

Market opportunities in environmental goods and services, renewable energy, carbon finance and CATs

Country report: Australia

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This report is one of seven on the opportunities for exports to, and direct investment and joint ventures in, the markets for environmental goods and services (EGS), carbon abatement technologies (CATs), renewable energy and carbon finance in selected countries (see Annex A for definitions of these sectors). It should be noted that the nuclear sector was excluded from the review. The other countries are Brazil, China, India, South Africa, Turkey and the USA – representing a mix of emerging/high growth and developed overseas markets in these sectors.

The findings from the reports have been fed into an overview report which:

- provides an assessment of the UK's competitive advantage in EGS, CATs, renewable energy and carbon finance,
- maps this onto the market opportunities as revealed from the case studies, and
- suggests the opportunities for UK exporters and direct investors by market and sector.

The report considers the general market opportunities presented in the selected countries. It is based on desk research that drew on the most readily available and accessible information sourced from within the country concerned and from international agencies.

It provides background designed to be helpful in focusing the more detailed investigations that will need to be carried out by anyone interested in selling to or investing in the relevant markets and countries.

The report does not assess specific opportunities for UK exporters and/or investors – or their appropriate route to market. However, it shows where there are significant market opportunities in environmental goods and services, renewable energy, carbon finance and CATs.

Summary of market opportunities in environmental goods and services, renewable energy, carbon finance and CATs

Opportunities

- 1 There are, and over the short to medium term will be, significant prospects for exporting and/or direct investment in the EGS markets of air pollution control, solid and hazardous waste management, wastewater and water treatment, environmental monitoring and in advanced fossil/clean coal technology, carbon capture and storage (CCS), low carbon fuels and renewable energy. A map of current and future opportunities in the environmental and low carbon markets in Australia is set out below.

Sector	Current opportunities*	Future opportunities	Policy framework (current)
Environmental Goods and Services (EGS)			
Air pollution & control	😊	😊	Good
Cleaner technologies	😐	😊	Good
Energy management			
Environmental consultancy			
Environmental monitoring	😊	😊	Good
Marine pollution			
Noise & vibration			
Land remediation	😐	😐	Fair
Waste management	😊	😊	Fair
Water supply	😊	😊	Good
EGS overall	😊	😊	Good
Carbon Abatement Technologies (CAT)			
CCS	😐	😊	Good
Generation technologies	😊	😊	Good
Low carbon transport fuels	😐	😊	Good
Asset management			
CAT overall	😐	😊	Good
Other opportunities			
Renewable energy	😐	😊	Good
Carbon finance	😐	😐	Fair

Key	😊	Text
	😊	Relatively large market size and activity, relatively demanding regulation, relatively high public expenditure in this sector and relatively liberal trade and investment regime
	😐	Mix of modest market size and activity, modestly demanding regulation, modest public expenditure and liberalising but still restrictive trade and investment
	😞	No or minimal market size and activity, no regulation, and restrictive trade and investment regime
		No or inadequate information

*The assessment of current opportunities is based on the most recent official data and information on market size and sector activity. In many cases this can refer to 2005 figures and as such certain conclusions in this report may not capture very recent developments in some sectors or announcements concerning the near future. A variety of sources, methods and time-frames was drawn on to assess future opportunities – covering the next five-ten years based on government policies and/or budget allocations and/or independent forecasts and projections.

MARKET ENTRY OPTIONS

- 2 Australia and the UK have an extensive trade and economic relationship. In 2006/07, the UK was ranked as Australia's fifth top import source and is considered a major two-way trade partner by the Australian Department of Foreign Affairs and Trade. Moreover, UK companies dominate EU direct investment in Australia at approximately 53 per cent. The availability of possible market entry strategies is summarised below:

Route to market	Availability	Comment
Export	•	The Australian economy is open to international trade, utilising imports and exports.
Foreign direct investment (FDI)	•	FDI has remained high for a number of years.
Joint venture (JV)	•	History of Joint Ventures in numerous industries.

Source: SQW Consulting

Gaps in the evidence base

- 3 A thorough trawl of readily available reports, studies and policy statements with regard to the markets under review and a limited set of consultations with stakeholders found little evidence on the opportunities in Australia in the following markets:
- Energy management (EGS)
 - Environmental consultancy (EGS)
 - Marine pollution (EGS)
 - Noise and vibration (EGS)
 - Asset management (CAT)
- 4 This is not to say that this evidence is unavailable. More information could undoubtedly be found on specific market opportunities and constraints from specialised and technical policy statements/guidance, journals and trade press. However, it was beyond the terms of reference for this review to investigate the opportunities in this degree of detail.
- 5 The report should be read as an introduction to the most significant opportunities in the Australian markets. It has been designed to provide a focus for the more detailed investigations that will need to be carried out by anyone interested in selling to or investing in the markets.

1: Introducing the Australian market

This section provides background information on the Australian economy and the drivers and international legal dispositions affecting the growth of the market of the environmental goods and services, renewable energy, carbon finance and CATs in Australia.

Key facts

- 1.1 In 2006, Australia had a gross domestic product (GDP) of US\$756 billion – putting it just outside the world’s top ten largest economies. Australia’s GDP growth has remained strong in recent years with an annual average increase of 3.2 per cent between 2001 and 2006. Australia is a resource-rich country with significant stocks of liquid petroleum, natural gas, coal and uranium. It is one of the few OECD countries that is a significant net energy exporter.
- 1.2 The Australian economy is open to international trade. OECD data showed that in 2006 Australia had a current account balance of payments deficit of 5.3 per cent of GDP. Imports of goods and services totalled US\$165 billion whilst exports totalled US\$156 billion. Australia has also received significant inflows of foreign direct investment (FDI), particularly since 2004, where inflows have averaged around US\$32 billion per year.

AUSTRALIA – KEY FACTS (2001-2006)

	2001	2002	2003	2004	2005	2006
Real GDP growth (annual %)	3.8	3.2	4.1	2.7	2.8	2.5
Gross fixed capital formation (% of GDP)	22.9	24.8	25.4	25.8	26.5	26.9
Total primary energy supply per unit of GDP (Tonnes of oil equivalent per thousand US\$2,000 of GDP, calculated using PPPs)	0.2	0.2	0.19	0.19	0.2	0.19
Carbon dioxide emissions per capita (metric tonnes)	20.9	21.0	20.1	20.6	20.4	—
Trade in goods and services (% GDP)	21.1	20.4	18.8	20	21	22.3
FDI inflows (billion US\$)	8.3	17.0	8.0	36.0	35.0	24.5

Source: OECD and Australian Greenhouse Office

Drivers of environmental goods and services, renewable energy, carbon finance and CATs

- 1.3 Australia is the world’s 18th largest consumer of total primary energy and it is ranked ninth on a per capita basis. Since the 1990s the rate of growth of energy consumption averaged 2.3 per cent per year. Energy growth to 2012 is predicted to average 2.2 per cent per year and this trend is expected to continue at a lower rate of around 1.6 per cent annual growth until 2030.
- 1.4 Australia’s continued growth and expansion has coincided with an increase in greenhouse gas (GHG) emissions. In 2005, total GHG emissions were 559 million tonnes of CO₂ equivalent (MtCO₂e), whilst carbon dioxide emissions per capita equalled 20.4 tCO₂. Although GHG emissions in 2005 were only 2.2 per cent above the 1990 levels, this masks a drop in emissions in the mid-1990s. Since 1996 GHG emissions have actually increased by 9.5 per cent.
- 1.5 Over the last three years Australia has suffered a long-term drought, which has often been attributed to climate change. As a result, key projects relating to water collection management and reuse, desalination, and climate change have received strong government support and funding. A\$24 billion (US\$20 billion)¹ was committed to water infrastructure in 2007, A\$4 billion (US\$3.3 billion) on climate change, and the Government’s Renewable Energy Action Agenda targets A\$4 billion (US\$3.3 billion) a year towards developing renewable energy technologies by 2010.

¹ Exchange rates are valid as of 08/09/2008. This approximates to 1 US Dollar = 1.22 Australian Dollars

- 1.6 A large part of public expenditure has traditionally been in water and wastewater treatment, and waste management (approximately 25 per cent each). Other well-funded sectors include soil and groundwater protection and remediation, air pollution control and climate change measures, cleaner production, sustainable cities and green building, and environmental biotechnology.
- 1.7 Australia generates considerable amounts of solid waste which in 2003 reached about 18 million tonnes, almost all of which is disposed of at landfill. There is increasing interest and activity in waste management and recycling, waste to energy and in conversion of biomass into biofuels.

International legal dispositions

- 1.8 The new Australian Government of December 2007 ratified the Kyoto Protocol as its first act of parliament. Australia’s status against a number of key international legal dispositions is presented in the table below:

Table 1-1: Australian status against major international legal dispositions relating to the environment

International convention	Australia’s status
UN Framework Convention on Climate Change	Ratified
Kyoto Protocol	Ratified
Ramsar Convention on Wetlands	Ratified
Montreal Protocol	Ratified
Convention on Biological Diversity	Ratified

Source: SQW Consulting

2: The market for environmental goods and services in Australia

This section describes the growth market for environmental goods and services (EGS) in Australia and outlines the drivers of this growth. It then provides more information on those segments presenting significant market opportunities.

Market growth and its drivers

Growth

- 2.1 The Australian market for environmental goods and services (EGS) was estimated at A\$22 billion (US\$18 billion) in 2006 with an annual growth rate of 7 per cent. Exports of goods (excluding services) are around A\$2 billion (US\$1.7 billion) per year and at least a third of EGS consumed in Australia is imported.
- 2.2 In 2001, the Australian government launched the Environment Industry Action Agenda that aimed to encourage annual sales in excess of A\$40 billion (US\$33 billion) by 2011. The Agenda set out to remove numerous perceived barriers impeding the industry. These included a lack of understanding of the industry itself and poor data collection; a lack of understanding of the value of the environment and the potential opportunities of environmental protection rather than just the costs; and poor communication between industry, its clients and its suppliers. The Action Agenda was re-evaluated by the Australian Government in 2006, concluding that the remaining actions are now the responsibility of industry and state governments.
- 2.3 The estimated distribution of expenditure in the Australian environmental industry in 2000 is presented in the table below. The largest segments were water and wastewater management (A\$6.6 billion or US\$5.4 billion) and solid waste management (A\$3.3 billion or US\$2.7 billion).

Table 2-1: Estimated distribution of expenditure in the 2000 Australian environment industry, A\$ million

Segment	Production of equipment & materials	Provision of services	Construction & installation of facilities	Total
Air pollution control	20	51	18	89
Water and wastewater management	1,462	3,783	1,341	6,587
Solid waste management	724	1,874	664	3,262
Remediation/clean-up of soil and water	220	568	201	989
Biodiversity and landscaping	443	1,147	407	1,997
Other pollution services	288	745	264	1,297
Cleaner technologies & products	1,163	0	297	1,461
Renewable energy	719	97	208	1,104
Industry total	5,039	8,264	3,402	16,705

Source: Perkins P (2006), 'The environment management services industry' paper prepared for the 2006 Australian State of the Environment Committee, Department of the Environment and Heritage, Canberra

- 2.4 Australian national government environmental expenditure rose from A\$1.7 billion (US\$1.4 billion) in 2001-02 to A\$3.2 billion (US\$2.6 billion) in 2005-06. The largest contributors to this were the Department of the Environment and Heritage (DEH) and the Department of Agriculture Fisheries and Forestry (DAFF). Expenditure was primarily targeted on addressing the issues of salinity, water use, recycling, energy use, and natural resource management. The Australian Bureau of Statistics (ABS 2004a) noted that local government environmental protection expenditure was just over A\$2.6 billion (US\$2.1 billion) in 2002-03, whilst natural resource management expenditure was A\$1.9 billion (US\$1.6 billion).

Drivers

- 2.5 Australia is in a similar position to many advanced economies, whereby demand for environmental goods and services has been largely driven by regulation and stricter environmental standards. Most recently, this seems to have advanced a step further as the new Australian Government made ratifying the Kyoto Protocol its emblematic first act of parliament.

- 2.6 Growing consumer and community pressures reflect new environmental awareness in Australia and have strengthened demands for coastal and urban pollution reduction. This also coincides with changing business attitudes towards environmental compliance and competitiveness. International agreements such as the Kyoto Protocol and the UNFCCC have spurred the improvement of Australia's air pollution monitoring systems in addition to providing further motivation to reduce GHG emissions. Australia's National Pollution Inventory received A\$5.2 million (US\$4.3 million) of government funding to upgrade and continue its operation. Localised initiatives are also being taken such as the A\$1 million (US\$0.8 million) pledged to improve the air quality in the Tamar Valley region of Tasmania.
- 2.7 Australia's growing population is highly concentrated in a relatively small number of urban areas. As a result, large pressures have been placed on key infrastructure such as water and waste. The recent drought in Australia, combined with old and overworked sewage systems, has put water and wastewater management high up the agenda. Ensuring a safe and constant supply of water is driving demand for water recycling, technologies to detect and repair leaks, and filtration/cleansing equipment. In addition to this, Australia's growing solid waste production and very high landfill proportions are also driving demand for improved waste management and waste recovery schemes.

Australia has an established and sophisticated research and development network, led by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). CSIRO is a government research body that employs approximately 8,000 workers. It often works with industry in developing and commercialising technologies, in addition to a number of government environmental action plans and public-private centres of excellence seeking solutions to specific problems.

Market segments

- 2.8 The segments with significant current and prospective activity are **solid waste management** (including hazardous waste), **water and wastewater treatment**, and **air pollution prevention and measurement**.

OPPORTUNITIES IN ENVIRONMENTAL GOODS AND SERVICES IN AUSTRALIA

Solid waste management

In 2003, 1,100 private and public businesses provided waste management services in Australia. These businesses employed 14,000 workers and generated income of A\$2.7 billion (US\$2.2 billion). The industry grew at an average rate of 11 per cent between 1997 and 2003 and its value added was A\$1.3 billion (US\$1.1 billion) (2003), contributing the equivalent of 0.2 per cent of Australia's GDP. Employment also increased from 9,000 in 1997 to 14,000 in 2003. Businesses providing waste management services were predominantly small employers, with 74 per cent of them having one-four employees (Australian Bureau of Statistics, 2004b).

The collection and transport of waste accounted for 59 per cent of the total income and treatment/processing and disposal of waste accounted for 20 per cent of income. While recycling only generated 8 per cent of income, it saw the largest growth, averaging 21 per cent a year over this period.

Around 18 million tonnes (Mt) of solid waste was generated in 2003, almost all of which (96 per cent) was sent to landfill. Only a small amount of the landfill methane is being recovered despite the good opportunities that exist. Nevertheless, a A\$60 million (US\$49 million) bio-reactor that can handle 400,000 tonnes of municipal waste annually and with a 20 MW electric capacity (enough to power 20,000 homes) recently opened. Statistics showing the current volume of solid waste generation have not yet been published.

Although landfill capacity is not an issue for Australia, the detrimental environmental effects of such a large amount of landfill waste are spurring the development of waste-to-energy processes and more widespread systems for recycling. Using recovered methane from landfill sites to produce energy is a growing industry. The Urban Resource – Reduction, Recovery and Recycling (UR-3R) Process is a public private partnership between an Australian company, Global Renewables, and two Sydney Municipal governments. It is a highly successful waste recycling model – annually saving 210,000 tCO₂ and generating A\$13 million (US\$11 million). Using a unique biological digestion and composting process, the company is turning methane to energy without incineration, and creating 30,000 tonnes of certified organic fertiliser for farmlands.

Hazardous waste

In 2003, hazardous waste accounted for about 8 per cent of the total income generated from solid waste. The collection and transportation of hazardous waste accounts for A\$109 million (US\$89 million) while its treatment, processing, and disposal contributes A\$41 million (US\$34 million) to total income. Statistics showing the current volume of hazardous waste generation have not yet been published. However, it is believed that in both Victoria and New South Wales the quantity of hazardous waste generation has been increasing in recent years. In 2002, South Australia collected and disposed of approximately 115,000 tonnes of hazardous waste, a 60 per cent increase in volume against 2000 levels (Australian Bureau of Statistics, 2004b).

Most hazardous waste is still being sent to landfill after treatment. However, these facilities are to be gradually phased out and replaced with long term containment facilities. Currently, the state of Victoria is developing minimum requirements for such facilities. Licensing provisions, controlled by the state-based environmental protection agencies, apply to waste transporters, generators, storers, transferers, separators, processors, reprocessors, treaters, incinerators, mobile waste processors, landfill sites and other waste disposal facilities.

Water and wastewater treatment

Total spending on the water and wastewater treatment sector is estimated at approximately A\$4 billion (US\$3.3 billion) per year. Current projections suggest this may grow by 5 per cent annually over the next few years. About 70 per cent of this spending relates to water collection and distribution and sewage collection and disposal. The remaining 30 per cent is concerned with product quality and treatment. Approximately 10 per cent of total spending is translated into the direct purchase of capital and equipment. The demand for water and wastewater treatment equipment is therefore valued at A\$400 million (US\$330 million) (United States Commercial Services, 2007).

The biggest impact on the water and wastewater sector has come from a severe drought that began in 2002. Economists cite the persistent drought as shaving almost 1 per cent off GDP growth. The drought has affected the farming industry and regional centres and driven numerous farmers across Australia into financial difficulties. Major cities have also been faced with serious concerns over uncertain water supplies. Governments – at the national, state and local levels – are grappling with policies and strategies aimed at securing Australia's future water supply.

The National Urban Water and Desalination Plan has funding of A\$1 billion (US\$0.8 billion) over six years. The plan aims to provide private sector firms, water utilities, and state and territory governments with the opportunity to apply for funds in the form of grants and refundable tax credits. A further A\$254.8 million (US\$208.9 million) has also been assigned to the National Water Security Plan for Cities and Towns. This is to support governments and local water authorities to minimise water loss, invest in more efficient water infrastructure, refurbish older pipes and water systems, and fund practical projects to save water.

The potential use of recycled water is gaining serious consideration. At present, almost all of Australia's key industry sectors source water from the same catchment areas used to supply households. Small projects designed to supply water to industries are already in operation or being developed while some major projects are now being considered. As the value of water increases, industries that are major users of water will find it more feasible to treat their own wastewater internally for re-use. There is an opportunity for cost-effective wastewater treatment systems.

The sewerage systems in most of Australia's major cities are old and in many cases overloaded. There are problems with water leakage and pipeline failure. Trenchless technology for pipeline replacement and non-destructive technology designed to detect and anticipate leakages and failures is becoming more important.

Demand for smart metering technology could expand through the development of third pipe reticulation, designed to allow for the use of recycled water. For the most part, water pricing in Australia has been based on simply covering the costs of production. As more intricate pricing structures begin to develop, it may be important to implement meters that allow for remote measurement as well as peak/off-peak measurement. Best prospects also exist for: biofiltration systems, presses for conversion of water or sludge waste, new oxidation systems for the removal of chemicals from industrial wastewater, filtration equipment for industrial waste applications, and flow meters for wastewater measurement.

Source: SQW from various sources

3: The market for carbon abatement technologies, renewable energy and carbon finance in Australia

This section summarises the readily available evidence on the market for carbon abatement technologies (CATs), renewable energy and carbon financing in Australia. It describes the general growth in the sectors and its drivers and presents information on those segments within the sectors where there are significant opportunities.

Market growth and its drivers

- 3.1 Energy use in Australia has continued to increase over recent years, driven by a growing population and economic output. Total energy consumption is projected to rise by around 40 per cent to 2030. In terms of specific sectors, transport and manufacturing/construction are projected to remain the two dominant consumers of Australian energy.
- 3.2 Fossil fuel sources dominate the energy mix in Australia; they account for almost 95 per cent of primary energy consumption. In 2005-06, the breakdown was 35 per cent petroleum, 29 per cent black coal, 19 per cent natural gas, 12 per cent lignite (brown coal), and 5 per cent from renewable sources.
- 3.3 Australia generated approximately 150 Terawatt-hours (TWh) of electricity in 2005. Over recent years consumption has been growing at an increasing rate: 1.9 per cent (2002), 3.4 per cent (2003) and 5 per cent (2005). The main users of electricity are the residential, industrial/construction, and commercial sectors. The growth of the commercial and residential air conditioning load has been cited as a major reason for the surge in consumption patterns.

Market segments

- 3.4 The most active market segments currently and in the short to medium term are likely to be in advanced fossil technology, biofuels, wind and solar. Major investment has been made in furthering 'clean coal' technology and the development of carbon sequestration. Australia also has experience of carbon trading through a state-led scheme in New South Wales and plans are underway for a national emissions trading scheme to commence in 2010.

Carbon abatement technologies

OPPORTUNITIES IN CARBON ABATEMENT TECHNOLOGIES IN AUSTRALIA

Advanced generation technologies

Energy from fossil fuel sources plays, and will continue to play, a major role in the Australian energy mix. 95 per cent of Australia's energy currently comes from fossil fuels and the Australian Government Department of Resources, Energy and Tourism does not envisage a major shift away from this ratio in the foreseeable future.

Australia's huge reliance on coal for current and future energy has focused attention on reducing the environmental impact of producing energy from fossil fuels. For example, the A\$500 million (US\$410 million) Clean Coal Fund aims to provide industry with support to accelerate the development and deployment of clean coal technology. Leading the push towards developing clean coal technologies is the COAL21 partnership between federal and state governments, the coal and electricity industries and the research community. COAL21 works to develop a number of action plans for the demonstration and wide application in Australia of GHG emission reducing technologies. These include Integrated Gasification Combined Cycle (IGCC), Oxy-fuel Combustion, and Ultra Clean Coal.

In addition, the Australian Government is attempting to lead the way in research and development of new technologies, by providing funding opportunities for low emissions technologies through the A\$500 million (US\$410 million) Low Emissions Technology Demonstration Fund.

Carbon capture and storage

A number of large carbon storage (CCS) projects have been planned or have begun in Australia with individual project expenditures reaching up to A\$4 billion (US\$3.3 billion). Australia's most advanced CCS initiative, the Otway Project in Victoria, is due to commence injection of approximately 100,000 tonnes of CO₂ from a nearby gas well into a depleted gas field at a depth of 2km. The A\$40 million (US\$33 million) project includes a major program of monitoring and verification that is supported by 15 companies, seven government agencies, and researchers from Australia, New Zealand, Canada, Korea and the USA.

Demand for CCS is expected to continue to grow, and many other CCS projects are in the preliminary stages of development. Examples of these include the A\$4 billion (US\$3.3 billion) Kwinana Project that is hoping to store 4 MtCO₂/year by 2012; the Fairview feasibility study into post-combustion CCS from 2009 at a 100 MW power station; and the Queensland Government's ZeroGen project testing the feasibility of transporting by pipeline up to 400,000 tCO₂/year to be stored in the Denison Trough some 200km away.

Low carbon transport fuel

Biofuels are a growth area through large-scale bio-diesel and ethanol manufacturing. The Government target of 350 million litres by 2010 represents a large increase in production from the 60 million litres capacity in 2006. The most likely feedstock for the industry is sugar cane grown domestically.

Source: SQW from various sources

Renewable energy

- 3.5 A range of policy measures in Australia support the uptake and development of renewable energy. These measures include the Australian Government's Mandatory Renewable Energy Target (MRET) under which electricity retailers and other large buyers are required to purchase renewable energy certificates (RECs) from accredited renewable energy suppliers. This is designed to create a guaranteed market for renewable energy products. The Australian Government has recently joined the Asia-Pacific Partnership on Clean Development and Climate, in addition to announcing that the renewable energy target will be increased to 20 per cent by 2020. Further initiatives include; a Low Emissions Technology Demonstration Fund; a Solar Cities programme; and state governments have also introduced renewable energy targets and funding programmes to support technology development and demonstration.
- 3.6 The renewable energy sector is currently dominated by a handful of sources. Bagasse (a waste product from sugar refining) makes up 40 per cent of Australia's renewable energy output and a further 30 per cent is from wood and wood waste. Hydroelectricity accounts for 21 per cent, with the remainder arising from biofuels, solar and wind energy (Department of Resources Energy and Tourism, 2008).
- 3.7 Under policy measures enacted in 2007, renewable electricity generation is projected to grow by 2 per cent a year to 2030. Most of this increase is expected to be from wind, biogas and biomass (mainly bagasse and woodwaste). Growth in wind power is projected to occur at 4.6 per cent and biogas at 8.1 per cent annually over the next two decades. In contrast, hydroelectricity will only grow by around 0.9 per cent a year during the same period – mainly due to a lack of suitable locations for new large hydro capacity.
- 3.8 The use of biofuels as an alternative transport fuel is also a growing industry in Australia. In 2003 the production of ethanol and biodiesel for transport fuel was around 60 mega litres (ML) and the Australian Government has set a target of at least 350 mega litres (ML) of production by 2010. In addition, some State Governments are introducing ethanol-blend transport fuel mandates.

OPPORTUNITIES IN RENEWABLE ENERGY IN AUSTRALIA

Wind

In 2006, Australia had approximately 570 MW of installed capacity generating an estimated 1,800 gigawatt hours (GWh) of electricity annually. In total, around 30 wind farms exist, with the largest having a capacity of 91 MW through 55 turbines. AusWEA, the wind energy industry group, estimates that a further 5,800 MW of potential wind energy projects were either in the initial planning stages or seeking planning approval during 2006. It should be noted that a considerable proportion of these would take several years to be operational even if planning consent was given. Wind energy technology imports were estimated at A\$170 million (US\$140 million) and these were dominated by German and Danish firms.

There is also a market for small-scale wind turbines (less than 100kW) for incorporation into remote area power schemes. Wind turbines are typically used to offset the need for diesel generators in areas not supplied by the national grid.

Biomass

The most common biomass technology currently used in Australia is energy generated from bagasse (waste material from sugar cane). This is used to both provide energy for the sugar cane industry and electricity for the grid. Australia's estimated installed biomass capacity in 2006 was 340 MW.

Other biomass technologies in Australia include biogas harvesting from landfills and waste treatment plants, much of which is consumed locally to provide energy for surrounding industries. Conversion of waste products from the agricultural and forestry sectors into replacement products for coal and oil is another fast growing segment. Initiatives such as the Mandated Renewable Energy Target (MRET) and Green Power Accreditation Programme have already provided significant support for the development of renewable energy. Furthermore, the extended 20 per cent MRET target to 2020 should provide additional impetus, security and continuity to aid the development of new technologies. Biomass, solar and wind are expected to provide the largest of these opportunities.

Solar

Due to its high levels of solar exposure, the Australian climate is ideally suited to solar power. Cumulative installed photovoltaic (PV) electric power in 2006 was around 52 MW with 90 per cent being off-grid in remote area power schemes. An estimated 12,000 domestic residents in Australia have PV systems installed. Australia has a history of research in and manufacturing PV technologies. In 2006, 1,200 people were employed in the PV industry and this number is expected to grow to 6,000 by 2010. Imports of PV cells were estimated at A\$70 million (US\$57 million) in 2005.

In addition to PV technology, Australia has significant production of solar water heating (SWH) systems. In 2005, an estimated 61,000 SWH units were sold domestically, and 18,000 were exported. SWH accounted for 8 per cent of total water heater sales, valued at around A\$106 million (US\$87 million). A further A\$32 million (US\$26 million) was exported. In 2006, Australia accounted for 1.2 per cent of the global Solar Hot Water/Heating Capacity.

Source: SQW from various sources

Carbon finance

- 3.9 As Australia only recently ratified the Kyoto Protocol, it is yet to establish any official Joint Implementation projects. However, carbon finance in Australia has been developed under the New South Wales Greenhouse Gas Abatement Scheme (GGAS). Retailers and large electricity customers in New South Wales (and since 2005, in the Australian Capital Territory) are required to meet mandatory intensity targets to reduce (or offset) the emissions of GHG arising from the production of electricity they supply or use. They can meet their targets by purchasing certificates (New South Wales Greenhouse Abatement Certificates or NGACs). NGACs are generated through the following activities: low-emission generation of electricity and improved generator efficiency, activities that result in reduced consumption of electricity or on-site generation of electricity and carbon sequestration into biomass.
- 3.10 The Australian national government is also pursuing plans for a national emissions trading scheme that is currently expected to begin in 2010. The 2008-09 Australian budget set aside A\$69 million (US\$57 million) for such tasks. Carbon accounting, reporting and auditing services are increasingly in demand, with growing opportunities for businesses in these areas.

4: Policy and regulatory frameworks

This section describes the trade policy context, the extent to which environmental policies and regulation have become more demanding and the governance institutions responsible for trade, investment and environmental policy and regulation. Both national and state/territory governments are pursuing increasingly stringent environmental regulations. A major recent development has seen Australia ratify the Kyoto Protocol.

Australian governance and trade

Governance

- 4.1 Australia operates a federal system, whereby the Australian Government has relatively limited constitutional powers over energy and environmental policies. States and territories are responsible for addressing a range of climate change issues, such as: waste management strategies; planning and development of power plants; land use and transport planning; and vegetation management. The federal government does have ownership and responsibility for offshore energy resources, and would have a similar role with offshore storage of CO₂. It also takes a co-ordinating role in energy and environmental policy issues that transcend state boundaries, for example integration of the electricity and gas networks, promoting the uptake of renewable energy, and GHG abatement under the UNFCCC.
- 4.2 The Australian government's 2008–09 budget assigned A\$2.3 billion (US\$1.9 billion) to implement a range of climate change measures. These include the introduction of a domestic emissions trading scheme in 2010 (A\$68.8 million (US\$56.4 million) over five years), expansion of the renewable energy target (A\$15.5 million (US\$12.7 million) over five years) and the establishment of the Department of Climate Change (A\$21.8 million (US\$17.9 million) over four years).

Trade

- 4.3 Australia and the UK have an extensive trade and economic relationship. In 2006/07, the UK was ranked as Australia's fifth top import source and is considered a major two-way trade partner by the Australian Department of Foreign Affairs and Trade. Moreover, UK companies dominate EU direct investment in Australia at approximately 53 per cent.
- 4.4 British firms have traditionally held significant investments in Australia, setting up operations in the resources and energy sector (for example, Shell and Rio Tinto-Zinc), telecommunications (Vodafone and British Telecommunications) and food and beverages (Cadbury and Unilever). Australia is pushing to liberalise the environmental and energy services markets, for example, Australia is part of a 'plurilateral' request to the WTO General Agreement on Trade in Services, believing a liberalised environmental services market benefits both exporters and importers of these services.

Environmental Policy

- 4.5 The main driver for Australian energy-related environmental policy is GHG emissions and climate change. Australia ratified the UNFCCC in 1992 and the Kyoto Protocol in 2007. Prior to ratifying the Protocol, Australia did negotiate an emissions target of 108 per cent of 1990 levels to be achieved in the first Kyoto commitment period (2008–12). This commitment only requires a relatively small effort and the government remains committed to achieving the target.
- 4.6 The Australian Government has set out commitments to go 'beyond Kyoto' with a 20–30 year timeframe that directs Australia towards more substantial emission reductions in the longer term. The strategy calls for Australia to develop a competitive economy with a 'lower greenhouse gas signature' and the implementation of policies and programmes that assist adaptation to the consequences of climate change that are already unavoidable. The Australian Greenhouse Office co-ordinates domestic climate change policy and delivers most domestic climate change programmes, a number of which are set out in the table below.

NATIONAL ENVIRONMENTAL INITIATIVES AND REGULATIONS

Low Emissions Technology Demonstration Fund

The Australian Government has established a A\$500 million (US\$410 million) Low Emissions Technology Demonstration Fund. The aim is to support industry-led projects to demonstrate the commercial viability of new technologies or processes or the application of overseas technologies or processes to Australian circumstances to deliver long-term, large-scale GHG emissions reductions. The fund is technology neutral and will encompass renewable and fossil fuel supply technologies as well as energy efficiency, and can be for either stationary or transport energy projects. To be eligible for support under the fund, technologies will have to be commercially available by 2020–30 and able to reduce greenhouse gas emissions from the energy sector by at least 2 per cent per annum from 2030. The fund has been designed to leverage at least A\$1 billion (US\$0.8 billion) in private sector investment.

Greenhouse Challenge Plus Programme

The Australian Government's A\$31.6 million (US\$25.9 million) Greenhouse Challenge Plus Programme was announced in 2004. It builds upon the success of the original Greenhouse Challenge Programme to help companies reduce their emissions, integrate greenhouse issues into business decision making and accelerate the uptake of energy efficiency.

Greenhouse Challenge Plus has around 800 participants, representing almost 50 per cent of greenhouse gas emissions from industry. In particular, it has excellent coverage of companies in key sectors, including electricity supply, oil and gas, aluminium, cement, mining and manufacturing. Most member companies participate voluntarily, but since July 2006, companies that receive more than A\$3 million (US\$2.5 million) per year of business fuel credits have been required to join the programme.

Under Greenhouse Challenge Plus, businesses measure and monitor greenhouse gas emissions and deliver maximum practical greenhouse gas abatement by working towards specific milestones set out under individual agreements. The Australian Government provides administrative and technical support for the programme.

Mandated Renewable Energy Target (MRET)

The Renewable Energy Act (2000) established the MRET to facilitate the development of the renewable energy industry in Australia. MRET aimed to spur an additional 9,500 GWh of renewable electricity per year by 2010. The target of 9,500 represents an estimated 2 per cent of the energy required by Australia in 2010. The Programme creates renewable energy certificates (RECs) that can be traded between generators of renewable energy and generators of non-renewable energy. Non-renewable generators need to purchase sufficient RECs to meet their commitments (2 per cent of their non-renewable generation) each year.

To help ensure the Government achieves its goal of a 20 per cent share for renewable energy in Australia's electricity supply by 2020, the Government committed to increasing the MRET from 9,500 GWh to 45,000 GWh in 2020. The expanded measure is to be phased out between 2020 and 2030 as emissions trading matures and prices become sufficient to ensure that an MRET is no longer required to drive deployment of renewable generation technologies.

Renewable Energy Development Initiative

Under the Renewable Energy Development Initiative (REDI), the Australian Government committed to provide A\$100 million (US\$82 million) over seven years from 2004–05 to support the development of renewable energy technology products, processes and services that have strong early-stage commercialisation and greenhouse gas abatement potential.

The programme aims to support the international competitiveness of Australian industry by encouraging innovation through increasing the level of research and development, proof-of-concept and early-stage commercialisation activities undertaken by Australian companies. The assessment of project proposals commenced in August 2005.

Emissions Trading Scheme

The Australian Government has begun work to establish a national emissions trading scheme. A Green Paper is currently being prepared and consultations have already assisted this development. The Government's current timetable suggests the bill to be passed through parliament in 2009 for trading to commence in 2010.

Source: SQW and Department of the Environment and Heritage, Australian Greenhouse Office (2005) 'Australia's Fourth National Communication on Climate Change'

STATE AND TERRITORY INITIATIVES AND REGULATIONS

Queensland

The Queensland Government's 13 per cent Gas Scheme came into effect in January 2005. It is a major regulatory measure of the Queensland Government's Cleaner Energy Strategy and is designed to foster greater use of gas in the state by requiring electricity retailers and some other liable parties, such as self-generators and power stations selling electricity to end-users, to source at least 13 per cent of the electricity they sell or use in Queensland from gas fired generation.

In 2003, the Queensland Government committed A\$9 million (US\$7.4 million) over five years to the Centre for Low Emission Technology, in conjunction with the Commonwealth Science and Industrial Research Organisation, Australian Coal Research, industry partners and the University of Queensland. The Centre facilitates research, development and demonstration of the key technologies that have the potential to significantly improve the environmental performance of coal-fired power stations, by reducing greenhouse gas emissions to near zero levels. The Centre will also conduct research into the policy issues surrounding low emission coal technologies.

New South Wales

In 2003 the New South Wales (NSW) Government established a mandatory Greenhouse Gas Abatement Scheme (GGAS), which requires liable parties (electricity retailers and large electricity users choosing to participate) to meet mandatory annual targets for greenhouse emissions, or pay a financial penalty. Annual targets for the scheme are based on per capita greenhouse emissions in NSW. Electricity retailers can meet their benchmark through purchasing increased amounts of electricity from less emissions-intensive sources, reduced consumer demand and the purchase of carbon sinks to offset emissions.

After the European Emissions Trading Scheme (EU ETS), the NSW GGAS is the second largest greenhouse gas abatement market with about 20.2 million certificates exchanged through 2006 for a value estimated at US\$225.4 million. The 2006 market represented a 3.3 times increase over the volumes transacted in 2005 and about 3.8 times increase in the value for 2005 (World Bank, 2007).

Victoria

The Victorian Government's A\$106 million (US\$87 million) Energy Technology and Innovation Strategy (ETIS) was launched in May 2005. Developed to facilitate a co-ordinated approach to the advancement of low emissions energy technologies to commercial-ready stage, the ETIS supports the progression of new technologies through their innovation processes, particularly where a market gap has been identified. Current projects include: the large-scale demonstration of clean brown coal technology power plants; investment in research, development and early stage demonstration projects as a base for later commercialisation; a trial of geo-sequestration; and investment to support construction of a pre-commercial plant demonstrating a coal drying technology known as mechanical thermal expression.

Green Power Accreditation Programme

The National Green Power Accreditation Programme (Green Power) is offered through joint collaboration by participating state and territory government agencies in New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory. Green Power aims to facilitate the installation of new renewable energy generators across Australia, beyond mandatory renewable requirements.

Under the programme, customers can elect to pay a premium to their energy retailers for the supply of electricity generated from renewable sources (solar, wind, biomass, hydro and geothermal). Accredited energy suppliers then agree to buy an amount of energy from renewable sources equivalent to the amount nominated by participating consumers and businesses. The programme has similar objectives to MRET – to reduce greenhouse gas emissions from the electricity generation sector and drive investment in renewable energy projects – but whereas MRET is a mandatory (legislated) requirement, Green Power relies on consumers voluntarily paying a premium.

*Source: SQW and Department of the Environment and Heritage, Australian Greenhouse Office (2005)
'Australia's Fourth National Communication on Climate Change'*

Key institutions

KEY GOVERNMENT DEPARTMENTS AND AGENCIES INVOLVED IN TRADE, INVESTMENT AND THE ENVIRONMENT

The Department of Foreign Affairs and Trade (DFAT) provides foreign and trade policy advice to the Australian government. DFAT is the lead agency managing Australia's international presence, managing a network of 89 overseas posts in five continents with over 3,600 staff.

The Department of Climate Change was recently formed in December 2007, as part of the Prime Minister and Cabinet Portfolio. The Department will co-ordinate the Government's response to climate change including development of an Emissions Trading Scheme and increased initial activity following the ratification of the Kyoto Protocol and participation in ongoing international climate change negotiations.

The Australian Government Department of the Environment, Water, Heritage and the Arts (formerly the Department of the Environment and Water Resources) develops and implements national policy, programmes and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture. The department advises the Australian Government on its policies for protecting the environment and water resources and administers environment and heritage laws. Within the department sits the Australian Greenhouse Office which has led much of the country's past monitoring of GHG emissions.

The Department of Innovation, Industry, Science and Research's key priority is to encourage the sustainable growth of Australian industries by developing a national innovation system that drives knowledge creation, cutting edge science and research, international competitiveness and greater productivity. The Department is committed to developing policies and delivering programs, in partnership with stakeholders, to provide lasting economic benefits ensuring Australia's competitive future.

The Council of Australian Governments (COAG) is an intergovernmental forum in Australia, comprising the Prime Minister, State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association. COAG includes a number of important ministerial councils relating to the environment. These include the Ministerial Council on Energy, the Ministerial Council on Natural Resource Management, and the Environmental Protection and Heritage Council.

Source: SQW Consulting

Annex A: Definitions of environmental goods and services, renewable energy, carbon finance and CATs

A.1 The Defra/BERR Environmental Industries Unit has defined the individual EGS sectors as follows:

TABLE A-1: CONSTITUENT SUB-SECTORS OF THE ENVIRONMENTAL GOODS AND SERVICES SECTOR

Sub-sector	Description	Examples of types of activity
Air Pollution Control	Defined as products, systems and services for the prevention, reduction and removal of gaseous and particulate pollutants from air	External and internal emissions and odour control, filters and catalytic converters
Decommissioning/Decontamination of Nuclear sites	Defined as products, systems and services required for the decommissioning of existing nuclear liability sites and structures	Consultancy, decontamination, recycling and compaction technologies, waste collection and containment
Environmental Consultancy	Defined as services to provide assessment and advice relating to environmental issues	Environmental audits, environmental impact assessment, corporate environmental responsibility
Environmental Monitoring, Instrumentation and Analysis	Defined as products, systems and services for energy management and energy efficiency	Energy consultancy/audits, building energy management systems, energy efficient products and efficiency advice
Marine Pollution Control	Defined as products, systems and services for controlling, clean up and minimising marine pollution	Products such as oil absorbents and booms and services such as marine pollution preventing techniques
Noise & Vibration Control	Defined as products, systems and services for monitoring and reducing noise and vibration	Noise meters, monitoring systems, acoustic buffers, enclosures and barriers and silencers
Recovery and Recycling	Defined as products, systems and services for waste segregation, recovery and recycling	Paper, organics, metals, plastics, glass, demolition and construction wastes, vehicles and white goods
Waste Management	Defined as products, systems and services for the minimisation, collection, treatment (not recycling) and disposal of waste	Advice on waste minimisation, landfill, mechanical and biological treatment, regulatory advice and technologies such as specialised containment, shredders, compactors and waste management vehicles
Water Supply and Wastewater Treatment	Defined as products, systems and services for the management of the fresh water environment, provision, treatment, distribution and storage of clean water and wastewater for industrial and domestic users	Resource development, demand management, manufacture of wastewater treatment equipment, design, construction, installation and operation of water and wastewater treatment facilities

Source: DEFRA, *Sustainable Consumption and Production – Development of an Evidence Base: Annex 1, UK Government Definitions of the Environmental Goods and Services Sector (Draft Review September 2006)*

A.2 Definitions for the individual CATs sectors are available from different sources including BERR's Strategy for CATs (2005), certain trade associations and prominent market leaders.

TABLE A-2: CONSTITUENT SUB-SECTORS OF THE CARBON ABATEMENT TECHNOLOGIES SECTOR

Sub-sector	Description	Examples of types of activity
Carbon Capture & Storage (CCS)	Defined as a multi-stage process where carbon from power generation is captured either before or after combustion and transported to a long-term storage in geological formations. This approach can reduce emissions by up to 85 per cent depending on the type of non-capture plant displaced	The entire supply chain for CCS technologies from R&D to demonstration and deployment. This includes manufacturing, as well as engineering and financial/business consulting services across the three main stages: <ul style="list-style-type: none"> • Carbon capture at plant • Transportation to a storage • Storage in a geological formation
Generation technologies that provide higher conversion efficiency	Defined as higher efficiency conversion processes, where the amount of fuel consumed and the associated emission of CO ₂ are reduced and the conversion processes are made more efficient (eg emission reductions of 10-30 per cent are possible depending on the performance of the old and replacement plant. Even higher levels can be attained by adding co-firing with biomass (typically a 5-10 per cent mix)	The entire supply chain for renewable technologies from R&D to demonstration and deployment. This includes manufacturing, as well as engineering and financial/business consulting services. Main technologies are: <ul style="list-style-type: none"> • Supercritical boilers • Integrated Gasification Combined Cycle (coal) • Combined Cycle Gas Turbine (gas)
Substitution to low carbon transport fuels	Defined as fuels used for transport based on the fermentation and distillation of replenishable organic matter, such as agricultural crops (eg sugar cane or beet, rapeseed) or woody material. Commonly known as biofuels, the main commercial varieties are bioethanol and biodiesel, where the former can be used as the main fuel and the latter is typically mixed with standard diesel in different proportions. Currently, there are second and third generation biofuels	Production of crops and other organic matter to be converted into fuel. The design of technology and equipment for producing biofuels. The production of different types of low-carbon fuels including bioethanol and biodiesel
Asset Management	Defined as planning, procurement and maintenance of energy generation facilities	Business planning, condition assessment, data gathering, technical maintenance

Source: BERR, British Biogen, Energy Asset Management plc

A.3 Renewable energy is defined broadly in all sources consulted and a generic definition is as follows:

TABLE A-3: RENEWABLE ENERGY

Sub-sector	Description	Examples of types of activity
Renewable energy	Defined as energy technologies that use natural resources such as sunlight, wind, flowing water, tides and waves, biomass and geothermal heat. The availability of these resources is either unaffected by energy capacity installed (eg solar and wind energy) or can be replenished in the short-term (eg hydro and biomass)	The entire supply chain for renewable technologies from R&D to demonstration and deployment. This includes manufacturing, as well as engineering and financial/business consulting services. Main technologies are: <ul style="list-style-type: none"> • Wind (onshore and offshore) • Solar (thermal and electric) • Hydro (smaller scale) • Biomass (heat and power) • Geothermal • Marine (wave and tidal)

Source: various sources

A.4 Carbon Finance is also a term which is not standardised across the literature and a definition reflecting the content attributed to it by several sources is as follows.

TABLE A-4: CARBON FINANCE

Sub-sector	Description	Examples of types of activity
Carbon finance	Defines as the investments in greenhouse gas emission reduction projects, the creation (origination) of tradable commodities on the 'carbon market', and the provision of financial and business services associated with all of the above	Trade in carbon commodities and derivatives on different markets and exchanges, such as CERs, EAUs, VERs and others CDM and JI project assessment, registration, finance and development

Source: various sources

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