Environment Business Australia

Submission to the House of Representatives Industry and Resource Committee Inquiry

Renewable energy in Australia - developing Australia's non-fossil fuel energy industry.
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Key recommendations

- Recognise renewable energy as an integral part of Australia's future economic resilience, energy security, export strategy, and capacity building support for developing countries
- Fast track the potential baseload renewable energy supplies of hot rock geothermal and solar thermal as well as marine energy which can power production of desalinated water
- Lead in the clean energy and 'cleantech' wave and recognise it as one of the best opportunities for wealth generation and preservation (for developed and developing countries) since the beginning of the industrial age
- Recognise and enable opportunity in tackling climate change. Be an international leader by demonstrating that productivity and prosperity can be fuelled by renewable energy
- Internalise the costs of negative externalities - make the economy smarter and more efficient by addressing energy pricing in a more logical way
- Remove barriers to competitive neutrality - protect leaders from being undermined by polluters
- Put in place immediate measures to help avoid positive feedback loops that will increase climate change risks
- Fast-track emissions trading and a carbon price signal by giving the market the data to act to overcome market failures of collateral damage
- Put a cap on emissions not on the price of carbon. Include all major emitters (sectors and companies) in an initial trading scheme - no exemptions
- Work with neighbours in the region to create a regional emissions trading hub and to encourage technology deployment and capacity building
- Make maximum use of energy efficiency steps
- Introduce early complementary measures and make better use of government tools and levers to create an 'enabling framework' for clean energy - including regulation, fiscal incentives and penalties, government procurement and investment, standards setting, and mandatory targets for emissions reduction and low emissions energy
- Ensure all tenders are focussed on outcomes not prescriptive process or outdated technologies
- Remove perverse subsidies put in place or sanctioned by government. Find ways to weave beneficial technologies into the market and to weave out those no longer delivering optimal outcomes
- Value the context for commodities not just the tradeable goods and services
- Recognise the competitiveness building value of embracing GHG emissions reductions targets of 60% by 2050 and 20% by 2020
- Protect Australian and global eco-system services
- Extend and increase MRET to an Mandated Low Emissions Technology Target of 10% by 2010, 25% by 2020 and match Germany's intention to provide 45% of energy from renewables b 2030
- Overhaul, streamline and harmonise regulations across jurisdictions and the three levels of government

We know enough to act

Contents

Introduction

Environment Business Australia welcomes the opportunity to offer the following recommendations to the Committee and requests the opportunity to present at one of the hearings so that experts from some of our member companies can provide additional technical, market and financial information.

As our member companies are preparing individual submissions to the Inquiry, EBA has not overly focused on the technical or financial merits of the various renewable energy approaches. Our aim is to demonstrate that Australia has an abundance of renewable energy sources to select from, and that this country can, and should, be an early leader in developing renewable energy for commercial advantage, aid and capacity building to developing countries, and to help combat climate change.

Building economic resilience
EBA's prime reason for making this submission is to emphasise that renewable and sustainable energy is an integral part of Australia's future economic resilience. The renewables sector is currently disadvantaged by perverse subsidies and preferential contracts to fossil fuels which artificially inflate the importance of energy status quo in Australia. A more up to date strategy and suite of policy measures is therefore needed.

Australia's natural endowment
Australia is naturally endowed with a world class renewable energy resource base and tremendous expertise has been built up in this country. EBA believes that this is a basis to build a long-term industry which will be competitive with the world's best. Furthermore, it will help underpin our energy-intensive production and the fact that we absorb, through our manufacturing and agricultural production, much of the energy and ecological footprint for other countries. This will become increasingly important in a carbon-constrained world and will be the basis for our on-going competitiveness - we need our current and potential markets to accept our energy as environmentally benign.

The development of electricity markets
No electricity delivery system, anywhere in the world, has developed without decades of government support. It is now critical that governments throw their support behind renewable energy and clean energy services to counterbalance the artificially deflated costs of fossil fuels whose negative externalities are not included in the market price of electricity. This is a fundamental issue of competition policy which needs to be urgently addressed.

Further recommendations and expert advice
Environment Business Australia is preparing separately an extended paper for the Federal Government on transition to a clean energy future for Australia and Australia's trade and environmental obligations.

Environment Business Australia

Environment Business Australia (EBA) is a business think tank and advocacy group promoting commercial solutions to environmental challenges. It is the peak body representing the Australian environment and sustainability industry, a sector with an approximate turnover of $20 billion per annum in Australia.

EBA is a not-for-profit organisation with no political alliances, entirely funded by membership subscriptions and the events it stages. The banking, investment, insurance, utilities, manufacturing, forestry, consultancy, engineering, natural resource management, water, energy, waste and recycling sectors are represented among its membership, alongside providers of research and technology solutions.

EBA's objective is to help drive transition that enhances Australian prosperity while at the same time protecting the natural capital which underpins our wealth, competitiveness and lifestyle. EBA is focussed on the 'opportunity side' of combating climate change by making the entire economy smarter and more efficient.

Executive Summary

There is an unprecedented urgency
Climate change can no longer be considered a "long term" issue. The task ahead is not to avoid 5 degrees Celsius average increase in global temperature *'at some point in the future'*. What we have to do is rapidly put in place steps that avoid an average global temperature rise of 1.5 degrees C. If we do not achieve this then the speed and intensity of climate change may increase as 'positive feedback loops' kick in (such as faster melting of polar ice and glaciers). The implications are that a 2 degree C rise would then be brought forward - potentially by decades. At that point, averting further rapid change would become increasingly difficult and it is foreseeable that 3 degrees, then 4, then 5 degrees C would follow rapidly. This point was reinforced in May this year by NASA scientist, James Hansen who suggests the planet is dangerously near a major climate change tipping point.

The community has joined science, economics and the environment industry in calling for action on climate change
The electorate has very clearly elevated climate change to one of the key issues requiring political initiative and intervention. As foreshadowed in EBA's 2005 discussion paper "Australia's Choice", demand for *growth* is being replaced by demand for *secure prosperity* and economic resilience. It is clear that the community would like to see policies and steps put in place, before the election, detailing how Australia will engage with the international effort to tackle climate change, and how Australia will drive energy efficiency and renewable energy into the domestic market energy mix, and how Australia will help other countries develop clean energy and clean manufacturing.

An opportunity to make economies smarter and more efficient
Action to tackle the immense challenge of climate change should not be seen as a draconian impost on developed and developing country economies. There is no longer an arch rivalry between the environment and the economy. Economies depend on environments and ahead of us is the opportunity to make economies smarter and more efficient.

However, increasing energy 'productivity' and eliminating negative externalities of pollution and greenhouse gas (GHG) emissions, requires a new blueprint for economics as well as energy and environmental matters. This blueprint should have vision, energy efficiency, clean energy, renewable energy as its cornerstones.

Without signals the market cannot differentiate "alpha" energy
Commercialising low-emission technologies, renewable energy and energy efficiency is as important today as commercialising coal-fired electricity was a century ago. Renewable energy sources require a carbon price signal and an economic deterrent to GHG emissions. New technologies inevitably bear high R&D, demonstration, operational trialing costs of early market penetration but do not carry the negative externalities of pollution. At present the market is incapable of rational differentiation between a low cost service/good with high collateral damage costs, and a service/good with higher initial cost but no latent drain on consolidated revenue or quality of life.

Redesign national energy framework
EBA believes that Australia should redesign its national energy framework policy with a far greater emphasis on energy efficiency and renewable energy. This would help to achieve:

- Compliance in changing markets: carbon constraints will become the norm and market trends will increasingly select sustainable production and consumption
- Maintenance of international competitiveness; development of new areas of competence
- Improvements in national energy security/independence
- Ability to aid developing countries with technology transfer and capacity building; enhanced export of Australian technologies, infrastructure expertise and operational management know-how
- Stapling of 'green credits' or carbon offsets to traditional commodities
- Policy certainty and continuity for investors, project developers, and R&D trajectory
- Employment development, especially in rural and regional Australia

We believe that Australia's environment and sustainability industry - its 'cleantech' sector, as well as the broader economy, will be significantly enhanced by the rapid growth of renewable sources in the energy mix.

The goal - for Australia to lead in the new economic 'cleantech' wave
EBA believes that clean energy and clean technology provide the greatest opportunity for wealth generation and wealth preservation the world has seen. To maximise these opportunities, Australia needs a portfolio approach where policies and technologies work together to tackle climate change. It is imperative that the equity industry and investors put into transition to a clean energy future is not undermined by lower performance from competitors who can outsource costs via pollution and other environmental externalities. This is an issue which markets have not yet understood and where government intervention is vital.

Clearly, a new technology wave has begun: Australia has the choice of leading, of being a fast follower, or of being a laggard. EBA recommends we take a leadership position because, as an energy intensive and economically robust nation, Australia can provide tangible leadership, especially in our region, by demonstrating that productivity and a prosperous economy can be achieved, and maintained, with clean energy.

Enabling framework is needed
The private sector has innovation in technologies and in financing, but only governments can unravel the existing market failures, overhaul the myriad of outdated and contradictory policies, and provide clarity and confidence for investors and project developers. In other words, the private sector's innovation cannot operate in isolation and it is time for governments to provide 'friendly markets'[1], or at the very least, put in place an enabling framework[2] that allows the market to pick the winners and deploy solutions.

R&D, demonstration and operational trialing/refinement and deployment of clean energy supply, and systemic efficiencies across the economy, all require innovative policies if Australia is to build a smarter economy that is more resilient to environmental and external trade/security shocks. Currently, investment is stalled because of the need for a national energy strategy that includes pricing the collateral damage of production and consumption and fully valuing the ecological resources and services which civilisation relies on.

By an enabling framework we mean governments using their powerful tools and levers to achieve maximum beneficial outcomes. For example:

- Regulation to uphold mandated standards of performance in energy efficiency, low/zero emissions energy delivery, and waste and pollution eradication. Regulation needs updating, streamlining and harmonising across all jurisdictions and levels of government
- Fiscal incentives and penalties,
- Market instruments (primarily carbon pricing and emissions trading in this case)
- Standards setting
- Procurement and investment to create new markets (e.g. automotive fleets);
- Bi-lateral/multi-lateral trade agreements
- Education
- Full cost recovery pricing

These are some of the policy levers needed to match the technology 'wedges'[3]. Governments can level the playing field for next generation approaches whose short-term costs inhibit the market from acknowledging their longer-term and broader-scope benefits.

A carbon price signal, and emissions trading are very important steps forward, however, on their own they are not sufficient, in the early days of a new marketplace, to drive deployment of clean and renewable sources of energy.

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[1] Friendly markets concept proposed by the World Business Council for Sustainable Development (WBCSD)
[2] The 'enabling framework' concept was coined by Environment Business Australia to explain why governments need to use their powerful tools and levers as innovatively as the private sector uses technology and finance.
[3] Socolow and Pacala, Princeton University

Timescales for markets and technologies
Without clear signals and mandates technological innovation will not be integrated at sufficient speed and scale in a market which is based on superficial evaluation of 'low pricing' of energy, and which still rewards the poor performance of waste and pollution.

Some of the energy solutions we suggest in this submission will be early movers in a developing market; others will take time to reach their longer-term potential. We recognise that, as a market with relatively small scope and scale, Australia is unlikely to be a commercial home to all of them. However, our proximity to, and our excellent relationship with energy-hungry countries in the region puts us in an excellent position to develop a variety of energy, and energy-services exports, and to provide practical aid by transferring technology to where it is most needed.

Australia should not therefore, be shy about embracing targets of at least 60% cuts in GHG emissions by 2050 and 20% by 2020 (against a 1990 baseline). These targets, which we emphasise should be seen as interim guidelines, which will probably need to be strengthened but in the interim, they provide the market and company boards of directors with a goal. They also provide direction and benchmarks for the timelines and milestones necessary for Australia to develop its next competitive edge in a carbon constrained international marketplace.

A cap on emissions is desirable, a cap on carbon price will only render the marketplace ineffectual.

Building the new market
Australia's energy supply will not change overnight, but an immediate framework for transition could ensure that by 2030 the nation has at least 50% clean energy delivery, which significantly cuts GHG emissions at cost competitive rates.

This would help to reverse our dependence on fossil fuels over a long enough time span to allow for fuel companies to diversify their portfolios; for new high quality jobs to be created; and for alternative exports to be developed as other countries replace coal fired electricity generation with cleaner sources of energy or switch to coal-fired generation with carbon capture and storage.

It is interesting to note that Germany, a country not overly endowed with renewable energy sources, has recently announced that it intends to power 45% of its electricity with renewable energy sources by 2030. In a similar vein, the Centre for Alternative Technology in the UK has released research showing that the UK can be carbon neutral in 20 years using existing technology. Both of these countries are aggressive exporters and see major competitive advantage from this policy stance.

Developing countries are also focusing on renewable energy sources. China in particular is undertaking R&D into hydrogen and geothermal energy sources. We believe this is partly because of a desire to have domestic energy security, but also to provide clean energy in a rapidly growing economy where air pollution is a serious hazard to health, productivity and economic growth. We emphasise that smaller, localised renewable energy plants are less likely to be targets for sabotage and would have less impact on grid supply if damaged.

Following the World Summit for Sustainable Development's core objectives of poverty alleviation by 2010 and sustainable production and consumption by 2050 – renewable energy has a critical role to play particularly in delivering the Millennium Development Goals of halving the number of people without access to clean drinking water and sanitation by 2015. Rural areas will be dependent on renewable energy to drive the infrastructure necessary to meet these objectives and EBA wishes to see Australian industry play a key supply role in providing combined energy and water treatment technologies and infrastructure.

Economics of climate change

The value of eco-system services
On a global scale eco-system services (clean air, drinking water, pollination, stable climate and weather conditions, agricultural productivity, inter alia) have been put at the equivalent of global GDP by some economists. The value of our eco-system services is part of Australia's natural competitive advantage and must

therefore be protected. We could not afford, nor would we have the technology to replace ecological services if the natural system went into chaos and delivery of services ceased. This is the only cost that the planet or any individual country cannot afford.

Investment stalled in Australia
Current uncertainty over pricing of carbon, and the clear need for a national strategy on climate change solutions is stalling investment in Australia. This situation is not duplicated in countries with clear carbon strategies. In the global market $US21 trillion of funds will be invested over the next ten years on energy infrastructure. At present we would have to question whether Australia will access a fair share of that funding either domestically or in the export markets we compete in.

As well as seeking a commercial return on investment, fund managers want to avoid any latent carbon liability associated with their investments. Indications are that higher capex costs associated with new-to-market cleaner energy will be considered favourably over lower capex that comes with higher opex costs associated with pollution, waste and GHG emissions. Many commentators suggest there is potential for litigation, similar to tobacco and asbestos, if companies do not act to reduce their GHG emissions, this is also being factored into investment decision making.

Innovation investors and developers also need to see a clear pathway to market if they are to remain in Australia, otherwise they will choose a more proactive country where they perceive the market is more dynamic and open to the ideas.

Cost of energy
The issue of cost of energy must be addressed more logically. Coal is frequently referred to as "cheap" but this is asking investors to model risk and return on outdated data. Current coal-burning processes externalise costs of pollution onto the environment, this is a transfer of wealth away from the national or global commons. When the costs of CO2e abatement and mitigation are factored in, clean coal will not be less expensive than other sources of energy including gas, and several zero emissions renewable energy sources which have scope to be brought down their cost curve.

Clean energy is not about setting up a generation of more expensive power - it is about modernising our energy systems in ways that do not inflict short, medium or long-term damage on humanity or on the environment. A national emissions trading scheme is necessary to the development of the marketplace for renewable and clean energy and helps to lead the economy away from broad risks associated with investments modelled on outdated scenarios.

The biggest challenge is monetising tomorrow's value to galvanise market action today so that it can provide better opportunities for winners to emerge by rewarding high performance in any sector.

*We need to value **all** commodities*
Societies value and trade commodities, but we insufficiently value the *context* for commodities. It is now time to look at both sides of the national and international balance sheet.

The international market will increasingly value the *productivity level* of energy and will sanction against environmental degradation, including greenhouse gas emissions. Negative externalities therefore have to be phased out for trade and economic as well as environmental reasons. The first step to achieving this is to cost them. The second step is to develop full cost recovery pricing (externality internalisation). Emissions trading is a fair and equitable way to help deliver a carbon price to achieve this outcome and to share costs across the entire supply chain - including the final consumer, but, as outlined elsewhere in this paper, additional measures are needed to fast-track renewable energy deployment.

Environmental degradation - a trade subsidy
Environmental degradation will increasingly be seen as a form of production subsidy (albeit indirect) and there are growing trade implications.

The concept of trade sanctions from countries keen to protect their investment in carbon reduction has been voiced by France, while UK supermarket chain Tesco says it is responding to consumer demand in selecting

food, wine and goods which have a low carbon footprint/low 'carbon miles'. Other UK supermarkets have indicated that they will follow this lead[4].

Massive funds are mobilising but investors need greater certainty
Many international and Australian investors are ahead of governments in understanding the foreseeable risks ahead[5]. Whether one considers it prudent risk management, opportunity-seeking, or far-sighted altruism, the finance sector is pulling ahead of government policy.

Energy efficiency

Although we recognise that this inquiry is focused on renewable energy and biofuels, we would like to take this opportunity to emphasise the important, and often under-estimated role that energy efficiency can play in reducing the carbon footprint of energy services and in making energy supply more cost effective across the economy.

Energy efficiency has the *potential* to provide 50% of the ultimate reductions in greenhouse gas emissions. New policy interventions are required to achieve this substantial cut in emissions by 2050 and these are likely to take three years to reach optimal impact. It should be noted that energy efficiency only receives 5% of total funding at present and the earlier the start in using existing technologies that are capable of delivering 20-30% increases in efficiency the less difficult the task ahead will be.

Renewable Energy

Australia has the largest and hottest proven reserve of hot rock geothermal; excellent sites to capture wind and solar energy; a large coastline with great potential for wave (NSW and Victoria especially) and tidal (northern WA); and world-leading solar thermal technology. Renewable energy sources can also be used to catalyse hydrogen as a new energy delivery system for use in electricity production in combination with fuel cells and as a transportation fuel.

Hot rock geothermal

It is estimated that, with early action, 25% of new generation capacity could be met with this technology by 2030, this would equate to 10% of Australia's total generation capacity. Two companies are confident of being able to supply 500 MWe installed capacity by 2015 (with potential for initial generation being as early as 2010) and this could be significantly accelerated from 2015 reaching 2000 MWe by 2020 and 4500 MWe by 2030.

There are no technical breakthroughs required as the core drilling and reservoir technologies already exist from the oil and gas industry. Similarly, the power station technology exists through the conventional geothermal industry. The high voltage DC transmission line technology is also well proven (transmission losses of between 5% and 7% are equivalent to losses powered by any other source and have been factored in to the cost benefit analysis).

The quality of Australia's hot rock resource, particularly that in the Cooper Basin, is seen as the best in the world. The high temperatures are coincident with good fracture permeability, fluid overpressures and a stress field that results in flat lying fractures dominating the flow field. This latter point means that many simple vertical wells can be linked up to create large-scale developments. The efficiency of converting thermal energy to electricity increases at a rate of 1% by every 1 degree Centigrade temperature increase. The Cooper Basin site has temperatures above 250°C compared with European sites below 200°C. Australia's high grade inferred resource of 2.5 million petajoules can support electricity production at current rates for hundreds of years.

[4] Waitrose and Marks & Spencer
[5] The Carbon Disclosure Project now represents over 280 institutional investors with funds under management over US$41 trillion

Globally, the value of the geothermal energy market is expected to reach $47 billion by 2020.

Cost analysis by economic consultancy ACIL Tasman found that, if carbon pricing is introduced, hot rock geothermal electricity will be cheaper than that from advanced coal, clean coal, nuclear, gas and other known potential baseload systems. Modeled costs for generating large amounts of base-load electricity from hot rock geothermal are in the order of $45 per MWh, this is lower than clean coal with carbon capture and storage ($67) and nuclear and gas ($65). These figures include a predicted $30 a tonne price for carbon.

Development of the hot rock geothermal electricity supply industry from the Cooper Basin needs to include transmission augmentations, allowing the electricity to be supplied to major centres in the National Electricity Market (NEM), including Adelaide, Brisbane and Sydney.

There is potential for Australia to assist developing countries with commercialisation of hot rock geothermal energy. To date geothermal energy commercialisation has been centred around shallow hydrothermal energy, typically concentrated in areas with earthquake and volcanic activity, which can be harvested at a depth of 100 metres and more (e.g. Philippines, New Zealand, Indonesia, Iceland). The hot rock processes developed in Australia will facilitate commercialisation of energy sources at much deeper levels. This could be of significant benefit to countries in our immediate region.

Solar thermal (paraboloidal mirror/trough) with chemical reaction energy

A 138 km by 138 km site with 20% land coverage by solar collectors working at 20% overall efficiency has the potential capacity to provide all of Australia's primary energy. 25% of new generation capacity could easily be provided by solar thermal energy by 2020. Australia has cutting edge technology - the ANU 'Big Dish' 400m^2 dish is the world's largest high performance parabolic dish solar thermal concentrator and can concentrate the sun's rays 1500 times to produce ultra-high temperatures of over 1200 degrees Celsius. This dish is a prototype of a design that is ultimately intended for use in large scale solar thermal power generation systems. It is being developed to full scale operational deployment and refinement at Whyalla in South Australia. The project will incorporate and demonstrate an ammonia-based solar energy storage system to power a thermochemical process that stores concentrated solar energy until it is required to generate emissions free electricity 24 hours a day, in any weather conditions and on a continuous baseload or on-demand peaking basis.

This technology has the potential to provide 300 MWe installed capacity of electricity by 2012. It should be noted that Spain has recently opened a 10 MWe solar thermal power plant and intends to roll out a further 100 plants. Other countries are heading in this direction - the US State of Nevada is home to a recently completed 64 MWe plant that was built in under 15 months. Australia has the technical capacity, the available land and the available financing to develop plants of similar (and increasing) capacity at the same speed, i.e. five plants could be operating by 2012.

There is also tremendous potential for developing countries, not only to provide domestic energy supplies but also to export energy to developed countries. For example, there is consideration of solar parks in the Sahara to provide EU electricity requirements.

A potential additional benefit of solar thermal energy is to value-add to Australia's coal exports - gasification of coal and export of liquid methanol could add 30% extra energy to the end consumer while more than doubling exports, even while the world moves to a carbon constrained marketplace.

Big dish thermal solar concentrators are being designed to produce liquid fuels, such as methanol, by high-temperature solar conversion from coal and gas (2012+), and from biomass (2015+). Hydrogen will also be produced (2020+) by the thermal splitting of water by achieving temperatures in excess of 3000 degrees Celsius. Maximum benefit would be achieved by co-locating solar thermal energy production alongside coal and gas deposits and biomass production.

Wizard Power's target cost range for the commercial big dish system is $60 - $100 per MWh, with energy storage adding 2 – 5 cents per kWh.

Globally, the value of the concentrated solar power market is expected to reach $28 billion by 2020. The European Solar Thermal Industry Association (ESTIA) estimates that the "OECD Pacific/Australia" market in 2025 will have more than 2000 MW of solar thermal power projects, estimated to be worth US$700 million.[6]

Apart from Australia, South-Western United States, North and Southern Africa, and the Mediterranean countries of Europe, the other most promising areas of the world are the desert plains of India, China and Pakistan. It is estimated that the combined market for South East Asia, India and China could consist of approximately 3000 MW of solar thermal power projects.

Solar photovoltaics

Australia is the sunniest continent in the world providing a significant competitive advantage for the development of a sustainable market for solar PV. Australia is also well recognised for having pioneered world leading solar PV technology and innovation, today the sector employees over 1500 people in Australia generating over $200m of export revenue (comparable to one of Australia's 3 uranium mines).

Solar PV generates clean electricity with no moving parts. It is a peak load technology because the electricity output from a solar system coincides with the peak demand for electricity. Every 2kW installed reduces CO2 emissions by 60 tonnes over the life of the installation with the capacity to provide over 60% of a typical modern efficient home's electricity.

Solar PV, combined with insulation, can offset the need to invest in centralised peak power generation infrastructure to meet peak electricity needs estimated to be more than $24 billion in the next 5 years. The Queensland Government estimates that for every air conditioner installed the electricity industry has to spend an extra $13,000 on more poles and wires to manage the load.

Corrective policies, such as rewarding a solar PV owner with a feed in tariff of commercial value could help significantly increase the uptake of solar technologies.

Wind energy

Wind is the fastest growing energy industry in the world, in Australia the wind industry believes it could provide 20% of Australia's electricity consumption by 2020.

Whilst the high costs of wind turbines have kept wind comparatively expensive at around $70 per MWh compared with coal fired generation at $30 - $40, there are still significant cost gains in the industry in the next decade as China and India enter the supply side with new manufacturing facilities. This will lead to improved economies of scale and also operational refinements that will bring wind down its technology cost curve.

Australia has a large wind energy resource in its southern states with Tasmania, South Australia, Victoria and Western Australia, subject to prevailing winds.

Significant growth is being experienced in large-scale grid connected wind farms in Australia and overseas. Another significant niche for wind power in Australia is installing wind turbines in conjunction with diesel power systems in remote areas, leading to reductions in diesel use and associated cost savings.

The long-range average cost of generating electricity from wind is expected to drop steadily from above $65/MWh to approximately $50/MWh in 2025.[7] Wind energy has been operationally refined over recent years bringing it down its cost curve further than other renewables - which have yet to be as extensively deployed.

[6] European Solar Thermal Industry Association (ESTIA): Exploiting the heat from the sun to combat climate change - Concentrated solar thermal power now. (2005).

[7] Renewable Energy Generators Australia: Renewable energy – A contribution to Australia's environmental and economic sustainability (2006).

Significant opportunities for Australian wind energy companies have been identified in China and India.[8] Wind energy is plentiful along China's south-east coast, while offshore capacity is estimated at 1000 MW. China's new development plans will accommodate many new wind farms allowing foreign investors to take part in China's development of wind energy. A target of 4000 MW has been set for 2010. There is an opportunity for companies to supply wind turbines, as well as for companies interested in establishing a local manufacturing capability.

As a result of India's mean annual wind power density, wind energy remains one of the largest sources of renewable energy. India has 3000 MW worth of installed wind capacity with gross technical potential estimated at 13,000 MW. The Wind Energy Survey Project has identified at least 208 potential sites for wind development, spread across the 13 states. Additional opportunities exist in Thailand, Malaysia and the Philippines.

Wave energy and seawater desalination

The Energetech/Oceanlinx system at Port Kembla employs a parabolic wall to focus wave energy on to an oscillating water column (OWC) chamber. The rising and falling motion of the waves causes an oscillatory water motion within the chamber, which in turn forces a high-speed airflow past a unique controllable turbine. The turbine drives an induction generator to produce electrical power. System components are computer controlled to optimise energy conversion in a range of conditions and automatically protect system components and ensure safety. The Denniss-Auld Turbine, unlike traditional turbines, can accommodate variations in flow directions and velocities. As a result, wave energy experts have acknowledged that this process has overcome the single most important barrier to commercialisation of OWCs. The Oceanlinx[9] demonstration site at Port Kembla has been named one of the world's top ten technologies by the International Academy of Science.

It is estimated that Australia has the potential for 1,000 MWe installed capacity per annum by 2020 reducing annual GHG emissions by approximately 1,000,000 tonnes of CO2 and 30,000 tonnes of SO2. This represents some 700+ wave energy modules which have the specific additional benefit of being able to produce desalinated seawater with near zero GHG emissions - this is of considerable importance when considering the number of countries likely to face water security issues.

The Oceanlinx Port Kembla prototype plant includes a desalination unit producing nearly 2000 litres of fresh drinkable water per day using nothing but seawater and power directly from the ocean itself. This is a significant breakthrough in providing desalinated water without major GHG emissions and enhances the potential of marine energy to supply a meaningful proportion of the world's fresh water without GHG emissions, or brine dispersal issues. Oceanlinx estimate that a 1.5 MW wave energy device has the potential to produce up to 1 billion litres of drinking water per year.

Globally, the value of the wave energy market is expected to reach $7 billion p.a. by 2020. the UK government estimates $1 trillion dollars will be spent by 2025.

According to Oceanlinx estimates based on US experience, suitable wave climates are anticipated to produce power using first generation systems at a cost of around 10 cents US per kWh, and ideal sites at a cost of around 5 cents. Over time, on moderately good sites, with capital cost savings from second generation designs, they expect to see the technology regularly delivering electricity at around 4 cents US per kWh.

Western Europe, the west coasts of North and South America, New Zealand and Australia are the regions of the world where waves with the highest energies are found and where commercial activity is expected to be focused. However, the production of desalinated seawater may be sufficient reason for the technology to be fast-tracked in other suitable coastal developing countries. An additional benefit is that this kind of marine energy plant can be easily adapted to cope with rising seal levels.

[8] Renewable Energy Generators Australia: Renewable energy – A contribution to Australia's environmental and economic sustainability (2006).
[9] Formerly named Energetech

Biofuels

Australian soils are old and worn and care needs to be taken before large-scale biofuel production from crops becomes a de facto replacement for hydrocarbon liquid fuels. This is because each crop reduces soil carbon, minerals and nutrients and replacement via heavy use of chemical fertilisers produces its own set of environmental and health problems.

Having said that, there are a number of interesting biofuel developments from wood waste (from sustainable forestry) and cellulosic waste from food crops.

Internationally there is growing concern regarding the illegal and unsustainable logging of tropical rainforests for cropping of palm oil. EBA supports the responsible production of biofuels and has called on the Federal Government to ban the importation of illegally logged tropical rainforest timber or by-products of the illegal destruction of tropical rainforests.

Biofuels from photosynthetic algae acting as a carbon sink
Beneficial uses for CO2 are in early commercial development. Showing tremendous early promise is a biofuel production process involving 'force feeding' CO2 to algae. If this technology scales up, as early research suggests it could, carbon captured from coal fired power plants may no longer need to be geo-sequestered. Clearly, the process would require a leak-proof, hydroponic growing system for both safety and audit reasons.

The process involves algae, acting as a biological sink, being harvested for its lipid content which is then turned into bio-diesel. Depending on the type of algae some may also be suitable for animal fodder. A carbon rich soil enhancer to replace chemical fertilisers is also under study. Detail on this process is available from our website www.environmentbusiness.com.au/What's New/

Based on US studies it has been estimated that approximately 63 square km of operational land could be all that is required for meeting 50% of all transport fuel needs of Australia. Therefore algae biofuels would not compete for land with other biomass. Mineral and nutrient levels in soils would not be reduced and there would be no competition with food production crops. And in suitable temperature ranges it grows rapidly with the potential to double its volume for harvesting within 24 - 48 hours, significantly different to other biofuel feedstocks, such as soybean or corn. Up to 50 percent of algae's body weight can be comprised of oil, whereas oil-palm trees, currently the largest producer of oil to make biofuels, yield approximately 20 percent of their weight in oil.

Algae grow in aquatic environments, and can cope with most of the contaminants in brackish water and flue gas (with the exception of mercury). There is therefore no demand for freshwater supplies and water can be recycled. This characteristic allows use of areas where saline groundwater supplies prevent any other useful application of water or land resources.

At the time of writing insufficient detail is available on research to date but it is understood that some types of algae may also be capable of removing 'waste' streams from contaminated water, including minerals, which can then be recovered and reused.

Work is also underway to evaluate the creation of ocean 'algal (plankton) blooms' to capture atmospheric CO2 and create carbon credits. The process may also assist dwindling fish stocks by providing a food source.

Critical steps needed now

Surety of a legal framework to protect leaders
As mentioned at the beginning of this paper - industry and investors require the surety of a legal framework to ensure that the equity they put into transition will not be undermined by lower - and less costly - performance from competitors.

Regulation is the basis of all markets and regulation is necessary to allow the market to discover the true cost of carbon. Strong and clear regulation should be rapidly introduced to pave the way for emissions trading, but also to streamline and harmonise the plethora of outdated, and often contradictory laws and guidelines in force across multiple jurisdictions and the three levels of government.

Ancillary market targets to speed up deployment of renewables
A mandated renewable energy target (MRET), a mandated low emissions energy/fuel target, a mandated pollution abatement target, and a mandated energy efficiency target are examples of market instruments that can work in tandem with a national emissions trading scheme. These targets would provide better clarity and confidence to business and would have a double beneficial impact - speeding up GHG emissions reduction and speeding up deployment of clean and renewable technologies.

At this point, and in the early years of an emissions trading scheme, a carbon price signal on its own will not be sufficient to pull beneficial technologies into the marketplace and overcome the decades of entrenched procurement and investment procedures which focus on prescriptive technology rather than desired outcomes.

MRET should be extended and increased
In order to attract sufficient investment in line with the long planning, development and amortisation periods associated with energy infrastructure, we continue to recommend an MRET of (a real) 10% by 2010 increasing to 25% by 2020. This will see Australia drawn into line with international competition and market demand for goods produced by clean and green energy.

Hypothecate fiscal incentives and penalties
While the concept of any new tax does not find much favour with the majority of industry, and while hypothecation is not currently a policy of Treasury, EBA nonetheless believes that there is significant merit in a system that taxes the elements we do not want (pollution, waste, climate change) and rewards those sectors of industry investing in research, innovation, commercialisation of new technologies and systems, and job creation in the cleantech sector.

We believe that such a system would value-add to the economy and would assist both the renewable energy industry and mainstream industry who are seeking to meet environmental compliance and to build their next competitive edge.

As stated in EBA's submission to the Prime Ministerial Task Group on Emissions Trading, we recommend that revenues from the national emissions trading scheme (permit auctions; non-compliance penalties) be hypothecated to:

- Support accelerated depreciation and the replacement of outdated technology or retirement of outdated plant
- Fast-track full-scale demonstration and market entry of energy efficiency, low emission energy and renewables
- Provide funds for tax concessions and re-investment tax concessions for R&D and technology commercialisation and deployment
- Household and commercial sector energy efficiency and insulation retrofits
- Fund feed-in tariffs that pay commercial rates
- Introduction of carefully selected materials destined to be energy efficient throughout their life-cycle
- Retraining for new employment
- Energy storage and transmission improvements

EBA would not support revenue going to consolidated revenue at either State or Federal level.

Main impediments to action

Historical imperative of artificially deflated prices
For decades Australia has benefited from the economic growth produced from artificially deflated prices for energy and water - we have become used to this low pricing and we have become complacent about the implications which are now coming back to bite us.

It is a dangerous subterfuge when goods or services such as the provision of energy, are marketed as being at a "lesser cost" than the competitor, when what is really happening is that our health, our environment, and our national economy are impacted. When full cost recovery pricing is not internalised in the supply chain, either consolidated revenue picks up the shortfall (with the taxpayer rather than the consumer footing the bill), or, society as a whole has to deal with a lowered quality of life. EBA argues that the taxpayers' bill is larger than the consumers' bill would be because of the lack of efficiencies involved and the non-costing of externalities.

Renewable energy *appears* more expensive because it carries early R&D, demonstration, commercialisation and high market penetration costs in its pricing. The market, not yet sufficiently up to speed with the difference between negative and positive externalities is not deciphering the available signals and is continuing to favour the entrenched energy providers.

While renewable sources of energy and sustainable biofuels provide significant potential for energy supply with major reductions in GHG emissions, this potential will not be achieved until a level playing field is created. The renewable energy sector has not benefited from decades of support which have taken many other industry sectors forward. For the economy to tap into their full potential renewable energy technologies need to be scaled up from their very low installed base and brought down their cost curve.

Subsidies
EBA recommends that a national energy framework should clearly identify the current energy subsidies and/or preferential energy contracts that are currently in operation. Our advice would be to phase out perverse subsidies/contracts that do not support sustainability principles. These could either be eliminated or, where the productivity is in the national interest, they should be replaced with subsidies/contracts that do not result in negative externalities, for example, subsidise a framework for hot rock geothermal energy instead of coal to smelt aluminium.

Conclusion

We know enough to act
We may not have a perfect picture of the problems of climate change. We may not be able to predict precisely what will happen when and where. But there are clear trends of increasing CO2 accumulation in the atmosphere; of rising temperatures; and of rising sea levels. Therefore, we know enough to fast-track measures to try to prevent the *foreseeable* negative impacts that these trends are likely to inflict on economies, security, health, agricultural productivity, water availability, quality of human life, eco-systems and biodiversity. Renewable energy has a tremendously important role to play in risk management, business efficiency, economic stability, energy security and independence, and indeed in the planetary rescue strategy.

While Australia has just 0.3% of the world's population, our GHG emissions represent 1.3% of the global total. Our ability to develop and deploy technology solutions to overcome this heavy carbon footprint, combined with our geographic position, our resources and endowments, our financial capital, our intelligence and our skilled and multi-national workforce, permit us to be one of the early leaders in tackling the threat of climate change.

Exporting energy efficiency/clean energy products and services into Asia presents one of the best commercial opportunities for wealth generation ever presented to the nation. Enhancing Australia's wealth and balance of payments is just one of the benefits. We also have a vested self-interest in providing clean energy and clean technologies to developing countries so they can pull their people out of poverty. Reducing tension and reducing greenhouse gas emissions in the region will accrue tremendous benefits for Australia.

The necessary first step is a national emissions trading scheme which includes clearly articulated GHG emissions reduction targets that put a firm cap on emissions (not on the price of carbon), combined with timetables, milestones and innovative complementary policy measures. This will allow the market to discover the real cost of carbon, in turn facilitating investment into the new 'cleantech' economic wave.

Australia can lead on environmental infrastructure
Australia is better placed than most countries to put in place the 'environmental infrastructure' projects that are necessary for sustainable energy. We have the necessary land mass; we have a budget surplus that can be invested in nation building projects; we have technology options; we have a market of considerable scope and scale on our doorstep; there is significant funding available in superannuation funds; and there is scope to make Australia more attractive to overseas institutional investors who want to be involved in cleantech and renewable energy development.

Australian companies are ready to build on existing expertise, and they are willing and able to assist with clean energy projects in the region but need government to provide the framework and the complementary measures. An early start to emissions trading is most strongly recommended but complementary measures are also required. Regulation, standards, market instruments, incentives and penalties need to be harmonised and fast-tracked into action.