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The AUSTRALIAN PRIVATE EQUITY & VENTURE CAPITAL ASSOCIATION Limited

CLEANTECH PE & VC

— September 2009

Long-term drivers of cleantech investment.

At least 20% of the country's electricity supply is targeted to be generated from renewable sources by 2020. The Government's Mandatory Renewable Energy Target (MRET) and the proposed Carbon Pollution Reduction Scheme (CPRS) are expected to be key long-term drivers of cleantech investment. Investors are also increasingly demanding environmentally-sustainable investment options.

Environmental world's firsts.

Many of the current clean technologies in use today were initially developed by Australian researchers. These include multiple advances in solar photovoltaic cell technology, evacuated glazing, solar thermal technologies, and water filtration.

Australian-grown clean-tech with global impact.

Australian-grown companies such as Solahart, Memcor (previously Memtec), Geodynamics, Ausra and Pacific Hydro are globally recognised for their clean technologies. Increased investment in cleantech R&D by the Government and local universities in recent years augurs well for further cleantech breakthroughs in the coming years.

Cleantech financing gap.

There is a significant financing gap between innovation and commercialisation, particularly at the pre-seed and seed stages. Most VC funds are fully invested and there are only a handful of cleantech-dedicated funds. In addition, there are limited funds available for investment in cleantech demonstration projects.

[1] Ernst & Young, *20-20 vision: Investment challenges and opportunities arising from Australia's 20% renewable energy target*, Nov 2008.

[2] Energy Supply Association of Australia, *The impact of an ETS on the energy supply industry*, Jul 2008.

What is cleantech?

Cleantech, or clean technologies, aim to generate competitive returns for investors and customers whilst simultaneously addressing environmental concerns. These technologies include the following segments: energy (renewables, storage, infrastructure, efficiency), water (treatment and conservation), air and environment (pollution reduction, emissions control, trading & offsets), recycling and waste treatment, and advanced materials (including nanotechnologies).

Long-term drivers

The combination of factors above have led in recent years to the most substantive public policy engagement seen to date in this sector. Today, renewables only represent 5.9% of Australia's total energy supply. To achieve this, it is estimated that more than half of all new electricity generation capacity installed in Australia will need to be renewable.[1] This implies an average investment of $2.3b a year in the renewable energy sector to 2020.[2]

[3] UNPRI

[4] Australian Bureau of Energy and Resource Economics, *Energy in Australia 2008*.

[5] Ernst and Young, *20-20 Vision: Investment challenges and opportunities arising from Australia's 20% energy target*, Nov 2008.

In May 2009, the Australian Government announced that it will invest $4.5b under its Clean Energy Initiative to support clean technologies. Of this amount, $3.5b is new funding to be directed to various programmes including large-scale integrated carbon capture and storage projects, and a solar flagships programme.

Institutional investors are also emerging as a key driver of demand for investments that actively consider ESG (environmental, social, governance) issues. Australian institutions, in particular, are at the forefront of rising demand for such investments. Among the 576 signatories to the United Nations' Principles of Responsible Investment, Australia has 86 signatories, behind only the US with 89 signatories. In addition, of the 184 signatories in the "asset owner" category (denoting major institutional investors such as pension funds) Australia accounts for the highest number in the world with 28 signatories, compared to 11 for the US.[3]

At the same time, investors are recognising that cleantech investments can provide portfolio diversification benefits, and act as a hedge against the potential effects of stricter environmental and emission standards/ regulations on other parts of their portfolios.

These factors have resulted in a sharp acceleration in demand for commercialisable clean technologies in recent years. Growth in cleantech investment has been robust, even despite the sharp reduction in global liquidity in 2007–09. Cleantech now accounts for nearly 4% of global PE and VC deal values compared to only 0.4% in 2007 (Figure 1).

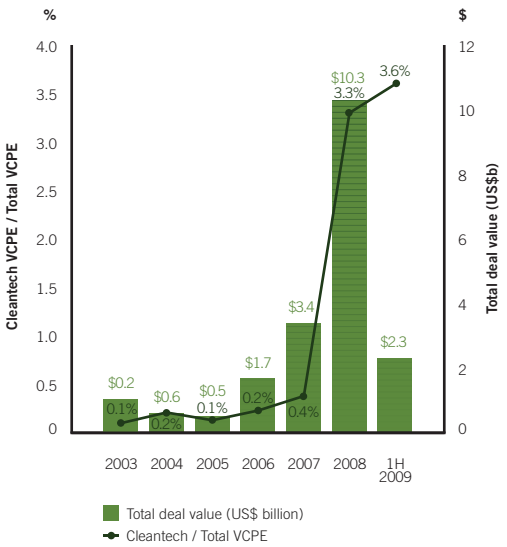
The Australian value proposition

The need to address climate change and to adapt to the nation's inherent environmental challenges has always been central to Australia's economic future. It is the world's driest inhabited continent and the 9th largest consumer of energy per capita, with this consumption projected to grow 1.6% p.a. on average until 2030.[4]

At the same time, Australia also has exceptional strengths in its favour. Its renewable energy industries are diverse. The southern states and Western Australia have excellent wind resources that are still yet to be fully exploited. Energy contained within the Cooper Basin's largely untapped geothermal resource is estimated at over 70 times Australia's entire current annual electricity demand.[5] Australia has an abundant supply of sunlight that can be harnessed into solar power.

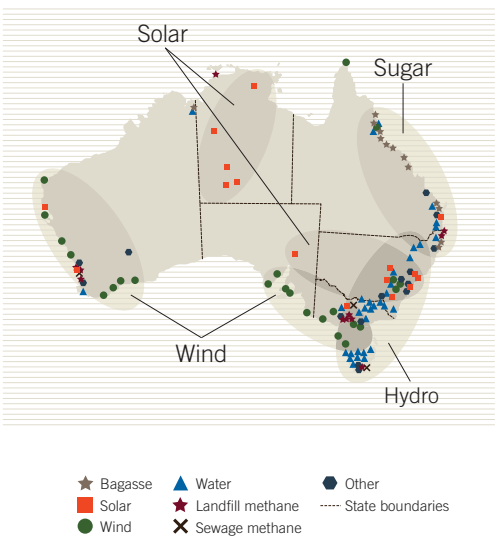
Most of these resources are still relatively untapped. Further improvements in the transmission infrastructure, and regulatory and planning framework, should see renewable energy – and other areas of cleantech investment – becoming one of the most significant economic opportunities of the current age.

Figure 1: Global cleantech VC deals
Source: ZEPHYR published by BvDEP



Note: Based on announced deals.

Figure 2: Accredited renewable energy sources
Source: Office of the Renewable Energy Regulator



Australia invents it…

Australia has consistently produced world-class innovations in cleantech, and continues to devote significant research resources to this sector (see Figure 3).

Many of the cleantech innovations used today were Australian-grown. For instance:

— Scientists at the University of New South Wales have been responsible for major advances in photovoltaics since the mid-1980s, such as the development of the buried contact solar cell and thin-film Cystalline Silicon On Glass technology.
— CSIRO technology developed in the 1950s – 60s laid the groundwork for commercialised packaged solar heating systems being offered by local manufacturers in Australia by the 1970s.
— Large area evacuated glazing and solar thermal Compact Linear Fresnel Reflector (CLFR) technologies were first developed at the University of Sydney.

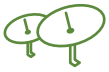
Many successful clean technologies initially developed in Australia have been eventually refined, licensed or sold globally. Australian-grown cleantech companies include US-based solar thermal power producer Ausra, water filtration company Memcor (formerly Memtec, now owned by Siemens Water Technologies), world-leading manufacturer of solar hot water systems Solahart, Melbourne-based solid oxide fuel cell developer Ceramic Fuel Cells, wave energy developer Oceanlinx, and geothermal technology developer Geodynamics.

Figure 3: The cleantech pipeline in Australia

The 140MW Woolnorth wind farm is the largest in the southern hemisphere.

Cooper Basin's geothermal potential estimated able to meet Australia's electricity demand for >100 years.

Est. 40% of CSIRO's budget directed to cleantech & advanced materials. Nine Cooperative Research Centres focus on cleantech. 2009: Government launches a $100m Australian Solar Institute project.



UNSW's PV research team among world leaders in silicon wafer cell technology since mid-80s, and holds several current efficiency records. Spinoffs include Pacific Solar, CSG Solar and BP Solar.

Thermosyphon technology first developed by CSIRO in 1953. Now Solarhart, Beasley, Rheem, etc have exported markets. Evacuated tubes technology orginally developed at University of Technology Sydney.

ANU "Big Dish" is world's biggest dish solar concentrator.

SUPPLY	COMMERCIALISATION	DEMAND
NATURAL ADVANTAGES	EXPERIENCED AUSTRALIAN VCs WITH A FOCUS ON THE CLEANTECH SECTOR	**CLEANTECH DRIVERS**
• Excellent wind resources in southern and western AU states.		• Australia's climate and high energy consumption levels give it a national imperative to seek sustainable solutions to these challenges.
• Among the best hot dry rock resources in the world.		• The Government's proposed Carbon Pollution Reduction Scheme and Renewable Energy Targets imply an average investment of $2.3b p.a. in renewable energy, from now to 2020.
• Abundant solar supply.		• Increased opportunities for VC investors in projects from numerous federal and state funded programmes.
• Excellent wave and tide resources near population centres.		• The Government's $4.5b Clean Energy Initiative announced in May 2009. This includes $3.5b in new funding, of which $2b is earmarked for large-scale carbon capture and storage projects, and $1.3b is to be invested in a Solar Flagships programme.
• Many sugar mills in QLD use cane waste → biomass resource.		• Strong demand by institutional investors for environmentally and socially responsible investments. Australia has the second highest number of UNPRI signatories in the world after the US.
INNOVATION PIPELINE	COMMERCIALISATION SUPPORT BY GOVERNMENT	
• Heavy government investment in cleantech R&D.	• $75m Climate Ready program.	
• Photovoltaics (PV) technologies developed in Australia have formed the technological basis for current cleantech powerhouses e.g. Suntech Power, one of the largest PV cell manufacturers in the world.	• $200m Innovation Investment Fund Round 3, and $83m Innovation Investment Follow-on Fund for VC in general.	
• World's first undergraduate PV & Renewable Energy Engineering programs introduced in Australia in early 2000s.		
• Domestic solar water heaters.		
• Other solar thermal.		
• Large area evacuated glazing first produced by the University of Sydney.		
• Geothermal research Geosciences Aust., UNSW, ANU.		
• Oceanlinx wave technology named among the International Academy of Science's 10 most outstanding technologies in the world for 2006.		

[6] This includes IFM Renewable Energy's $691m acquisition of Pacific Hydro in 2005.

[7] Figures for 2008.
Source: ZEPHYR published by BvDEP, AVCAL analysis.

Bridging the cleantech financing gap

Globally, clean technologies are becoming a significant part of the venture capital investment world. They are now the third largest investment class for venture capitalists in the US.

Over 2001–08, it is estimated that around $1b has been invested by PE and VC funds in Australian clean energy companies (Figure 4).[6] Investor appetite for cleantech has increased significantly as well, as shown by the steady increase in capital raising in this sector on the ASX (Figure 5).

Figure 4: Australian VC and PE investment in clean energy companies
Source: New Energy Finance

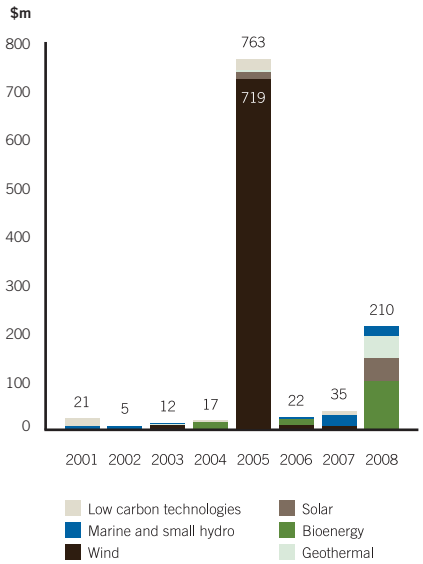
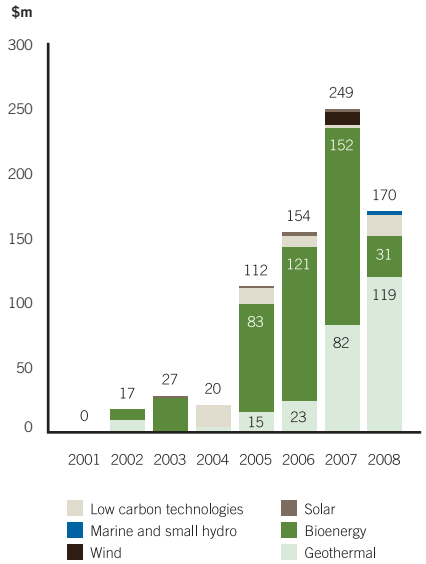


Figure 5: Capital raised by clean energy companies on the ASX
Source: New Energy Finance



Note: Total values include estimates for undisclosed deals.

The future is green

Investors currently have the opportunity to enter a still-nascent market. In Australia, PE and VC funds account for an estimated 3% of the number and 17% of the value of all cleantech deals with domestic targets.[7] This share is still much lower than in the US (41% of total cleantech M&A deal numbers and 55% of total cleantech M&A deal value) and the UK (22% and 37% respectively).

Australia's well-developed capital market, world-class research capacity and climatic conditions make it well positioned to capitalise on the economic opportunities afforded by the impending significant increase in cleantech demand. Importantly, the presence of stable and long-term drivers of cleantech demand suggests good exit opportunities for investors.