, 20% of power generation in Denmark is sourced from wind. There is enormous potential for more wind power generation in Australia – indeed there are thousands of megawatts of wind projects in development, awaiting a supportive policy framework.

## Solar Photovoltaic

Australia is one of the sunniest countries in the world and there is potential for a great increase in the proportion of Australia's power to be generated from the sun. The quantum of Australia's power derived from solar photovoltaic (PV) energy is small; the failure to develop and implement solar programmes relates to lack of incentives and changes in policy that have generated a lack of business confidence. There is a failure to recognise that the early bird catches the export worm and that employment in renewable industries will outweigh losses in fossil fuel industries.

Worldwide the take-up of solar PV has been growing very rapidly on the back of robust "gross" feed-in tariff policies which ensure that owners of solar PV systems are paid a premium rate for the electricity they generate. The cost of solar PV is rapidly improving with the European Commission reporting that solar PV systems are now more than 60% cheaper than they were in 1990. Furthermore, they predict that the cost is likely to fall a further 50% between 2005 and 2020.

## Solar thermal power generation

Solar thermal power plants convert solar energy to heat, using a system of mirrors or lenses focused on absorbers. This heat energy is then converted to electricity in the conventional way using turbines - either steam or gas. The European Solar Thermal Industry Association produced an excellent summary of these technologies and their potential in a report for Greenpeace in September 2005.[31] Installed plants are producing

power at about twice the cost of conventional coal-fired generators. Concentrating solar thermal technology in California has been delivering electricity there for two decades. Now advanced solar thermal electric options are dropping in price and some companies are introducing thermal storage to match power demand. Solar thermal power could not only replace most fossil fuelled electricity generation in the US, but could replace petroleum-based transportation by providing renewable electricity for plug-in electric vehicles. This is not only technically but also economically feasible - and not just for the US but for China and India as well.[32] Spain now has a solar tower that takes reflected heat from the sun from angled ground-based mirrors that powers 6,000 homes. A planned larger tower will supply enough electricity to drive the power needs of the 600,000 residents of Seville. This technology stores enough heat for when the sun does not shine and can provide 24 hour power. Australia, with its abundance of suitable sites for solar, could be a leader in this industry.

## Geothermal

Geothermal power extracts heat from under the earth's surface to convert to electricity. In Japan and New Zealand, underground hot water is utilised. In Australia, holes are being drilled into hot fractured rocks kilometres beneath the surface, where it is hoped water can be pumped down and the hot water recovered. Geothermal is the biggest source of Iceland's power and produces about 7% of New Zealand's.

Other applications of geothermal energy include the use of the stability of ground temperatures at only a few metres depth to assist domestic heating and cooling.

## Solar water heating

Water pipes are arranged on rooves to absorb heat energy directly from the sun and are "boosted" by conventional heating to achieve the desired temperature.

## Heat pumps

A more diffuse utilisation of solar thermal technology can be used to both heat and cool individual houses and workplaces. It has been estimated that these individual solar thermal applications might eventually reduce demand on national power grids by 10% or more.

## Biomass

Bagasse, or sugar cane waste, has been used in co-generation (combined heat and power) plants in Australia for decades. Bagasse, as a waste product, is a 'good' bio-fuel, as are other fibrous and cellulitic products which would otherwise be burned for their disposal.

The cleanest and most efficient way of utilising these fuel sources is in combined-cycle gasification systems in which the emitted gases can be cleaned and/or 'captured'. The more sophisticated the plant, the more costly the power.

## Other sources

**Methane** is a potent greenhouse gas with a greenhouse warming potential 21 times that of carbon. Capturing and using methane as a fuel source from gas that would otherwise be vented into the atmosphere from waste dumps or coal mines is environmentally sound. Methane is becoming more commonly utilised in Australia and elsewhere.

## Tidal power

There are places in the world where tidal flows are strong enough to drive turbines without major environmental impact, and tides are being used to generate clean power. Each proposed application requires careful environmental evaluation because of the potential to cause sedimentation or to kill mangroves, other coastal vegetation and to deplete fish stocks. Because tidal flow is so reliable, there is potential for research into better ways of harnessing this energy.

## Wave power

Around the world, there are a variety of devices being trialled that convert wave energy into electricity. Carnegie's CETO project incorporates floating buoys beneath the ocean surface, their motion can be used to pump seawater on to shore which can then be used to generate electricity and desalinate water. A small scale trial has been successful and two commercial scale projects have been planned.

## Solar and wind electrolysis

The hydrogen to power hydrogen fuel cells can come from by-products of petroleum refining or be generated in nuclear power stations – and both industries are extolling their hydrogen-producing credentials. However, the 'cleanest' source of hydrogen is water from which hydrogen can be released by electrolysis. Research is underway to use solar and wind energy to provide the electrolysis of water, the ultimate in clean fuels and energy conversion and storage.

# Other issues

# Government support for emerging technologies

Firm targets for renewable energy production provide certainty for business investment in new technologies and for suppliers of existing technologies. DEA supports in principle the Federal government's Renewable Energy Legislation but with a target of 30% by 2020. This will complement the Carbon Pollution Reduction Scheme (CPRS) proposed by the Federal government, with the aim of ensuring that renewable energy is deployed in Australia but only has a modest impact on the price of electricity. Over time, renewable energy will become more competitive on price and the RET will no longer be required. DEA also supports the separation of renewable energy target legislation from emissions trading legislation.

Tradeable credits for renewable energy generators enable a second source of revenue for these green producers, in addition to selling their electricity to the grid. These credits can be sold to users of fossil fuel users to further subsidise the green industries. DEA supports the introduction of Renewable Energy Certificates (RECs).

The Australian government has recognised the potential for technological advances to reduce greenhouse gas emissions and has participated in the setting up of the AP6 Partnership (Australia, the US, India China, South Korea and Japan) to invest in and exchange new technologies. $100 million has been committed to the AP6 initiative. The British government has recently announced a 1 billion Pound partnership to invest in

'clean' energy technologies (500 million Pounds government money and 500 million Pounds industry investment).

It is not easy, to establish how much Australian government money is being directed towards the various emerging renewable energy technologies, although it appears there has been a focused investment in supporting the 'clean coal' option, presumably for political reasons.

"Feed-in" tariffs (FiTs) subsidise the production of renewable energy by enabling a premium price to be paid for electricity sourced from renewable suppliers. Various Australian states have enacted FiT legislation for solar PV energy. DEA calls for a uniform, federal approach to using this economic tool. DEA supports the removal of FiTs as the price of producing this renewable energy falls and they become naturally more competitive with other energy sources. Numerous countries have introduced FiT legislation. Other strategies that can be utilised by government in a coordinated strategy include:

Planning for the national electricity network (grid) to ensure successful incorporation of intermittent producing technologies such as wind generation. Current barriers to connection include the disproportionate costs and obligations imposed small project proponents, often in regional areas.

Local, state and federal planning regulations to ensure robust and efficient processes are in place to minimise unnecessary delays in developing green projects. One aspect of this is amending the Environment Protection and Biodiversity Conservation Act to take climate change into account.

Tax concessions to enhance the uptake of renewable energy and improving the energy efficiency of homes and business. Examples include the accelerated depreciation of assets such as solar panels.

# Carbon Capture and Sequestration (CCS)

Australia's coal industry, the source of $12 billion a year in exports and the generator of 84% of Australia's stationary power, has stated that it "recognises that greenhouse gas emissions have to be cut significantly."

However, Carbon Capture and Sequestration (CCS, "clean coal") technology is experimental and even if successful, the time scale required for the useful roll out of this technology is unlikely to assist in the urgent need for control of greenhouse emissions.

As at 2009, there is not a single CCS project operating on a commercial scale. The much touted "FutureGen" projected announced in 2003, and planned for Illinois in the US, may never become operational. To become useful for carbon emissions abatement, there would need to be hundreds of plants worldwide.

In Australia, at best, CCS could produce a 9% emissions reduction in 2030 and a cumulative reduction from 2005 to 2030 of only 2.4%, partly due to the lack of suitable carbon storage facility. A recent study commissioned by the German federal government confirms that compared with renewable energy options such as wind and solar, CCS will increase $CO_2$ emissions 10 to 40-fold and raise the cost of electricity by 100%.

Despite these pessimistic observations, there is almost universal government enthusiasm for the future of CCS. Unfortunately, governments have a vested political interest in the success of these ventures because of the large number of existing jobs in the coal industries. DEA accepts that research into CCS is a political necessity but also notes that

coal is an environmental health hazard responsible for much morbidity and mortality worldwide. The costs of these externalities are not factored into the price of coal which remains artificially low.

DEA does not accept the accounting of 'clean coal' as a renewable energy source.

# Alternative fuels for transport

Transport is a major source of greenhouse and other particulate emissions. In Australia, about 15% of all $CO_2$ emissions come from transport, but for individual Australian households, this amounts to 34 % of all their emissions. The instability of global oil production has lead to a rapidly-increasing focus on bio-fuels either in the form of ethanol or biodiesel that would also provide a new market for agricultural producers. Instead of importing energy, countries could grow it in their own fields.

Biofuels are not an acceptable solution because their production has high energy costs and therefore greenhouse emissions. The dominant crops are maize, sugar cane, soya, rapeseed (canola) and palm oil, and in Africa, Jatropha which will grow on marginal land. However, industrialisation of the process in developing countries has led to widespread deforestation and pollution of local water resources, forced displacement of small farmers, human rights abuses and increased food prices due to redeployment of food productive land. In developed countries, the use of the arable land at the expense of food crops has lead to recent rises in global food prices.[33]

DEA does not support bio-fuel production for the above reasons except in some cases of small local production.

Hydrogen fuelled vehicles are a promising transport solution, especially if the hydrogen can be economically and reliably produced by electrolysis of water or from an anaerobic, bioelectrochemically assisted fuel cell capable of producing hydrogen from sugar. This technology remains experimental.

Another option is the use of "plug-in" hybrid electric vehicles (PHEVs), which use rechargeable batteries and hybrid technology. The electricity required to charge these vehicles' batteries could be derived from renewable energy sources.

# Nuclear power

Recognition of the reality and potential severity of climate change has stimulated the mining and nuclear energy sectors to call for increased use of uranium and other nuclear fuels to replace and complement the combustion of carbon releasing fossil fuels, especially coal, in order to generate electricity.[34,35,36]

Reliance on nuclear power cannot successfully ameliorate climate change and the true costs of nuclear power are poorly understood. Nuclear power is another extractive industry and sources of high grade uranium will also likely become exhausted at some stage.

Doctors for the Environment Australia's first Energy Policy adopted in 2006 set out in detail the scientific arguments for and against the adoption of various nuclear energy scenarios. This is available on request.

DEA does not support the development of nuclear power in Australia. When the entire life cycle of a nuclear power plant is taken into consideration, including its construction, decommissioning, and the fossil fuel used to mine, mill and process uranium, any resulting emissions savings will not eventuate for many years after the power plant has become operational. As higher grade deposits are exhausted, the use of lower grade ores will result in negligible emissions benefits if any. There are also significant health and security hazards with nuclear power generation, notably waste disposal.

# Concluding remarks

Dangerous climate change is closer every day. As it nears, the capacity of humanity to rescue itself from its predicament shrinks. Reducing greenhouse gas emissions is vital to mitigate climate change. However, climate change is but one of numerous interlinked problems which threaten human health and sustainability, including international and intergenerational inequality and the abundance of powerful weapons.

A rational energy policy should seek to prevent dangerous climate change and should seek to preserve stocks of dense energy sources, such as fossil and nuclear fuel. DEA believes that Australians should vigorously and actively contribute to the development of a combination of greenhouse-sparing energy technologies, including energy conservation, and the deployment of wind, solar and geothermal energy technologies. It is likely that these sources of power are cheaper than fossil fuel generated power when health impacts are taken into consideration. We believe that we can and should develop regional leadership in these fields.

DEA supports the use of economic tools and policy, as well as regulation, to appropriately recognise the price of carbon pollution, and to achieve specific energy and emissions targets.

Australian leadership regarding climate change and energy policy is vital for the Asia Pacific region. Together with Singapore, Japan and New Zealand, we form part of the wealthiest and most fortunate group of nations in this area. As a major financial beneficiary of coal exports, we bear extra responsibility for global climate change. In the past we may have been largely innocent of the knowledge of atmospheric harm, but now we face culpability and the possibility of eventual legal liability. Australia possesses great resources of science, technology and solar energy. If we could genuinely harness these in the pursuit of regional and global public good, then it is likely that the Australian people would benefit materially and psychologically. Most importantly, Australian leadership will help reduce the foreboding risk of unmitigated global climate change.

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