



Australian Innovation: Towards a

sustainable

future

people • planet • profit

Entrepreneurs and innovators who dare to be different

Contents

Partners acknowledgement	6
Advisory committee	7
Introduction	8
COMMENTARY: Mike Hawker – Inspiring future generations	10

The business of the environment

	chapter 1	The NSW Department of Environment and Conservation The Sustainability Advantage	16
		Part 1 The emerging carbon market – a new economy	18
		Offset thyself – smart solutions using carbon credits	19
		Creating credit – a new environmental market	20
		Part 2 Sustainable energy – finding alternative fuels	22
		COMMENTARY: Ric Brazzale – Energy efficiency and clean energy technologies	23
		A whole lot of wind – developing hydrogen-assisted diesel generators	25
		BHP Billiton A sustainable balance	26
		ActewAGL From renewable energy to recycling	30
		From farms to fuel – kitchen table experiments to biodiesel plants	32
		Australian Paper Renewable energy powers paper production	34
		More than a mallee tree – producing energy, activated carbon and eucalyptus oil	36
		Let there be light – a breakthrough in solar energy	38
		Transforming energy with clean coal – finding solutions with a collaborative forum	40
		Harnessing bright ideas – turning plastics into fuel	42
		Part 3 Waste – a valuable resource	44
		Rocky road – creating termite protection from waste rocks	45
		Closing the loop – how a sales gimmick led to innovation	46
		Second life – finding new life for old parts	48
		Never give up – tyre recycling goes global	50
	The right partnerships – using waste as an alternative fuel source	52	
	Waste not, want not – finding smart, adaptable solutions for a whole lot of rubbish	54	
	Part 4 Water – vital for our future	56	
	COMMENTARY: Paul Perkins – Every drop counts	57	
	Innovation in institutions and policy – the National Water Initiative	59	
	Efficiency in irrigation – scientific discoveries taken overseas	60	
	Improving water management – an inexpensive rainwater diversion	61	
	Sustainable water usage – reducing reliance on potable water	61	
	Land re-hydration – one man's crusade to save Australia's rural landscape	62	
	A fishway that catches European carp – restoring environment flows of rivers	64	
	Worms and insects purify water – innovation in waste water treatment	66	
	COMMENTARY: The Natural Edge Project – Biomimetic innovations	68	

Supply chain, product stewardship and design

	chapter 2	COMMENTARY: John Gertsakis – Design in sustainability	72
		BHP Billiton In good supply	74
		Every step of the way – stewardship beyond the gate	76
		BHP Billiton Responsible diamond and gold jewellery supply chain	77
		CHEP Lean and green	78
		PACIA A vital industry partnership	80
		The Vinyl Council of Australia and PACIA Wrapped in plastic	82
		Behind the veil – the challenges of mapping a supply chain	84
		Cadbury Schweppes Responsible packaging	86
		Painting the town green – environmentally friendly paint	88
		A new cut of the cloth – developing sustainable fabrics	89

12

Social change and sustainable communities

90

	chapter 3	COMMENTARY: Sean Rooney – Sustainability and innovation	92
		This wide brown land – creating a sustainable rural sector	94
		Hope for young people – innovative ways to tackle petrol sniffing	96
		From banking to biodiesel – a unique model to boost regional communities	98
		More than bush tucker – from Central Australia to supermarket trolley	100
		Shape shifters – coping with the pressures of seachange	102
		Forestry Tasmania If you go into the woods today	104
		COMMENTARY: Peter Newton – Sustainable urban systems	106
		Creating urban communities – turning a blank canvas into a thriving suburb	108
		How green is my valley – creating an entire sustainable community	110
		COMMENTARY: Peter Szentel – Sustainable building and design	112
	Investa Property Group More than bricks and mortar	114	
	Making what's old new again – one of the greenest buildings in Australia	116	
	A civic example – new ways of thinking create this benchmark building	117	

Social entrepreneurship and community partnerships

118

	chapter 4	COMMENTARY: Michael Traill – Social entrepreneurship in action	120
		BHP Billiton Working with the community	122
		ANZ Improving financial literacy	124
		Telstra All about access	126
		A model social enterprise – creating jobs and a revenue stream from waste	128
		Innovative partnerships – developing enterprise among indigenous communities	130
		A collaborative partnership model Fighting HIV together	131
		HBOS Australia Community commitment	132

Financing a better world

134

	chapter 5	COMMENTARY: Rod Lester – Alleviating poverty through micro-insurance	136
		A matter of ethics – ethical investment decision drive this fund	138
		Sustainable investing – a new approach to investment	140
		COMMENTARY: Mark Mills – Using capital investment to change the world	142
		How do you rate? – indexes and ratings	144
		COMMENTARY: Linda Funnell-Milner – Global Reporting Initiative	146

The final word

148

COMMENTARY: Paul Gilding – The business of sustainability	149
Conclusion	151
Partners contact details	152
A-Z company directory	154
Reports and websites	157
About the author: Valerie Khoo	158
About the publisher: CL Creations	158
About www.sustained.com.au	159

Introduction

The pursuit of sustainability is synonymous with opportunity: the opportunity to explore areas of new business, to commercialise technologies, and make a difference to the world.

Sustainability is an area that now has a firm place in corporate vernacular, yet it is a term that still lacks a universal definition.

For some companies, sustainability is an essential and key part of their core business, while others relegate it to an add-on section of their annual report, almost as an afterthought.

Sustainability is still an emerging and evolving area of business, but one that is being taken seriously by corporate heavyweights who realise that to ignore it would be: at best, foolish; at worst, disastrous.

As we began exploring leaders in sustainability in Australia it became apparent that there are subtle differences in the definition of sustainability. Some view sustainability purely as an environmental imperative – an approach to tackle issues such as climate change, depletion of non-renewable resources and the destruction of the planet.

While the sustainability movement undoubtedly has its roots in the environment, it now encompasses wider parameters. Today sustainability incorporates issues such as the vibrancy and longevity of communities and cities; more efficient use of resources – whether they be buildings, water or waste; and the economic empowerment of individuals, particularly those in poverty.

The common element in successful sustainability initiatives has been the innovation required to make them work. This innovation has spanned the gamut from scientific breakthroughs in sustainable technologies to effective new ways of approaching age-old problems.

The innovation in sustainability showcased in this book is commercial, scalable and, ultimately, good for the world. Profits – and yes, there are profits – and sustainability not only co-exist – they are a direct result of business decisions that focus on sustainable goals.

Entire businesses are based on reducing greenhouse gases, improving the quality of life of generations to come and – dare we say it – making the world a better place.

While many of the visionaries of leading sustainability companies have often started with environmental or societal aims, they have been quick to recognise the micro- and macro-economic benefits of sustainability.

Those most successful have integrated these three drivers into a holistic approach to business. This has not been limited to the big-end of town or major corporations who can afford to appoint sustainability managers – indeed entire departments – to promote the cause. Companies like IAG and Westpac have been championed as leaders in sustainability. However, there are also numerous small private equity companies who are making their mark with sustainable initiatives – some of which may have a greater impact than their larger corporate counterparts. Small outfits such as Close the Loop and Biolytix began as one person with a bright idea and are now fulfilling global contracts.

The goal of sustainability can be pursued at all levels, regardless of a company's size. What is required is a vision, a determined quest to succeed, a driving passion that will overcome ups, downs, regulatory minefields and other prohibitive factors.

For the journey of sustainability isn't easy. And, as many organisations and people in this book will testify, a supportive regulatory framework is important. Those that lead should not be competitively disadvantaged for paving the way.

The pursuit of sustainability is about a better world. It's also about good business. This book aims to showcase companies, initiatives and people who realise the two can go hand in hand.

Ultimately, this book is also about people – the visionaries who turned 'Eureka' moments into global applications, the failures that preceded success, the struggle to turn ideas into commercial reality.

It features stories about the search for like-minded collaborators and investors, overcoming obstacles and challenges, and the very human epiphanies that drive our belief that we can change the world. ■



COMMENTARY

MIKE HAWKER



Inspiring future generations

There is one central consideration for fully understanding why business must engage in sustainability. Simply put, no business will survive unless it takes into consideration the community in which it operates, delivers consistent value to customers, maintains the highest standards of governance and ethics, and mitigates its overall impact on the environment.

For this reason, my view of sustainability is that it is not in addition, or peripheral, to the way we do business. It is fundamental to it.

Being sustainable is about being a well managed company. Our purpose and values are at the core of who we are, how we operate and build relationships. It is the quality of these relationships that will distinguish us in the long term.

It is important to remember that the prime drivers of sustainability have been the demands and high standards set by the community itself. We should never forget the public outrage directed at destructive polluters and the vocal protests against banks that withdrew services in the mid 1990s. These campaigns were powerful reminders that boards and senior managers of companies must never lose touch with the people who are their customers, employees and shareholders and who, combined, give any company its licence to operate.

It has been interesting to follow the transition of corporate sustainability thinking and practices in Australia over the last decade. Much of this began as well meaning philanthropy but some of the spend by corporations lacked clear accountability to shareholders. My view is that it is impossible to get the sustainability equation wrong if all the actions undertaken in the name of sustainability are central to the core purpose of the business. In IAG's case, our focus is on reducing risk in society, which in simple terms reduces risk to ourselves as an insurer. For example, by assisting society to reduce the risk of young people getting into crime, not only are we helping to make those communities

safer and more productive places to live, but we are directly reducing the cost to our company in claims for household break-ins and car thefts.

My sense is that Australia is increasingly a world leader in corporate sustainability. We still have some way to go in relation to our efforts to reduce carbon dioxide emissions and combating the devastating effects of climate change. In 2006, six leading corporations along with the Australian Conservation Foundation formed the Australian Business Roundtable on Climate Change which advocates that achieving a 60% reduction in greenhouse gas emissions from year 2000 levels by 2050 is possible while maintaining strong economic growth.

I commend the individuals and companies who have contributed to *Australian Innovations: Towards a Sustainable Future*. In putting together this important book, the authors have documented for posterity vital work across a broad range of industries. I hope this will inspire future generations of Australian business and community leaders.

Michael Hawker has more than 18 years experience in the financial services industry. Before joining Insurance Australia Group Limited as Chief Executive Officer in 2001, Michael was Group Executive, Business and Consumer Banking at Westpac Banking Corporation. Previous positions include Executive Director of Citibank International PLC in Europe and Deputy Managing Director of Citibank Limited in Australia.

Michael was listed by *Euromoney* as one of the Top 50 Bankers under 40 and, in 2000, he was awarded the *Australian Banking & Finance Magazine* – Millennium Banker of the Year Award.
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1 The business of the environment



The effects of climate change are bringing our contribution to greenhouse gases to the fore. Tsunamis, hurricanes and freak weather patterns are no longer one-off incidences. They are affecting business operations and, much worse, causing human tragedy around the world. In the last five years alone water has gone from being considered an abundant resource to a critical factor in the sustainability of our cities and communities.

The majority of sustainable innovations focus on the environment. This chapter explores innovations designed to tackle climate change, ranging from smart approaches to renewable energy and clean coal technology, to pioneering strategies in carbon trading.

It discusses innovation in the area of water and looks at a paradigm shift in the way we view waste. Exciting Australian innovations are diverting tonnes of waste from landfill, turning unwanted rubbish into a valuable resource, and creating new markets for these commodities. >>

» Climate change

Famously described by Al Gore former Vice President of the United States as "An Inconvenient Truth", climate change is now on the agenda of companies who understand it's not just about tackling global warming for the benefit of the planet; it's also an essential part of cost analysis and smart risk management.

Climate change is no longer a faraway concept that will impact the world long after we are gone. We are already seeing its affects. Temperatures are reaching record highs, ice in the Arctic and Antarctic regions is melting and mountain peaks once capped with snow are now patchy areas of dirt with the occasional speck of white.

Somehow, when we weren't looking – or when we were too busy burning the fossil fuels that have contributed to this phenomenon – the climate changed. And its effects are being felt by this generation.

In the past some scientists, if they even acknowledged the phenomenon at all, doubted the idea that climate change could be the result of human behaviour. However, now most scientists agree that climate change has largely occurred as a result of our contribution to greenhouses gases – through the burning of fossil fuels such as coal, driving our cars, flying planes, and clearing land.

It's been going on for generations. But now, as the world's economies accelerate, so does this activity. We fly more, drive more and require more power plants – to do more.

What are greenhouse gases?

Greenhouses gases include carbon, methane, nitrous oxide, ozone in the lower atmosphere, and chlorofluorocarbons (CFCs). According to CSIRO: "Atmospheric trace gases that keep the Earth's surface warm are known as greenhouse gases. About three-quarters of the natural greenhouse effect is due to water vapour. The next most significant greenhouse gas is carbon dioxide."

According to the Australian Greenhouse Office's publication *Climate Change: Questions Answered*, the burning of fossil fuels by humans adds about 6.5 billion tonnes of carbon each year in the form of carbon dioxide, while land clearing, reduced soil humus and the erosion of topsoil account for one to two billion tonnes of carbon a year.

How long do greenhouse gases last in the atmosphere?

According to CSIRO: "Carbon dioxide persists for more than a century in the air. Methane's average lifetime is about 11 years. Nitrous oxide and some of the CFCs stay in the air for more than a century."

Now is the time

It's impossible to turn back the clock. And reducing the speed of "progress" – particularly in rapidly developing countries like China and India – can be difficult when its momentum is already pushing forward at such a hurried pace.

Although Australia is a relatively small contributor to greenhouses gases in proportion to the whole world, we are the highest per capita polluter.

Addressing climate change means a multi-pronged approach involving improved energy efficiency; switching to less carbon intensive fuels; using renewable energy; considering nuclear power; planting trees for biological sinks; and carbon dioxide capture and storage.

This section features Australian innovations in some of these areas, focusing on sustainable fuels and energy, clean coal technology and innovative approaches to capturing opportunities in the emerging carbon market.

The formation of the Australian Business Roundtable on Climate Change means the issue has been tabled by the big end of town. Represented by BP Australia, IAG, Origin Energy, Swiss Re, Visy Industries and Westpac, the Roundtable commissioned a report by CSIRO and Allen Consulting Group, *The Business Case of Early Action*. It was released in April 2006.

The key concept here is that it is a business case. Climate change has moved from the realms of "greenies" and environmental activists. The report's joint CEO statement says: "As business leaders representing a cross-section of the Australian economy, we believe that climate change is a major business risk and we need to act now."

Opportunities and investment

Similar forums have developed in specific industries. The Investor Group on Climate Change, comprising a range of Australian and New Zealand investors such as superannuation funds, insurance companies and other financial services providers, firmly acknowledges the risks and opportunities associated by climate change. While there are clear risks, not least dealing with the aftermath of freak storms or floods, there are also opportunities such as the chance to invest in renewable energy and sustainable technologies.

In some cases the solutions featured in this section are extraordinarily complex; for example, the scientific breakthrough with SLIVER solar cells. Whereas in other areas, answers are incredibly simple but effective concepts, such as the work being done by CO2 Australia and Carbon Planet.

Climate change is on our doorstep. But, as these organisations prove, so are some of the answers. ■

Picture courtesy: Invest Australia; Arthur Mostead (photography).

THE SUSTAINABILITY ADVANTAGE

Sustainability Advantage is a new program developed by the NSW Department of Environment and Conservation (DEC) to assist businesses in managing risk and realise economic and environmental benefits. By David Trewin

In the past government and business have predominantly worked together on environmental issues relating to 'environmental responsibility' (compliance with environmental law) and 'resource efficiency'. The NSW DEC has a strong record in using regulation, market mechanisms (such as the Hunter River Salinity Trading Scheme), policy and science, funding and education to lift business capacity in these areas.

The Industry Partnership Program (IPP) is a good example. Between 2002 and 2005 the DEC worked with more than 400 companies to implement cleaner production or resource efficiency initiatives. Matched funding was provided to 45 partnership projects that delivered annual environmental and financial savings totalling 35,500MWh of electricity and 18,000 gigajoules of gas (37,000 tonnes of CO₂), 311Ml of water and over AS11 million in annual financial savings.

The IPP involved a diverse range of industry sectors including galvanisers, metals manufacturers, food processors, boating and marina facilities, poultry producers, the textile industry, and the construction industry. The achievements of individual companies and clusters are profiled in case studies on the DEC's website.

Sustainability Advantage has been greeted with enthusiasm by business, who see value in its flexibility and the holistic approach it takes to sustainability.

As a step beyond compliance, cleaner production has proven itself to be a catalyst for further sustainability work. Many of the companies involved with the IPP reaped considerable financial benefit and have been asking the DEC, "What's next?"

As the interest in business sustainability grows, other companies have been seeking assistance to begin or hasten their sustainability journey, prioritise and pull together actions and approach sustainability in a holistic rather than single issue or ad hoc manner. The importance of holistic approaches was summed up by Greg Johnson, former Manager Corporate Sustainability at Colonial First State Property when he said: "Holistic environmental programs are a better fit for Colonial. Our sustainability impacts are interrelated and a focus on one narrow issue can be an impediment to priority setting and strategic action. It is also more productive for us to cover a broad spectrum of issues."

SUSTAINABILITY ADVANTAGE

Sustainability Advantage offers NSW Government support to organisations who want to take action to improve their environmental performance. It helps to clarify the relevance of sustainability to the business and provides strategies to manage environmental risk and opportunity. The program is based on three important principles:

- 1 The right of business to profit and grow
- 2 DEC support for business to accelerate the environmental priorities of individual companies
- 3 The need for all projects to add business value by mitigating risk or maximising opportunities

Sustainability Advantage assists companies of all sizes to build a more sustainable business through:

- Systematically addressing environmental risk and compliance
- Integrating environmental strategies with business planning
- Lowering costs through more efficient use of resources and waste management
- Enhancing customer-supplier relationships to build partnerships, realise efficiencies and improve environmental performance
- Becoming an employer of choice through actively engaging employees

Sustainability Advantage offers business a partnership with the DEC that runs for an initial period of 12-18 months. Organisations do not have to allocate large amounts of extra time to environmental improvement. Instead the program helps companies to identify their priorities and allocate their time to projects that are more important and beneficial.

To help set environmental priorities, involvement in Sustainability Advantage begins with a two-hour management diagnostic that allows a small group of managers from across the business to evaluate current environmental performance and rank future initiatives. These initiatives are then implemented through individually tailored, flexible projects selected from the following areas:

- VISION, COMMITMENT AND PLANNING – develop a business vision that includes environmental commitment (policy and strategy) and the plans to drive environmental improvement.
- ENVIRONMENTAL RESPONSIBILITY – risk assessment, planning, education and training, and on-ground action to help ensure compliance with environmental law.
- RESOURCE EFFICIENCY – reduce resource use and waste in products, services and operations.
- SUPPLY CHAIN MANAGEMENT – working collaboratively with suppliers and customers to add value and improve environmental performance.
- STAKEHOLDER ENGAGEMENT – education and training to support company efforts to involve staff in sustainability planning, direct action at work and volunteering. Also includes work with external stakeholders and 'neighbour of choice' initiatives.
- LEADERSHIP – sustainability advocacy, mentoring and reporting.

The DEC provides group training and support for individual companies to ensure that participants gain maximum benefit from involvement in Sustainability Advantage.

A cluster approach underpins the program. About four times a year representatives from participating companies come together in industry or geographic groups to share ideas and experiences, benefit from expert presentations and find solutions to common problems.

Sustainability Advantage has been greeted with enthusiasm by business, who see value in its flexibility and the holistic approach it takes to sustainability. Almost 50 organisations are already involved in the program, including clusters of companies from the Hunter, the commercial property and building products sectors, tertiary education, and a group of leading food manufacturers that includes household names such as Goodman Fielder, Coca-Cola Amatil, and Kellogg's.

THE FUTURE

The DEC is currently expanding Sustainability Advantage. Additional groups are being formed and partnerships are being created with peak industry and government organisations to ensure that as many companies as possible get an opportunity to reap the benefits of being more sustainable.

The Department of Environment and Conservation (NSW) invites enquiries from individual companies, business groups and government organisations that would like to participate in Sustainability Advantage or pull together a group of interested companies. ■

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WHY FOCUS ON SUSTAINABILITY IN YOUR BUSINESS?

In Australia the call to action on sustainability is increasing in intensity, driven by a growing sense of crisis around water and climate change. The popularisation of sustainability is highlighted by the current media focus on the looming environmental crisis. In October 2006, *The Sydney Morning Herald* described climate change, the peaking of oil supply and water shortage, as an "unholy trinity ... coming together in a manner which will profoundly alter our way of life, our institutions and our ability to prosper on this planet."

There are three main reasons why improved social, environmental and economic performance makes good business sense:

1. IT IS THE 'RIGHT THING TO DO'

To create a sustainable future government, business and the community will need to work together. As part of its corporate social responsibility business can contribute to a sustainable future by reducing the impact of its goods and services, assisting suppliers to improve their environmental performance and educating consumers.

2. IT MITIGATES RISK

Improved environmental and social performance helps companies to get ahead of risks posed by government regulation; pressure from NGOs, green consumers and shareholders; demands from corporate clients; and a failing reputation that can affect 'supplier of choice' status and company value.

3. IT HELPS TO REALISE OPPORTUNITIES

Opportunities are realised from waste management that reduces costs, developing innovative green products to capture emerging markets, improving employee productivity and retention, and growing reputational value.

The results of sustainable companies speak for themselves. Between 1994 and 2004 stocks listed on the Dow Jones Global Index increased in value by 137%, while stocks listed on the Dow Jones Sustainability Index increased by 182%. This is consistent with the findings of London's *Financial Times*, which commented in 2001: "Even on a sector by sector basis, shares of companies with a superior environmental or human rights record appear to out-perform." For Australian businesses, the lessons from these findings are self-evident. When matched by good general management, superior environmental and social performance will boost profits and market capitalisation.

The emerging carbon market – a new economy



Carbon trading. Carbon Tax. Carbon price signal. Whatever the term used, it refers to using market forces – by putting a price or tax on carbon – so that large emitters will either have a financial imperative to reduce their emissions, or pay up. Corporations that do not reach their quota in carbon emissions, or who undertake activities that are carbon positive, could possibly trade their “credits” with those that need them. One of the key recommendations of the Australian Business Roundtable on Climate Change is the design of a “long, loud and legal” framework to establish a price signal; “a national market-based carbon pricing mechanism to deliver cost-effective emission reductions.”

The carbon economy is in its infancy in Australia. The New South Wales (NSW) Greenhouse Gas Abatement Scheme is currently Australia’s only mandated carbon trading system. All electricity providers in the state need to meet greenhouse reduction targets either by reducing emissions or purchasing NSW Greenhouse Gas Abatement Certificates.

Although Australia can’t yet participate in the international market for carbon trading, the domestic framework has spawned innovative players in the carbon credit market such as CO2 Australia, Carbon Planet and Easy Being Green, the latter being the brainchild of Paul Gilding, former Executive Director of Greenpeace International and now head of Ecos Corporation. ■

How does the Kyoto Protocol impact carbon emissions or trading in Australia?

While Australia is a signatory to the Kyoto Protocol, the Australian Government has chosen not to ratify it. Developed countries that ratify the Kyoto Protocol will be bound by international law to achieve certain emissions reduction targets.

Countries that agree to these emissions reductions targets can participate in a carbon trading system to reach these targets.

How does the NSW Greenhouse Gas Abatement Scheme work?

The NSW Greenhouse Gas Abatement Scheme was established in NSW through an Act of the NSW Parliament. The Scheme began on 1 January 2003 in NSW and on 1 January 2005 in the Australian Capital Territory (ACT). According to The NSW Greenhouse Gas Abatement Scheme it “establishes an annual state-wide greenhouse gas benchmark for the electricity sector and then requires individual Benchmark Participants (who buy or sell electricity in NSW) to meet their allocation of the mandatory greenhouse gas benchmark, based on their share of the NSW electricity demand.”

Offset thyself

Carbon Planet allows individuals and businesses to offset their ecological footprint – from one-off events or plane trips to comprehensive emissions audits of an organisation’s activities.

Ross Williams’s passion for skydiving was the driver behind the creation of Carbon Planet. It was the late 1990s and Williams was a frequent skydiver. But a chance viewing of a *Four Corners* television program on carbon emissions made him question his personal contribution to the harmful greenhouse gases in the Earth’s atmosphere. Not quite ready to give up the adrenalin rush of jumping out of planes, Williams wanted to find a way to offset the carbon emissions he was responsible for.

“I decided that if I was responsible then I should clean up my own mess,” says Williams, who was then working in the information technology industry. When he realised there was no one offering individuals the opportunity to buy carbon credits, Williams recognised a business opportunity and approached friend and fellow South Australian Dave Sag with the idea to form a company to retail carbon credits.

Coincidentally, Sag, who was then working in IT in London, had been researching issues associated with climate change. “It took all of two seconds to convince me,” says Sag. They founded Carbon Planet on 12 January 2000, and spent much of the next four years researching the complex world of carbon trading, implications of the Kyoto Protocol and the challenges of marketing an emerging environmental service.

Carbon Planet finally began trading on 3 June 2005. Its first year of trading was slow and steady. The company initially purchased a small parcel of 2,000 carbon credits from Forests NSW, which it on-sold predominantly through its website. “Normally a minimum parcel of carbon credits would be in the tens of thousands,” says Sag. “But Forests NSW was supportive of the idea and allowed us to dip our toes in the water with a smaller parcel.”

Offset your personal footprint

Unlike companies such as CO2 Australia, who have targeted big corporate emitters from day one, Carbon Planet has initially focused on individuals – people who wanted to offset their personal footprint on the environment either on an ongoing monthly subscription basis or for one-off activities such as air travel.

Sag, who is now based in Adelaide, says that the company is rapidly ramping up its activities. While it only sold around 2,000 credits in its first year of operation, Sag is ambitiously aiming to sell one million credits in 2007. One of Carbon Planet’s credits equates to removing exactly one tonne of carbon dioxide from the atmosphere and storing it for 100 years.

“Initially the bulk of Carbon Planet’s customers were individuals,” he says. “Now we have a different offer for corporates – ranging from SMEs to large emitters.”

The company has also consulted – and sold credits to – major events such as the WOMAD Festival in Adelaide, which offset 1,290 tonnes of carbon dioxide through Carbon Planet. This took into account everything from the energy used to produce the event to air travel for performers.

“If we do the audit up front, before an event, we can also make recommendations on how to reduce emissions naturally,” says Sag. “Even though we are in the business of retailing carbon credits, the bigger picture is to combat climate change. We would prefer people to change their behaviour – then what they can’t naturally reduce, we’ll offset.”

Auditing emissions from film festivals to weddings

Carbon Planet has also been asked to audit a film festival in the United Kingdom, a blog from Canada – which only produced two tonnes of carbon dioxide – and Sag even audited his own wedding and honeymoon (47 tonnes of carbon dioxide).

“As we grow my ambition is that we will be the world’s biggest retailer of properly certified carbon credits,” says Sag, who is also working towards a certification process. “It’s like gold jewellery which can be labelled environmentally safe, or dolphin-free tuna. Ultimately, we’d like to see a CO2-free badge on everything from toothpaste to timber.”

Both Williams and Sag have now wound down their IT careers to concentrate on Carbon Planet, with Williams injecting about AS1 million into the company.

“On one hand, this can be a global mega-business and, on the other, it can also save the planet. That’s what gets me out of bed in the morning,” says Sag.

As for Williams, his penchant for jumping out of planes has been usurped by Carbon Planet. Sag says: “Ross isn’t skydiving much these days.” ■

www.carbonplanet.com

How does Carbon Planet make money?

Carbon Planet buys carbon credits in bulk – currently from Forests NSW – and on-sells them in much smaller parcels to people and organisations who would otherwise not be able to buy them in small quantities. Carbon Planet adds a gross margin of about 30% which covers operating costs and a profit. In 2006, Carbon Planet’s retail price for one credit was AS\$23 (including GST). Carbon Planet also provides an emissions auditing service and functions as a carbon credits broker, linking up producers of carbon credits with companies that need them.

Sustainable energy – finding alternative fuels



When it comes to sustainable energy, the jury is out over whether we should be directing our efforts toward developing renewable fuels or concentrating on clean coal technology.

While a mix of both seems like a logical solution, developing a sustainable energy sector requires clear regulations and consistent treatment of taxes and excises. As some of the companies featured in this section can attest, bright ideas only go so far. Some initiatives are scuttled by inconsistent frameworks and a lack of domestic support, and are instead forced to find markets abroad.

Nevertheless, some companies have transformed from kitchen table experiments to full-scale operations poised to conquer international markets, as is the case with Australian Renewable Fuels. Others are the result of years of research. Some companies recognise their research and development limitations but know how to spot an innovation with commercial potential, as with Ozmotech's development of a rudimentary technology first discovered in a humble factory in Japan. ■

COMMENTARY

RIC BRAZZALE



Energy efficiency and clean energy technologies

Australia is an unusually lucky country when it comes to sustainable energy. More so than most countries, Australia has an abundance of low-emission energy resources such as solar, wind, geothermal ("hot rocks") and natural gas that can meet our electricity needs for the foreseeable future. Not only that, these resources provide clean electricity, with low or no harmful greenhouse gas emissions.

An ecologically and economically sustainable, robust economy is within Australia's grasp. We have the natural resources, the technologies, and innovative businesses raring to go. The only thing missing is the unified political will that would propel Australia into a clean, sustainable and healthy future.

About 35% of Australia's greenhouse-gas pollution – mainly carbon dioxide – comes from our heavy reliance on coal-fired electricity to power homes, factories and offices. And demand for energy is rising rapidly.

The good news is that a variety of clean energy options are available now, requiring no technological development to make a substantial, affordable contribution to Australia's energy supply and lowered greenhouse emissions. These are:

■ **NATURAL GAS** – Natural gas, when used in combined cycle gas turbines, produces power at an emissions intensity of around 0.37-0.4 tonnes carbon dioxide per megawatt hour (CO₂/MWh). This is dramatically less – about one-third – of the CO₂ generated by coal. Large quantities of natural gas are available here much more cheaply than in Europe and America.

■ **ENERGY EFFICIENCY** – The scope for cost-effective improvement in Australia's efficiency of energy use is very large (reductions in consumption ranging from 10% to as high as 60% across sectors).

■ **BIOENERGY** – electricity derived from biological matter is greenhouse neutral and available in large quantities in Australia due to extensive left-over agricultural waste.

■ **WIND** – Australia's southern coastline is exposed to the Roaring Forties winds, providing a resource that delivers excellent, comparatively high capacity factors. Our wind speeds are considerably better than those in Europe, where the greatest amount of wind capacity has been installed.

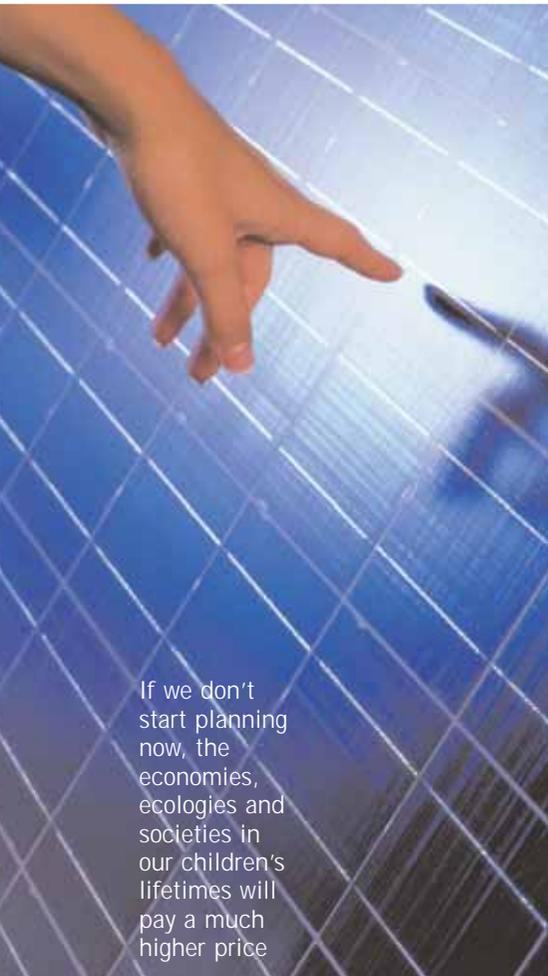
■ **SOLAR** – Australia has the highest solar irradiation of any continent in the world and has a number of markets where distributed solar photovoltaics have particular strengths.

In addition to the technologies already in the market, Australia's geothermal resource holds tremendous promise for providing multi-gigawatt, constant-output electricity.

Clean energy: why on earth aren't we using it?

The importance of reducing greenhouse emissions is broadly accepted. Business leaders, governments, and researchers worldwide are reaching unprecedented agreement about what now needs to be done to make the transition to a "low-carbon economy". In mid-2006 the fifth largest economy in the world, the US state of California, imposed the US's strictest carbon emission laws ever.

In Australia, the Asia Pacific Partnership on Clean Development and Climate meeting in Sydney in January 2006 recognised the importance of business and private sector investment in dealing with climate change. Business leaders such as the Australian Business Roundtable on Climate Change, whose members are Westpac, Origin Energy, BP, Visy, Swiss Re, ACF and IAG, have since pressed the point, stating that "Climate change is a major business risk and we need to act now". They have joined the growing clamour for the Australian Government to help business to fight climate change. >>



If we don't start planning now, the economies, ecologies and societies in our children's lifetimes will pay a much higher price

» Barriers and solutions

The key way to tackle climate change is to improve energy efficiency and increase the deployment of clean energy – technologies like solar, gas and wind, which come from low or no-emission fuel sources – by gradually reducing our dependence on polluting coal.

Although coal is likely to remain a significant energy source for many years to come, Australia can and should make more use of its clean energy riches. We need to plan now for a new, affordable energy mix that incorporates and values these clean technologies.

Governments need to instigate market-based policies such as:

- A robust, national renewable energy target
- A value placed on pollution via a carbon dioxide pollution tax and/or caps on carbon dioxide pollution
- Minimum standards for energy efficiency
- The addressing of energy market barriers to clean energy

Whenever Australian governments have made clean-energy-friendly policies businesses have responded swiftly and with zeal.

For example, the successful Mandatory Renewable Energy Target (MRET) operational in 2001, required electricity retailers to draw a modest 9500 gigawatt hours, or 2% of electricity, from renewable energy sources by 2010. This low target has been reached ahead of schedule. As a consequence clean energy investment is languishing while other countries steam ahead.

As well as driving investment in clean energy and giving some certainty to investors, MRET generated significant job opportunities, especially in regional Australia. A report by Ellis and Associates estimated total direct employment of 6,189 in the renewable energy industry in 2002-03. Employment in the sector since 1999 grew by 2,014 full-time equivalent jobs across all states and territories.

Various state governments in Australia have "gone it alone", setting their own renewable targets and greenhouse policies. Victoria, New South Wales and South Australia have been particularly proactive.

In short, small steps have been taken by Australian governments but it has not been enough to halt our escalating emissions.

The future could be bright

The Clean Energy Future for Australia study found that bioenergy, natural gas, wind, hydro and solar heat should be the main contributors to a clean energy mix by 2040. Fossil fuels still play an important part in the electricity generation scenario of 2040, with natural gas, as the cleanest of the fossil fuels, the main substitute for coal.

We need to begin the transition to a low-carbon economy by expanding the role of renewables and other existing technologies in Australia's coal-dominated energy mix. If we don't start planning now, the economies, ecologies and societies in our children's lifetimes will pay a much higher price. We owe it to them, and to the sustainability of our markets and our unique environments, to leave a better legacy than that. ■

Ric Brazzale is the Executive Director of the Australian Business Council for Sustainable Energy (BCSE), the peak industry body representing the sustainable energy industry in Australia.
www.bcse.org.au

A whole lot of wind

Hydro Tasmania's work on a hydrogen-assisted diesel generator may be the answer for communities living on remote islands.



A bright idea, a forgotten piece of equipment and a group of keen researchers have created a hydrogen-assisted diesel generator which could be the forerunner of viable energy solutions for remote island communities.

Hydro Tasmania is working closely with the University of Tasmania's Hydrogen and Allied Renewable Technology research group in the development of a diesel engine that uses a mix of diesel and hydrogen.

Adding hydrogen into the fuel mix means that diesel consumption can be cut by 50% without any significant loss of energy. This also leads to lower greenhouse gas emissions.

While the research group is also trialling a hydrogen engine in a racing car and a postal bike, Hydro Tasmania is developing a more practical application for it – to power remote island communities such as Cape Barren Island, that would otherwise rely heavily on diesel.

Hydro Tasmania is currently proposing a trial on an island off Tasmania. The germination of the idea began in 2003. According to Hydro Tasmania's Research and Development Coordinator Rob Grant, someone posed the question if hydrogen could be used in diesel generators in the same way as natural gas. "We looked around and found that no one had really done it," says Grant. "We realised it was an opportunity, so then thought about what we could do next."

By coincidence, Grant discovered an old unused generator sitting out the back of a power station. "It was gathering dust so we thought we may as well

put it to use," says Grant. "If we had to spend AS40,000 on one just to do some experiments, then it would have been more difficult."

The work, headed by Dr Vishy Karri and Dr Hafez from the University of Tasmania, using the old generator, has proven that a hydrogen-assisted diesel generator can work. According to Grant, the next step is to connect the generator to a system which produces hydrogen from excess wind generation.

A hydrogen engine could power remote island communities that would otherwise rely heavily on diesel

"If we use this concept on an island, it's best to use any wind energy directly for powering homes," he says. "Any excess wind energy – which may occur, say, overnight when your load is light – can be used to produce hydrogen which can be stored in tanks. This hydrogen can then be used for power generation when the wind isn't flowing, or for fuelling vehicles."

While it's still a while before this concept becomes a commercial reality, Grant points out that the high cost of diesel is moving them closer to their goal. If it goes ahead, Grant says it will be a world first. ■

www.hydro.com.au

RENEWABLE ENERGY POWERS PAPER PRODUCTION

Australian Paper is demonstrating its leadership by executing its Sustainable Futures Philosophy and maximising renewable energy sources in its manufacturing operations.
By Sam Pudney

Over 60% of Australian Paper's annual energy needs are met from renewable sources. Renewable energy is derived from sources that don't produce greenhouse pollution, cannot be depleted or can be replaced, such as solar, wind, biomass (waste), wave or hydro.

The company also continually investigates the potential of new sources of renewable fuels to maximise sustainability.

Simon Talbot, Australian Paper's Corporate Relationship Manager says: "Australian Paper is dedicated to meeting the needs of its customers. Our environmental and social performance is key to our success and we are committed to harnessing renewable energy sources for long-term sustainability. We are firmly focused on managing natural resources wisely in a bid to continually improve our environmental performance."

This unique initiative utilises waste from poppy plants as a fuel source for the manufacture of paper

In 2006, less than 5% of Australia's energy needs were generated from biomass fuels, despite its demonstrated benefits as an alternative energy source. Australian Paper has been an early adopter of biomass fuels, which now contribute in excess of 30% of the company's energy needs.

THE SUSTAINABILITY IMPERATIVE

Paper manufacturing is a complex process and requires a source of cellulose fibres. These can be derived from sources as varied as cotton rags, straw, sugar cane and wood. Modern papermaking in Western countries is mainly based on wood, due to factors such as quality, availability and economics.

Separating cellulose fibres from wood is difficult and there is a range of chemical and mechanical processes utilised, depending upon the wood type and the end use required. One of the dominant industry processes for pulp is the Kraft process. This system relies on high



An example of creative ways to recycle paper



Poppies are eventually turned into biofuel used by Australian Paper

temperatures to dissolve the lignin and release the fibres. After the treatment, the fibre is washed to remove the dissolved lignin and chemicals – which is then referred to as 'black liquor'.

Talbot explains: "Black liquor is recognised by the Commonwealth Government as a renewable energy source. Our Maryvale Mill currently generates steam and electricity from black liquor in two recovery boilers, which are supplemented by three natural gas fired boilers. This initiative has been so successful that by 2009, Maryvale expects to be producing approximately 9,000,000Gj of renewable energy."

TASMANIAN OPERATIONS SET AN EXAMPLE

Australian Paper's Tasmanian operations have some of the highest levels of renewable energy usage within the global paper industry. Australia's most significant hydro-electricity plants and adjacent wind farms supply the company's Burnie and Wesley Vale Mills.

"In addition to these mainstream renewable sources – our Tasmanian engineers have successfully retrofitted on-site boilers to accept agricultural and sawmill waste," says Talbot. "This is a unique initiative which utilises waste from poppy plants as a fuel source for the manufacture of paper."

"Tasmania is one of the world's major suppliers of medicinal opiate products, which is strictly controlled by the Federal and State Government. Once medicinal opiate has been extracted from the poppy flower, significant volumes of plant waste remain. Australian Paper is turning this waste into a biofuel and minimising fossil fuel consumption, such as coal and oil."

Since 2005, 92% of the energy used by Australian Paper's Tasmanian mills was derived from renewable sources. By reducing its reliance on fossil fuels, the company is actively reducing greenhouse gas emissions.

The company has also modified the boiler systems used at its Maryvale and Tasmanian operations to utilise materials that would otherwise go to landfill. ■

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Purchasing sustainable paper

Australian Paper's sustainability efforts are reflected in the company's environmental and social performance. So next time you're looking at purchasing paper, consider the alternatives. Ensure the paper grade is made in Australia using renewable energy and derived from sustainable fibre sources. Why? Because imported products not only consume vast amounts of greenhouse gases in their transportation to our shores, but they do little to contribute to our economic, social or ecological position.

More than a mallee tree

Enecon has found multiple uses for mallee trees: the generation of energy, provision of eucalyptus oil and as a way to combat salinity.



Mallee is grown in belts 60 to 100m apart while the land in between is retained for conventional cropping. Mallees reduce greenhouse gases and generate energy

There's more to a humble mallee tree standing on a farm in rural Western Australia than meets the eye. If Colin Stucley, Managing Director of Enecon has his way, the mallee will not only reduce salinity, it will also reduce greenhouse gases, produce activated carbon, generate energy and provide eucalyptus oil from its leaves.

However, when Stucley first founded Enecon with Jim Bland in 1998, mallees were the last thing on their mind. Stucley and Bland were chemical engineers, both with careers in the oil and gas industries spanning 20 years.

"We wanted to do something which was more sustainable," says Stucley. "Something more in line with our beliefs."

Stucley admits that desire was partially driven by the fact he has kids. "You want to do something that is good for future generations," he says. "We also saw this as a way we could develop an interesting business and further our own careers in a way we were proud of."

Stucley and Bland set up Enecon in 1998 at the same time they got the worldwide licence for technology developed by CSIRO Forestry and Forest Products. The technology is a process that uses wood to produce energy, charcoal and activated carbon.

"Activated carbon acts as an effective sponge for removing contamination from liquids and gases," says Stucley. "When you make charcoal and activated carbon, a lot of energy is released at the same time and we're looking at recovering that energy instead of wasting it."

Stucley spent several months travelling around the country looking for opportunities to put the technology into place. However, it wasn't until he met Dr Syd Shea, then Executive Director of Western Australia's Department of Conservation and Land Management (CALM) that pieces started to fall into place.

"Syd had recognised the importance of getting trees back into the farming landscape to avoid salinity problems

in Western Australia," says Stucley. "However, he knew that up front costs were a major disincentive to large scale plantings, in spite of the long term environmental benefits."

Turning mallees into multiple products

Enecon proposed the concept of Integrated Tree Processing (ITP) where mallees provide multiple products for local and overseas markets: the wood can be harvested to produce activated carbon and energy, and the leaves supply eucalyptus oil and energy. The farmers receive commercial returns for the trees in the short term as well as longer term environmental benefits: their plantings combat salinity, and the trees sequester carbon dioxide. Furthermore, the mallees are coppicing trees, which means shoots regrow from the stumps after harvest – and so they can be harvested sustainably every two to three years.

Initially, feasibility studies, trials and laboratory experiments were undertaken to test the viability of this concept. Funding was then arranged for a demonstration plant, led by Western Power Corporation, the Australian Greenhouse Office and AusIndustry. The plant was completed in 2005 and operating trials were undertaken up to the middle of 2006.

We wanted to do something which was more sustainable ... something more in line with our beliefs

Engaging an army of stakeholders

While the ITP concept has made significant progress, it's still early days in terms of making it a commercial success. Although the demonstration plant can prove the technology, the supply of mallees to each new processing plant will require hundreds of stakeholders – farmers who have to be convinced they are planting for a viable industry. "This is the development of a new rural industry," says Stucley. "There is a chicken and egg scenario: you can build the plant when you know there are trees available. But many farmers cannot justify planting the trees until they know a plant will be nearby."

To operate cost-effectively, trees need to be within an economic transport distance of a plant. Nevertheless, more than 1,000 farmers in the Western Australian wheatbelt have been planting mallees – largely for the environmental benefits, but also on the expectation that commercial opportunities will be developed.

Stucley stresses that ITP is not the "sole solution" for new tree planting and associated industries.

"The opportunity, and the need for new tree crops in Australian agricultural regions is far greater than any one industry can catalyse," he says. For this reason, Enecon also investigates other new technologies for sustainable energy from wood. It has recently set up an off-shoot company to develop projects based on commercial pyrolysis technology from North America, which also uses wood to produce renewable energy and sustainable chemicals. "This pyrolysis technology produces renewable oil which can be used immediately for power generation and heating and eventually in engines as well. There are huge opportunities if this low cost pyrolysis oil can tap the market for transport fuel," says Stucley.

While it's been a long road to develop the ITP demonstration plant, Enecon generates revenue from consulting and other engineering projects related to renewable energy to continue profitably. "We could make a lot more money going back into oil and gas," says Stucley. "But it wouldn't be half the fun." ■

www.enecon.com.au

How will the biomass industry survive – and thrive?

According to Enecon's Managing Director Colin Stucley, emerging industries such as biomass need assistance in the early stages. "These industries require stable policy and a depth of understanding and support from government," he says. "While there are many individuals in government departments who already do that, Australia's overall policy on renewable energy could do a lot more to help develop these industries."

"There is a valuable role for government to support work that is between pre-commercial and fully commercial. Currently it's a funding dead zone. Building the first commercial plant in Australia with any new technology carries significant risk and yet it falls outside the major programs for government support. We need funding strategies from government that share the risk and share the rewards."

Stucley points to the concept where funding support is provided as a grant. Then if the initiative fails, the grant isn't called in. If it's successful, the grant is turned into a loan and the government can recover its costs.

Transforming energy with clean coal

CSIRO's Energy Transformed Flagship is spearheading innovation to develop a hydrogen economy, create energy efficiencies and find clean coal solutions.

CSIRO's Energy Transformed Flagship has set itself a bold target: to halve greenhouse gas emissions; double the efficiency of the nation's new energy generation, supply, and end use; and to position Australia for a future hydrogen economy.

While it will be years before some of the steps towards achieving this goal will become reality, the Flagship already has a number of initiatives underway.

According to the Director of the Energy Transformed Flagship, Dr John Wright, one important initiative has been the creation of a collaborative forum on the theme of energy futures. "We've brought together industry, Federal Government, public interest groups, environmental groups and others to develop a number of scenarios in 2050," says Wright. "It's a very incisive group with a wide variety of views - ranging from the big end of town right through to environmental viewpoints."

The forum spent about 18 months analysing various scenarios and released its report in November 2006.

Modelling scenarios

"We talk about eight scenarios between now and 2050, taking into account the full gamut of environmental consequences, energy technology types, even the price of petrol at the pump."

Wright says there is a base case of "business as usual", which is followed by various scenarios including one that looks at the effect of an energy shock. "This would be where the price of oil zooms up for example," says Wright. "How would that change the 'business as usual' scenario? When that happens we might see a lot of fuel substitution and, if so, what would the impact of that be?"

The forum also looks at scenarios of reducing greenhouse gases via a market mechanism. "This is where we analyse the impact of the price of carbon," says Wright. "We've also introduced different technology scenarios, bringing nuclear power into the mix, and we've discussed the impact of carbon sequestration and storage. We've also looked at the case where we have a greatly enhanced distributed energy system - how would that be managed and what would the consequences be? And we've done a very deep cut scenario with a reduction of CO₂ emissions by less than 50% to see what the difficulties would be to get to that stage."

Painting these pictures has enabled Wright and his team to assess where to prioritise their efforts. "The theme of energy futures was a guide to take up to 2050 so we could get a better view of where to target precious research

dollars and assess the areas that would have the best impact in low emissions technology and transport," he says.

Already, the Flagship coordinates the Centre for Low Emission Technology at the Queensland Centre for Advanced Technologies. It also coordinates the National Solar Energy Research Centre in Newcastle, New South Wales. It is working with Holden in developing hybrid and, ultimately, fuel cell vehicles. It has also developed a co-generation process which has been successfully demonstrated at Hornsby Council, an outer suburb of Sydney. "We were approached by Hornsby Council who wanted to replace their air conditioning system with something that had much lower greenhouse gas emissions," says Wright. "We replaced it with a system that delivered reduced greenhouse gas emissions and used energy much more efficiently."

The system generates electricity and heat, with the heat driving a device that turns incoming ambient air into cooling. Apart from producing electricity on site, power can also be exported to the grid.

Clean coal technology

While the Flagship is making inroads in various areas of energy efficiency and innovative production, all eyes are on its work with carbon sequestration and storage (CSS). When it comes to capturing carbon, there are three main ways this can be done: pre-combustion capture, oxygen combustion and post-combustion.

In Australia, where there are numerous coal-fired plants actively contributing to greenhouses gases and climate change, post-combustion capture (PCC) technology is at the fore because it's the only type of capture that can apply to both new and existing plants. While newly built plants can be equipped with the technology to capture carbon, it's the existing plants that need to find a retro-fitted solution.

The Flagship is coordinating a PCC project in Newcastle. This involves treating the flue gas being emitted by plants in order to capture the carbon emissions before they get into the atmosphere. "This is about the development of new solvents for the extraction of CO₂ from flue gases of existing power stations. We want to make this cost cheaper," says Wright. "We need to ensure we have a solvent that won't be degraded by the impurities in the flue gas - we want it to be benign. And once we capture the gas in the solvent we want to be able to release the CO₂ from the solvent before we then take the CO₂ away and bury it."



Clean coal is part of the solution to reduce greenhouse gas emissions

While many believe that efforts should be directed to developing renewable energy sources as a way of reducing greenhouse gases, Wright says that clean coal technology is essential. "We have a big stock of existing power plants in this country that are going to be producing electricity for the next 30 to 50 years," he says. "We need technology that's going to reduce the emissions we've got already. It's the same situation in places like China and India - they're rapidly building coal-fired stations. If the world doesn't produce technology we can retro-fit onto existing power stations, it's going to be extremely difficult for the world as a whole to cut down on greenhouse gas emissions."

Wright says that international collaborations to find a solution are already underway. "We share fundamental information," he says. "And my vision is that we can develop appropriate technologies that could then be acquired by the rest of the world." ■

www.energytransformed.csiro.au

What is the Energy Transformed Flagship?

The Energy Transformed Flagship was formed in 2003. It is one of six CSIRO Flagships: the others being food, health, light metals, oceans and water. According to the Flagship, its main initiatives centre around:

- Developing a national energy model
- Developing and implementing technologies for near zero emissions from coal-fired power and renewable energy systems
- Developing technologies for new generation transport vehicles and alternative fuels
- Developing and integrating leading edge technology and energy management systems to facilitate the introduction of distributed generation into the Australian transport and stationery energy sectors.

Waste – a valuable resource



One of the most exciting areas of innovation and sustainability has been in developing ways to recover waste and use it as a resource. Reusing waste – in everything from recycling plastic to rocks and household rubbish – is not only an efficient use of resources, there are growing opportunities in providing these technological solutions as demand for them continues to increase.

In Australia, there are numerous innovations that are diverting more waste from landfill and finding unique ways to transform “old” products into “new”. Close The Loop’s technology in recycling printer cartridges began as a sales

gimmick and is now a state-of-the-art solution with global contracts. Fuji Xerox’s Eco-Manufacturing facility turns the idea of built-in obsolescence on its head. While Global Renewables’ cutting edge waste resource and recovery process provides a waste management solution that can adapt to the needs of different countries and communities.

Where waste was once literally considered rubbish – and relegated to be buried in landfill forever – smart innovators have undergone a paradigm shift in their view of waste and have turned it into an invaluable resource that can be mined for recycling, reuse – and revenue. ■

Rocky road

Mawsons has found an innovative way to turn unwanted rocks – a by-product of concrete aggregate production – into an environmentally friendly termite protection solution.

Several years ago, John Mawson was looking at a big pile of rocks. They were by-products of his family-owned concrete and quarrying business, Mawsons. “The nature of our stone crushing activities is that a certain proportion of the material we crush ends up as a by-product we can’t use,” he says. “We wondered what we could do to find a market or use for the product so that we could fully utilise it as a resource. Until then, we were just accumulating the rocks on site.”

In 1985 Mawsons teamed up with CSIRO to find a solution. They developed a termite protection and pest control system created from the unwanted rocks. By 1991, their first product – aptly named Granitgard – was available as a physical barrier used for termite protection.

For Mawson, it was a solution to a problem he had grappled with for 40 years. “We’ve tried to do a number of things with the by-product,” he says. “Our quarries are in country areas which limits what we can do. If we were in metropolitan areas, we might have been able to use the material in making asphalt. But here, there are no asphalt manufacturers nearby.

Granitgard gives people an alternative to having buildings that are chemically dependent

“We also tried to use it in aerated concrete but when CSIRO helped us to find a way to use it as pesticide-free termite protection, we thought that had a good ring to it. Otherwise, the rocks would have just piled up on our sites. We couldn’t even give them away.”

Wearing the right label

Granitgard boasts the Good Environmental Choice Label from the Australian Environmental Labelling Association. “We wanted to establish our credentials,” says Mawson. “Sustainability and environmentally-friendly products are terms that are bandied about, particularly in the building industry. With termite protection and pest control, there are many companies who say their pesticides are environmentally-friendly – but those two words shouldn’t go together. We wanted independent assessment to verify our environmental claims.”

However, Mawson admits it’s a challenge to change the mindset of many players in the building industry. “Our main focus now is in continuing to make builders aware of the sustainable options they have,” he says. “These products work and they are not expensive. They may not be cheaper in the short term but they are definitely cheaper in the long run because the pesticides

currently used are short-term pesticides. This means they need to be re-applied. Whereas Granitgard gives people an alternative to having buildings that are chemically dependent.”

Mawsons continues to work with CSIRO and recently developed a new product. Based on the same principle of using a by-product of another process – this time, bitumen and sawdust – the result is Blockaid, which went on the market in 2003. This is a water-based, brush-on termite barrier.

While Granitgard and Blockaid only account for approximately 5% of Mawson’s revenue, Mawson believes it was the right decision to enter these new markets. “The quarry industry isn’t renowned for being ‘freaky and green,’” he says. “But we believe that every industry should consider their environmental responsibility. Sustainability is a concept that should be mainstream, not peripheral to what you do.” ■

www.mawsons.com.au



Mawsons couldn't even give its rocks away. So they invented a solution

Second life

Fuji Xerox's smart approach to remanufacturing has resulted in significant cost savings, innovation and tonnes of waste diverted from landfill.

What began as an initial effort to reduce the cost of spare parts – particularly imports affected by adverse exchange rate fluctuations – has resulted in an Eco-Manufacturing Centre for Fuji Xerox which is diverting tonnes of waste from landfill and saving the company millions of dollars.

The Eco-Manufacturing Centre in the suburb of Zetland in Sydney remanufactures used parts in photocopier equipment. Fuji Xerox's Communications

Manager Anne Cherry says it's about value-added recycling. "We use a

parts are replaced. Prior to the Eco-Manufacturing initiative, 100% of parts removed from equipment were sent to landfill.

With a reliance on parts being supplied from overseas, Fuji Xerox was subject to the vagaries of the exchange rate. "This was putting the business under a fair bit of financial pressure," says Cherry. "And the cost of new parts was a significant expense to the business."

Birth of an idea

In 1992, Dan Godamunne was a senior engineer and proposed the concept of remanufacturing used parts. In a back room in one of the company's warehouses, Godamunne set about trying to show that this could be done – with no loss in quality and at a more efficient cost than importing the parts from overseas.

This was not simply a matter of taking old parts, giving them a spit and polish, and re-inserting them into machines. It involved comprehensive testing, new cleaning methods and a complex re-engineering process to ensure the parts performed as they should.

For a company that had always used new parts in its machines, it was unsurprising this idea was initially met with scepticism. "There was a perception that remanufactured parts would not meet quality standards," says Cherry. "Many people held the view that anything used is not as high quality as something new. That was one of the major obstacles in this initiative – we first had to convince

senior management this process would guarantee quality standards. Then we had to convince the technicians who repaired the equipment."

After an initial trial to show the process could deliver the goods, an investment of A\$8 million was allocated to build the Eco-Manufacturing Centre in 1998. While 100% of parts were once simply sent to landfill, now less than 10% goes to landfill. The Centre contributes about A\$20 million to the company's bottom line each year.

Exporting expertise

Apart from cost savings, the Centre has developed an export program to provide services for Fuji Xerox operations in Asia. This means spare parts from nine other Asia-Pacific countries are sent to Zetland for remanufacturing and then returned for reuse. "We've taken our solutions and developed them for Asia," says Cherry. "In 2002, we had revenue of about A\$500,000 from exports. In 2006, we generated about A\$6 million from overseas markets."

Apart from the obvious environmental benefits, the costs savings are significant. "We have a part which is a laser scanner. A new part would normally cost around A\$14,000. We can remanufacture a used part for about A\$1,000," says Cherry.

The remanufacturing process has also spearheaded innovation. While remanufacturing a magnetic roller, engineers realised that inserting a simple coil spring would double the life of the roller. This meant the remanufactured magnetic roller – with the coil spring – was lasting twice as long as a new magnetic roller, which did not contain the spring. The coil spring cost the princely sum of about two cents.

As a result of the Centre's discovery, the spring is now included in all new magnetic rollers. "This has saved the company about US\$40 million (A\$53.4 million)," says Cherry. "We only need half as many rollers because now they last twice as long."

Fuji Xerox is considering rolling out the Eco-Manufacturing concept to other industries. "We've been talking to other businesses – such as the automotive sector," says Cherry. "CSIRO is also interested in its application to other industries. When you're looking at household goods, entertainment products, computers and televisions, some technologies are quite compatible with photocopiers, with similar motors and electronic boards.

"As businesses look towards becoming more efficient and the government moves towards getting companies more focused on product stewardship and product takeback, there is a great incentive for them to look at reuse and recycling."

Meanwhile, Godamunne is now the Centre's General Manager of the Eco-Manufacturing Centre. What started as his simple idea now employs 95 people and remanufactures approximately 250,000 parts each year. It has won a range of awards including the Australian Museum Eureka Prize for Industry 2002. Cherry says simply: "What's good for the environment is good for business." ■

www.fujixerox.com.au

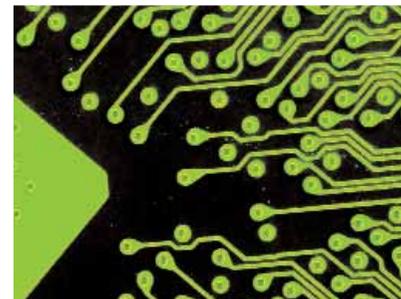
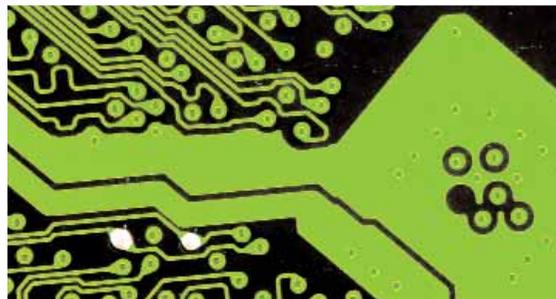
LEFT AND BELOW LEFT: Spare parts from nine other Asia-Pacific countries are sent to Zetland for remanufacturing and then returned for reuse



technically sophisticated reprocessing model," says Cherry. "We keep

the spare part or component as far as possible in its original state but we test it, validate it, and make some enhancements to the product which allow us to reuse it again in our equipment."

Most of Fuji Xerox's equipment is leased to customers. As a part of the regular maintenance of the equipment,



What about the photocopier machine itself?

The Eco-Manufacturing Centre focuses specifically on remanufacturing the parts within a photocopier machine. The machine itself, once it is at the end of its life, is sent to the Fuji Xerox operation in Thailand where it is stripped into its various components for recycling. According to Fuji Xerox, this is a zero-waste operation and no products go to landfill.

The right partnerships

Adelaide Brighton is incorporating sustainability principles across its business, including using alternative fuels and finding innovative ways to use wastewater.

Innovative sustainability practices have led to the development of an alternative fuels technology and a system for reusing water at Adelaide Brighton's cement plants.

Adelaide Brighton is an integrated producer of materials for the construction and resource sector industries with operations in all mainland states and territories of Australia.

With a heavily reliance on the use of natural gas at its Birkenhead cement manufacturing operation, the company has been keen to find an alternative fuel source. Although various options have been explored over the years, it wasn't until 2002 that the effort gained momentum.

According to Adelaide Brighton's Group Sustainability Manager Ros DeGaris, the company wanted to conserve natural gas and utilise waste as a fuel source. "Waste management isn't our core business," says DeGaris. "So we needed to partner with somebody who knew the industry and how to access suitable sources. We needed to look for what is in our region – you can't afford to cart waste too far."

Working with the Environment Protection Authority (EPA) in South Australia, the company recognised that demolition waste included timber that wasn't being reused effectively. "When a truckload of demolition waste goes into the recycling depot, about 94% is now being recycled as scrap metal, concrete back into road base, and our alternative fuel," says DeGaris. "We use the timber and a certain amount of other burnable material such as plastic to fuel our cement kilns. Making the material for the fuel useful has made the other materials more recyclable as well."

Partner in waste

Adelaide Brighton now partner's with Resourceco to divert this material which would otherwise have gone to landfill. With the raw material identified, the company then had to create the technology to separate the material from the initial delivery of waste and turn it into a fuel suitable for use in a cement plant. "That's been a big step," she says. The result is a joint venture between Adelaide Brighton and Resourceco who have formed Alternative Fuel Company. "We sent waste experts and cement experts overseas to select appropriate equipment and develop a process," says DeGaris.

Although the equipment itself has been sourced from overseas, the technology and integrated process involved has been created by the joint venture. By 2003, the EPA gave approval for trials to be undertaken, in order to detail the specifications to ensure quality fuel standards.

"It was important for us to engage with the EPA from the start," says DeGaris. "We wanted to have a transparent system. And we wanted to know what we had to do in order to meet their approvals."

With successful trials – and EPA approval – under its belt, a permanent facility to use the demolition timber alternative fuel to heat the cement kiln at the Birkenhead operation was in place by 2005. The A\$23 million combined joint venture partners' investment is already paying off.

"We use a lot of energy," says DeGaris. "This project allows us to displace about 25% of our natural gas use at Birkenhead. It also diverts nearly 300,000 tonnes from landfill each year."

One of the challenges of the initiative has been becoming a player in the development of the resource recovery industry in the region – that is the reuse of waste. "You would think it would be pretty simple," says DeGaris. "But waste doesn't really have a value. And we're competing with those who provide simpler methods of disposal – such as landfill. We've had to talk to government about how legislation can support this idea."

"There is also the fact that we now have a whole new fuel source in addition to natural gas. We haven't replaced it completely, so there is a new system to manage. There has been a lot of learning right across the supply chain to successfully establish the new practice."

Using water from wine

Timber isn't the only material being reused and recycled. At its Angaston plant in the Barossa Valley, South Australia, wastewater from a bottling line has been reused in the cement manufacturing process since 2005. "We are developing suitable specifications to ensure that the wastewater is of a consistent quality," says DeGaris.

The initiative reduces the plant's draw on mains water, with the EPA approving use of up to 60 mega litres per annum. Prior to this initiative, the wastewater was turned out to evaporation ponds.

Collaborative approaches with other industries and companies are key to the success of these sustainability initiatives. "It's a matter of looking for opportunities that fit," says DeGaris. "For example, the bottling line had been looking for opportunities for a while. The Angaston plant is located so close to them – so the connection became clear." ■

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