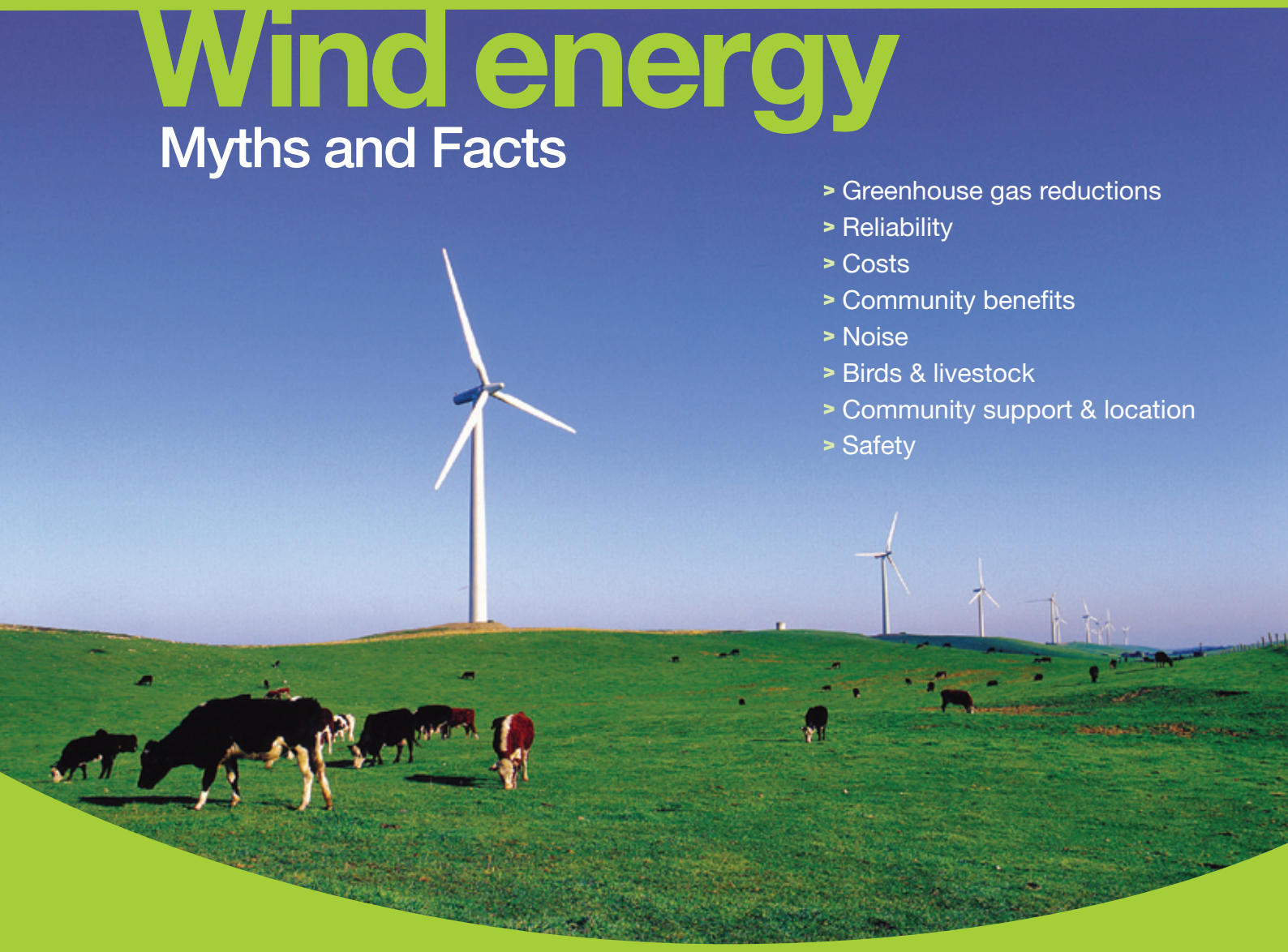
Wind energy

Myths and Facts

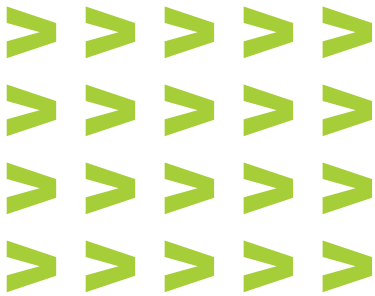
- Greenhouse gas reductions
- Reliability
- Costs
- Community benefits
- Noise
- Birds & livestock
- Community support & location
- Safety



May 2007

Sustainability victoria

Victoria
The Place To Be



There is substantial and growing evidence that climate change is one of the greatest threats facing our world >

Climate change is a result of greenhouse gas emissions, such as carbon dioxide, methane and nitrous oxide, building up and warming the planet by acting as a blanket that traps in the sun's heat.

Electricity generation is responsible for over half[1] of Victoria's total greenhouse gas emissions.

Victoria's energy demand is growing by over one and a half per cent each year,[2] and the level of greenhouse gas emissions from burning fossil fuels is continuing to increase.

The Victorian Government is implementing a range of policies and programs to reduce greenhouse gas emissions from the energy sector while maintaining a secure, efficient and affordable supply of energy.

An integrated policy package aims to deliver an increased supply of renewable energy, improved energy efficiency across the economy and cleaner electricity generation from brown coal.

To increase the uptake of renewable energy the Victorian Government has introduced the Victorian Renewable Energy Target, so that 10 per cent of Victoria's energy consumption will be met by renewable sources such as solar, wind, hydro and biomass by 2016.

Wind energy is one of the most cost effective forms of renewable energy and has an important role in reducing our reliance on fossil fuels.

Victoria has world-class wind resources. The technology to harvest energy from wind is well-proven and is being widely used around the world to provide reliable supplies of energy.

In a bid to make Victorians aware of how wind energy can help supply our state's energy needs in the future, Sustainability Victoria has compiled the following information to separate the myths from the facts around wind energy and its role in Victoria's future energy sector.

Victoria's wind energy industry (May 2007)

Status	Capacity (MW Wind Energy)
Installed	134
Approved	1178
Investigation or planning	1,200+

Greenhouse gas reductions >

Myth: Wind farms don't cut greenhouse gas emissions.

Fact: Every unit of wind energy cuts greenhouse gas emissions.

> Each megawatt hour of wind energy generated in Victoria currently avoids producing 1 tonne of greenhouse emissions on average.[3]

> A typical 2 megawatt wind turbine installed in Victoria will reduce greenhouse gas emissions by around 6,000 tonnes per annum.[4]

> Victoria's existing wind farms are cutting more than 400,000 tonnes of greenhouse gas emissions per year,[5] the equivalent of taking 94,000 cars off the State's roads.

Myth: Wind farms don't reduce the amount of fossil fuel being used.

Fact: Every megawatt hour of wind energy cuts 1 tonne of greenhouse gas emissions.

> Each megawatt hour of wind energy generated in Victoria currently avoids producing 1 tonne of greenhouse emissions on average.[3]

> The greenhouse abatement is the result of a mix of energy supplies from sources such as hydro, gas, brown coal, as well as imports of electricity from other states being displaced by wind energy generation.

> Because the state of the electricity market can change every half-hour it is not possible to say exactly what sources of generation are being displaced at any given time. Regardless of this, every megawatt hour of wind energy cuts on average 1 tonne of greenhouse gas emissions.

> No other energy generation[6] likely to enter the Victorian energy market in the short to medium-term delivers as much abatement as wind.

Myth: Reducing the output of a brown coal power station reduces its efficiency and causes more greenhouse emissions.

Fact: A brown coal power plant can reduce its output by at least 20 per cent[7] with little change in efficiency when wind energy is available to displace the brown coal or in response to other changing conditions such as when power demand drops.

> The output from Victorian wind farms is taken directly into the electricity grid and replaces generation from hydro and fossil fuel sources such as gas, black coal-based electricity imports and brown coal.

Myth: Wind turbines use more energy to make than they can deliver.

Fact: The energy used to make wind turbines is quickly recovered by the amount of energy they generate.

> For example, the Challicum Hills wind farm generated enough energy to cover the energy consumed to manufacture, transport, install and maintain the wind farm within the first few months of its operation.[8]

Reliability >

Myth: Wind farms are unreliable.

Fact: Wind farms are a proven and reliable provider of energy.

> The power grid is a dynamic system, designed to ramp up or down to respond to changing demand, and with the ability to provide back-up capacity for all types of generation including wind, hydro, gas or coal.

> As an intermittent energy generator wind energy forms part of a broad mix of energy supply technologies.

> Wind speeds can usually be forecast 24–48 hours ahead. This, together with the careful choice of location and geographical spread of wind farms in Victoria, ensures the wind input into the network is as predictable and smooth as possible.

> No power source is 100 per cent reliable. Maintenance and faults may require any type of generator to be taken off-line at short notice.

Myth: Wind farms don't generate much energy.

Fact: Victoria's wind farms currently generate enough clean electricity to power over 77,000[9] Victorian homes.

Victoria

> Victoria currently has 134 megawatts (MW) of installed wind capacity (May 2007).

> Another 1178 MW of wind energy development is under construction or has received planning approval, with an additional 1,200 MW in various stages of investigation or planning in Victoria.

> If 1,000 MW of wind energy capacity is constructed in Victoria it will generate enough electricity to power over 440,000 homes, or almost 40 per cent of Melbourne's domestic consumption.

> At the same time it would prevent over 2.5 million tonnes of greenhouse emissions entering the atmosphere each year – the equivalent of taking 600,000 cars off our roads.

Australia

> Australia's present total installed wind capacity is 817 MW – enough to power 460,000 homes or more than a quarter of Melbourne's domestic consumption.

> Australian wind farms are currently preventing about two and half million tonnes of greenhouse gas emissions entering the atmosphere each year – the equivalent of taking more than 575,000 cars off the road.

International

> At the end of 2005 the installed worldwide wind energy capacity was 59,000 MW – which is greater than the total electricity generation capacity of Australia.

> Wind energy is a fast growing industry around the world. China, India, the US, Canada and many European nations are leading the way in wind energy.

> The total installed wind energy generation in India alone is 4,430 MW with over 1,430 MW of this being added in just one year (2004–2005).

Myth: Wind farms are inefficient.

Fact: Wind farms convert wind to energy very efficiently.

How efficient is the turbine at generating electricity?

> Modern wind turbines are efficient, and convert up to 50 per cent[13] of the energy in the wind into electricity.

> By comparison brown coal power stations convert about 25 per cent[14] of the energy in coal into electricity.

What happens when wind doesn't blow?

> Wind farms in Victoria are sited to take advantage of consistent winds and provide wind energy to the grid about 90 per cent[15] of the time. This means that 90 per cent of the time, some wind is blowing and energy is being generated by the turbines.

> Wind varies and does not blow consistently all the time which is reflected by the 'capacity factor' of the wind farm. Turbines are built to generate energy at a range of wind speeds and the 'capacity factor' compares what the average output is in relation to the maximum possible output (a notional figure, assuming the highest wind speed the turbine is built to cope with blows all the time).

> Wind farms in Victoria have a capacity factor of between 30 and 40 per cent.[3]

Myth: Wind farms make the power grid unstable.

Fact: The current output from Victoria's wind energy is easily integrated into the grid network.

> The National Electricity Market has been designed to balance changing energy demand with supply.

> Victoria currently generates around 1 per cent[16] of its electricity from wind.

> As more wind energy comes on-line, the geographical spread of wind farms together with improvements in wind forecasting will mean the energy industry will easily be able to integrate more wind energy into the grid.

Myth: Wind farms require extra back-up from other generators.

Fact: Victorian wind farms do not require additional back-up.

- The power grid is a dynamic system, designed to ramp up or down to respond to changing demand, and with the ability to provide back-up for all types of generation including wind, hydro, gas or coal.
- The National Electricity Market (NEM) is designed to be sufficiently robust to overcome even the unplanned loss of the biggest generator unit online due to maintenance or faults.
- The NEM is capable of dealing with, responding to, and managing a range of fluctuations, including the variable output from wind farms.
- Energy from wind farms is an important part of the energy mix and is not designed to be a sole energy provider.
- Modelling[17] indicates that at high levels of wind generation (i.e. 1000 MW) there is enough capability within the NEM to accept wind energy supply reliably.
- Sudden falls in wind generation would be met by a combination of increased generation from hydro-electric plant and gas-fired generation in Victoria, imports from operating coal-fired plants in NSW and brown-coal fired plants in Victoria.

Myth: Wind farms can't cope with hot weather.

Fact: Wind turbines have been designed to operate in all weather conditions, including in extremely hot temperatures.

- A modern wind turbine can be built to operate in the range from -20 to +50 degrees Celsius.[18]

Myth: Wind does not blow in hot weather or the hottest part of the day when needed.

Fact: Data from the Bureau of Meteorology shows that Victoria has higher average wind speeds in mid afternoon over summer, when demand is at its highest.

- The Bureau of Meteorology weather observations[19] typically show that there is good wind speed on the hottest days in the summer. For example wind blows 98 per cent of the time across western Victoria at 3 pm in the summer months.
- The Bureau of Meteorology stations at various locations[20] show that wind speed is higher in summer afternoons than in the mornings.

Costs >

Myth: Wind farms are expensive and require government subsidies.

Fact: Wind farms are proven and increasingly cost effective energy providers.

Cost of fuel

> Wind is always free, whereas fossil fuel prices fluctuate and have increased with time. For example, in the USA, natural gas fired generation was more expensive than wind energy in late-2005 when gas prices reached record highs.

Capital costs

> The current capital cost of a typical 2 megawatt wind turbine is about $3.6 million.

> The up-front, capital cost per megawatt for wind farms is currently greater than that of traditional power technologies such as coal.

> However, wind energy has no fuel cost, no fuel supply risk, low operation and maintenance costs and no potential greenhouse liability which all make it a cost effective, secure and competitive source of energy.

Cost of production

> Over the last 25 years, the cost of producing a unit of electricity from wind has reduced by 80 per cent, and cost reductions can be expected to continue.

> Currently energy from wind costs around twice as much as from existing coal fired generators. However, work done by economic consulting firm McLennan Magasanik Associates[21] shows that the cost of wind energy is already comparable or better than the forecast cost of fossil fuel alternatives with comparable (zero) emissions.

> The introduction of carbon pricing mechanisms or a requirement for new generation (cleaner) coal technology will deliver comparable prices in the market.

Government support

> The renewable energy industry is at an early stage of its development. In common with many emerging industries government assistance is necessary to allow the industry to improve new technologies and become commercially competitive, so that it can deliver sustainable and long-term benefits to the community.

Community benefits >

Myth: Wind farms don't create many jobs.

Fact: Wind farms in Victoria have already created hundreds of jobs in regional Victoria and more are expected as the industry grows.

> The $9 million Vestas wind blade factory in Portland has created more than 120 new jobs[22] and the Keppel Prince Engineering tower manufacturing workshop, also in Portland, now employs nearly 250 people in its wind energy division.

> A large wind farm, such as the 165 MW Portland Three Capes project, employs 450 people during construction and creates up to 15 full time permanent jobs.

> Worldwide, the wind sector currently employs more than 235,000 people[24] – most are in highly-qualified jobs in manufacturing, technical and financial services, engineering, research and marketing.

> Many more jobs are created in the local community to service the industry and to support the installation and maintenance of wind farms. The Business Council for Sustainable Energy reports that there are already in excess of 750 indirect jobs[25] related to the renewables industry in Victoria.

Myth: Wind farms have no community benefit.

Fact: Wind farms have many benefits for communities.

Local community benefits

> At a local level, wind farms provide new jobs and contribute significant income to landholders and local communities.

> Wind farms are projected to contribute millions of dollars in rate payments to local councils across Victoria in the future.

General community benefits

> Wind farms help reduce greenhouse emissions, helping communities that are facing the growing problem of climate change.

> In Victoria, changes in our climate are already changing the natural systems that support us with more droughts, storms and bush fires predicted.

> Any changes in temperature and water supplies will impact on local communities and our way of life.

> Victoria's energy demand is growing by more than one and a half per cent each year, and greenhouse gas emissions have increased by 40 per cent since the early 1990s. It is therefore important to look to cleaner, more sustainable energy options to support our environment, communities and economy.

Noise >

Myth: Wind farms are noisy.

Fact: You can hold a normal conversation at the base of a running turbine without having to raise your voice.

- Advances in technology mean the mechanical sound from modern wind turbines has practically been eliminated.
- Noise is assessed using the New Zealand Standard NZS6808: 1998 Acoustics – The Assessment and Measurement of Sound from Wind Turbine Generators.
- The planning process ensures that noise from all turbines is determined before the wind farm is built to ensure it is within the acceptable range.

Birds and livestock >

Myth: Wind farms pose a threat to birds.

Fact: Monitoring has found that no rare, threatened or endangered birds or bats have been killed by wind turbines in Victoria.

- No rare, threatened or endangered species have been killed in Victoria as a result of wind farms.
- Based on seven-months of monitoring[26] at the Codrington wind farm the mortality rate for common bird species for the Codrington wind farm was estimated to be 1.2 birds per turbine per year.
- Rigorous planning processes ensure that the risk to rare and threatened birds is fully assessed before a wind farm can go ahead.
- Millions more bird deaths are caused by collision with vehicles, buildings, windows, communication towers and powerlines than wind farms.[27]
- A 2001 US study[27] estimates that bird deaths from wind farms is less than 0.02 percent of the total bird deaths caused by collisions with human built structures.

Myth: Wind farms scare livestock.

Fact: Wind farms do not have any noticeable effect on stock or cropping.

- There have been no reports of decreased production from farms as a result of having wind turbines on the land.
- Animals graze normally around the towers without any discernible impact.

Community support and location>

Myth: Most people don't want wind farms.

Fact: A poll by AC Nielsen in October 2006[28] found that 77 per cent of Australians think we should have more wind farms.

> The same poll found that 68% of people were prepared to pay more for their electricity if it came from environmentally friendly sources.

> A Newspoll in May 2005[29] found 94 per cent of Victorians believed it was important to make energy from renewable sources rather than fossil fuels.

Myth: Wind farms will ruin Victoria's coastline.

Fact: Most wind farms in Victoria are being developed on private farms located inland, away from the coast.

> The Victorian Government's Policy and Planning Guidelines for the development of wind energy facilities in Victoria prohibit commercial wind developments on land reserved under the National Parks Act which means that commercial wind farms are excluded from Wilson's Promontory and over 40 per cent of Victoria's coastline.

> The Guidelines are in place to protect significant landscapes from inappropriate wind farm developments and include rigorous environmental and visual impact assessments.

> The Guidelines provide for community consultation in an open and transparent process.

Myth: Wind farms reduce property values.

Fact: Studies have found no evidence to support the claim that wind farms decrease property values.

> While no formal studies have yet been carried out in Australia, studies in the USA[30,31] and Denmark[32] have found there is little to suggest that wind farms impact negatively on the value of neighbouring properties.

Safety >

Myth: Wind farms attract lightning.

Fact: Lightning does not pose a threat to wind turbines.

> All wind turbines are equipped with comprehensive lightning protection systems.

> Lightning protection systems transfer high voltages and currents to the ground without affecting turbine performance.

> Turbine blades usually have internal lightning conductor rods running all the way to the blade tips.

Myth: Wind farms start fires.

Fact: The fire risk at wind farms is very low.

> Flammable components are located high above the ground.

> High-voltage connections are underground.

> Lightning protection devices are installed on every wind turbine.

> By comparison the recent fires at Longford, Energy Brix and Hazelwood coal mine show that large fossil fuel installations are at greater risk and have far more severe impacts.

References >

[1] Victorian Greenhouse Gas Inventory 2004

[2] Data from ABARE eReport 05.9, australian energy: national and state projections to 2029–30, 2004

[3] *'Assessment of Greenhouse Gas Abatement from Wind Farms in Victoria'*, MMA July 2006

[4] Based on MMA report,[3] and using a capacity factor of 35%

[5] Based on 134 MW with an average capacity factor of 35%

[6] *'Comparison of energy systems using life cycle assessment,'* A Special Report of the World Energy Council, July 2004

[7] See for example, the Power Station Heat Rate (GJ/MWh) versus Output (MW) for Hazelwood Power Station included in the MMA report[3]

[8] *'The energy balance of modern wind turbines,'* Danish Wind Turbine Manufacturers Association, No. 16 December 1997

[9] Based on assumption that a Victorian homes consumes 5.87 MWh per annum.

[10] 2016.0 – Census of Population and Housing: Selected Characteristics for Urban Centres, Australia, 2001

[11] Australian Wind Energy Association

[12] *'Worldwide wind energy boom in 2005: 58.982 MW capacity installed'*; World Wind Energy Association, March 2006

[13] *'Wind power plants; Fundamentals, design, construction and operation,'* Gasch and Twele, Solarpraxis, Berlin, 2002

[14] Loy Yang Power, Sustainability Report 2005

[15] Information supplied by Pacific Hydro

[16] Based on Sustainability Victoria analysis

[17] Assessment of Potential Security Risks due to High Levels of Wind Generation in South Australia – Summary of DIgSILENT Studies (Stage1); NEMMCO, December 2005

[18] Germanischer Lloyd, Rules and Regulations Non-Marine Technology, Regulations for the Certification of Wind Energy Conversion Systems

[19] http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/windrose_selector.cgi

[20] http://www.bom.gov.au/climate/dwo/200512/html/IDCJDW3068.200512.shtml

[21] *'Renewable Energy – A Contribution to Australia's Environmental and Economic Sustainability,'* McLennan Magasanik Associates Pty Ltd; June 2006

[22] Information supplied by Vestas, 17 October 2006

[23] Information presented by Pacific Hydro Pty Ltd at BCSE Victorian Clean Energy Conference, 19 March 2007

[24] *'Worldwide Wind Energy Boom in 2005,'* World Wind Energy Association, Press Release, Monday 6 March 2006

[25] Information provided by Australian Business Council for Sustainable Energy, 24 March 2006

[26] Codrington Wind Farm Avian Avoidance Behaviour Report, Meredith, Venosta and Ressom, Biosis Research Pty Ltd., 2002

[27] *'Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States,'* National Wind Coordinating Committee (NWCC), August 2001

[28] *'Wind Energy Study'*, AC Nielsen, October 2006

[29] *'Sustainable Energy Study'*, Newspoll, May 2005

[30] *'Economic impacts of the Kittitas Valley wind project,'* A report to the Economic Development Group of Ellensburg WA, ECONorthwest, August 2006

[31] *'Impacts of Windmill Visibility on Property Values in Madison County, New York,'* Project report submitted to the Faculty of the Bard Center for Environmental Policy, Ben Hoen, April 2006

[32] *'Social Assessment of Wind Power; Visual Effect and Noise from Windmills – Quantifying and Valuation,'* Jørgen Jordal-Jørgensen, AKF, April 1996

Sustainability Victoria
1300 363 744

Urban Workshop
Level 28/50 Lonsdale Street
Melbourne 3000, Australia
www.sustainability.vic.gov.au

This document is printed on Tudor, an Australian made stock.
It contains 100% pre-consumer and post-consumer waste fibre.
No additional bleaching is used in the recycling process.