

sustainable
energy

innovation

a new era
for australia

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www.energycentral.com.au will give life to this important Australian energy industry initiative through the creation of this dynamic online directory.

foreword



The world is entering an era when the ability to provide sustainable and cost-effective energy solutions that meet people's needs will shape the international competitiveness of companies and the productivity of national economies.

Australia brings major advantages to meet this challenge. We have a strong history of innovation in developing new and renewable energy sources and technologies. Our capabilities in coal, gas, oil and in utilising renewable resources like biomass, wind and sunshine provide a diversity of options for secure and reliable energy supplies. Capturing the benefits from improved energy efficiency in industry, power generation, buildings and transport are proving crucial in improving productivity and providing sustainable energy solutions.

In developing a future vision for the national energy market, Australia is guided by the principles of:

- Promoting efficiency in energy supply, including efficiently operating markets and competitive energy costs
- Promoting efficient energy use
- Fostering energy diversity
- Maintaining environmental responsiveness

The Government is targeting greenhouse gas emissions abatement across the entire Australian community through a AU\$1 billion portfolio of programs.

The Mandatory Renewable Energy Target creates a guaranteed market for 9,500 gigawatt hours of new renewable energy generation that will drive billions of dollars of new investments in Australia.

The Renewable Energy Action Agenda provides the framework for industry and the Government to work towards achieving industry's vision for annual renewable energy sales of AU\$4 billion by 2010.

Investment in innovation through Cooperative Research Centres in areas covering clean coal and renewable energy, and through the Commonwealth Scientific and Industrial Research Organisation, provide the foundation for further industry development.

Mandatory minimum energy requirements included in the Building Code of Australia will provide new standards of energy efficiency for domestic and commercial buildings.

This volume provides an practical overview of the diversity of the skills, technologies and capabilities available from Australia's sustainable energy industries. It also outlines the efforts underway to capitalise on the opportunities available in Australia and offshore.

Investors will be interested to learn how attractive Australia is as an investment location. The diversity of products and services available will impress importers. The research and finance communities will appreciate the innovation in Australia and the opportunities for commercialising ideas. Decision-makers in government and business will be better informed by the comprehensive overview of this growing field.

I recommend this volume to you.

Hon Ian MacFarlane, MP
Minister for Industry, Tourism and Resources

Australia is fortunate to be a country rich in energy resources, but the availability of relatively inexpensive energy supplies has resulted in the development of energy-intensive industries on our shores and high per-capita energy consumption. Our dependency on fossil fuels – coal, oil and natural gas – while unlikely to change radically in the foreseeable future, requires us to take action to reduce the emissions of greenhouse gases derived from these fuels and to seek sustainable energy practices and solutions.

It is clear that a two-pronged approach is required to mitigate energy-related greenhouse gas emissions.

We need to:

- Develop a strong national commitment to energy end-use efficiency
- Ensure a sustainable supply of energy

This is the scope of this book, which profiles Australian capability in sustainable energy innovations.

Chapter 1 outlines the country's underlying drivers and support programs for sustainable energy development and gives an overview of Australia's sustainable energy industry. Renewable energy companies and their projects are covered in Chapter 2, while sustainable energy innovation in the fields of coal, gas and cogeneration are highlighted in Chapter 3. This is followed by Chapter 4, which turns the spotlight on energy efficiency in the building and transport sectors. Chapter 5 focuses on the challenge of bringing sustainable Australian energy innovations to global markets, highlighting interaction with government support programs and the transition from laboratory to commercial product. Chapter 6 peers into the future, taking stock of the innovations waiting in the wings and predicting the technologies that are likely to emerge in coming years onto our energy landscape.

A publication such as this can only report part of the story. Through the information and case studies provided we hope to demonstrate that Australia is a fertile ground for sustainable energy innovation investment and to showcase our capacity to provide the world market with sustainable energy solutions.

Allan J Gillespie

Immediate past Chairman

Electricity Supply Association of Australia



ALLAN J GILLESPIE

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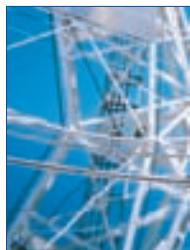
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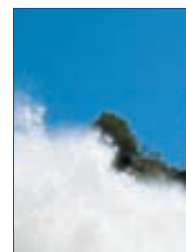


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initiatives:
improving the
environment
while
increasing
regional
development,
employment
and export
markets

DR STEPHEN SCHUCK
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sustainable energy initiatives in australia

The environmental consequences of the use of fossil fuels have focused the world's attention on the need to produce and use energy in a sustainable manner, with minimal emission of greenhouse gases. This recognition has led to greater emphasis on the environment for policy makers, industry, business and domestic consumers alike, setting the stage for unprecedented global growth in the field of sustainable energy innovation. Investment in energy-efficient practices and renewable energy sources is increasing rapidly in response to global warming and other environmental concerns.

In Australia, companies already established in traditional energy industries, such as coal, oil and natural gas, are becoming innovators in the development of sustainable energy sources and are improving the environmental performance of fossil fuels. The restructuring of the electricity supply industry and the introduction of competitive energy markets has also changed the corporate focus, offering new opportunities for renewables in

an energy economy still largely based on fossil fuels. The country has also seen growing interest in sustainable transportation systems.

Many outlying parts of Australia are not connected to transmitted electricity supply, thus creating a need for remote area power supplies as well as providing the opportunity to implement modular, innovative solutions based on energy efficiency and a range of renewable energy sources.

commonwealth government initiatives

[initiatives improving the environment]

In June 2001 the Council of Australian Governments (COAG) agreed to establish a new Ministerial Council on Energy in order to provide a national framework to guide future energy policy decision-making. The Council generally reaffirmed existing commitments to currently agreed electricity and gas market reforms, including an independent review of the benefits of energy market reform and directions for future market development. The review will identify the strategic issues for Australian energy markets and the policies required from Commonwealth, State and Territory Governments. It is anticipated that this National Energy Market Reform process will encourage a diverse range and choice of energy solutions in Australia.

The Commonwealth Government announced several measures that have driven Australia's sustainable energy industry forward, including industry development initiatives aimed at increasing regional development and export opportunities.

Key components of these measures include:

AUSTRALIAN GREENHOUSE OFFICE

The **Australian Greenhouse Office (AGO)** was established as a separate agency within the environment portfolio to provide a whole-of-government approach to greenhouse matters. Support for renewable energy provided through

the AGO includes commercialisation assistance, promotional showcases, market analyses, grant programs, standards, training and information. The AGO programs in support of greenhouse gas mitigation, including sustainable energy, have amounted to approximately AU\$1 billion over five years.



Dish concentrating photovoltaic module.
Picture courtesy: Solar Systems.

Major AGO programs in support of sustainable energy are:

Opposite page: Solar concentrator.
Picture courtesy: Stanwell Corporation.

RENEWABLE ENERGY SHOWCASE PROGRAM

The Renewable Energy Showcase Program is a AU\$10 million, single-round competitive grants program. It supports and promotes leading-edge and strategically important renewable energy projects that have strong commercial potential, are technically proven, demonstrate the potential for large-scale widespread application, offer the prospect of significant abatement of greenhouse gas emissions over the longer term, and make a substantial contribution towards building the capacity of Australia's renewable energy industry (see Chapter 5 for project details).

RENEWABLE ENERGY COMMERCIALISATION PROGRAM (RECP)

The **Australian Greenhouse Office's** Renewable Energy Commercialisation Program (RECP) is a five-year, AU\$55.6 million competitive grants program designed to foster the development of the renewable energy industry in Australia by providing funds for projects leading to the commercialisation of innovative renewable energy equipment, technologies, systems and processes. The program has two components: Commercialisation and Industry Development. The Commercialisation component of the program has now completed six rounds, offering funding for 50 projects across the renewable energy spectrum (see Chapters 2, 5 and www.greenhouse.gov.au/renewable/recp/support.html for details of project awards).

The Industry Development component of the Renewable Energy Commercialisation Program has been established to provide funding support for projects that benefit a class of industry participants and address broader issues, such as removing barriers to the implementation of renewables.

RENEWABLE ENERGY EQUITY FUND (REEF) PROGRAM

The Renewable Energy Equity Fund (REEF) program established a venture capital fund specifically to support renewable energy businesses with an annual income of less than AU\$5 million per year. Under this program, the Commonwealth Government provides funds in a ratio of 2:1 with private sector funding.

AusIndustry, in conjunction with the **Australia Greenhouse Office**, conducted a competitive

assessment of applicant fund managers, and awarded the fund licence to **CVC REEF Ltd**. Further details on this program are in Chapter 5.

GENERATOR EFFICIENCY STANDARDS PROGRAM

A key program with the **Australian Greenhouse Office** is the Commonwealth's voluntary Generator Efficiency Standards Program, in which all of the largest Australian coal-based generators have agreed to sign onto a program that aims to reduce cumulative carbon dioxide equivalent emissions by four million tonnes by 2010.

GREENHOUSE GAS ABATEMENT PROGRAM (GGAP)

The **Australian Greenhouse Office's** Greenhouse Gas Abatement Program is a AU\$400 million competitive program that will run over four years, targeting opportunities for large-scale, cost-effective and sustainable abatement across the economy.

The objective of the Program is to reduce Australia's net greenhouse gas emissions by supporting activities that are likely to result in substantial emission reduction or substantial sink enhancement, particularly in the first commitment period under the Kyoto Protocol (2008-2012). To date, there have been two funding rounds.



Biogas flare at Swanbank bio-reactor cell.
Picture courtesy: Thiess Services.

RENEWABLE REMOTE POWER GENERATION PROGRAM

The **Australian Greenhouse Office's** Renewable Remote Power Generation Program provides funds through the State and Territory Governments to encourage the use of renewable energy in lieu of diesel fuel for electricity generation in remote parts of Australia. Up to AU\$264 million is available over four years through rebates of up to 50 percent of the capital cost of a renewable energy installation for renewable remote-area power supply systems.

PHOTOVOLTAIC REBATE PROGRAM

The Photovoltaic Rebate Program of the **Australian Greenhouse Office** provides cash rebates to householders and owners of community-use buildings who install grid-connected or stand-alone photovoltaic systems.

GREENHOUSE CHALLENGE

The Greenhouse Challenge is a major Commonwealth Government and industry greenhouse response program. At the time of its launch in 1995 it was one of the world's first formal voluntary programs to focus on industrial greenhouse gas emissions. The program offers participants benefits that include financial savings in return for improvements in energy efficiency, public recognition for their efforts and credible monitoring of progress on greenhouse abatement.

Emission reductions from the Greenhouse Challenge are estimated to be equivalent to 23.5 million tonnes of greenhouse gas, compared with what would have occurred in the absence of the program.

Independent verification of outcomes is also a strong point of the program, which adds to its credibility and builds Australia's capacity to monitor progress towards greenhouse targets.

MANDATORY RENEWABLE ENERGY TARGET

An important initiative, the **Mandatory Renewable Energy Target (MRET)** for electricity provided by electricity retailers or used by large buyers, commenced on 1 April 2001. The target requires an additional 9,500GWh per year of supply by 2010 to be maintained at this level until 2020. The target operates via the creation



and trading of renewable energy certificates (RECs), each equal to 1MWh of renewable electricity generated or displaced, in the case of solar water heaters.

The **Office of the Renewable Energy Regulator (ORER)** has been established to oversee the implementation of the measure. Plans are already under way for a variety of biomass, landfill gas, municipal solid waste, hydro, solar and wind projects. Investments of around AU\$3 billion are expected to result from this mandated market.

Rocky Point sugar mill new 30MW cogeneration power plant.
Picture courtesy: Stanwell Corporation.



This 100 kilowatt PV array at Wilpena Pound in South Australia was installed by Advanced Energy Systems in 1997. Picture courtesy: Advanced Energy Systems.

RENEWABLE ENERGY ACTION AGENDA

The Commonwealth Government is also supporting the renewable energy industry through the development of an Industry Action Agenda. This agenda was developed in conjunction with renewable energy and related industry groups and aims to increase the size of the industry to one with a turnover of AU\$4 billion by 2010.

The Action Agenda sets out to leverage government support to develop business opportunities, promote renewable transport fuels, implement an export strategy; increase community commitment, improve the reliability and quality of renewable energy products and services, ensure skilled people are available to support industry growth, improve access to finance, establish a renewable energy peak industry forum and implement a renewable energy industry innovation strategy.

ENERGY EFFICIENCY BEST PRACTICE (EEBP) PROGRAM

The Commonwealth Government's Energy Efficiency Best Practice (EEBP) Program aims to stimulate energy-efficient good practice in industry, leading over time to best practice. EEBP is administered within the Federal **Department of Industry, Tourism and Resources (ITR)**, in cooperation with other government agencies and industry associations, to optimise the benefits of the range of greenhouse gas reduction, competitiveness and innovation programs.

INTERNATIONAL GREENHOUSE PARTNERSHIPS OFFICE

Under the UN Framework Convention on Climate Change, there is provision for countries to

undertake collaborative projects to reduce greenhouse gas emissions via the Activities Implemented Jointly (AIJ) pilot phase. In addition, the Kyoto Protocol provides for collaboration between developed countries, via Joint Implementation (JI), and developing countries through the Clean Development Mechanism (CDM). In 1998, the Commonwealth Government set up the International Greenhouse Partnerships (IGP) Office to enable Australia to gain experience with collaborative projects and facilitate the establishment of CDM and JI. Australia has reached agreement with eight countries to implement 12 pilot projects that encompass the use of renewable energy and energy-efficient technologies (refer to Chapter 2 for examples). The Office has also provided capacity building for 22 developing countries and economies in transition to increase their ability to participate in collaborative projects.

COOPERATIVE RESEARCH CENTRES PROGRAM

The Australian Commonwealth Government launched the Cooperative Research Program in May 1990. This was set up to strengthen collaborative links between industry, research organisations, educational institutions and government agencies. Under this program the **Australian CRC for Renewable Energy (ACRE)**, the **CRC for Coal in Sustainable Development**, and the **CRC for Clean Power from Lignite** have been established. They each have programs that act as drivers for the sustainable production of energy.

Australian States and Territories also conduct a variety of programs in support of sustainable energy development and commercialisation.



The power of waves. Picture Courtesy: Pacific Hydro.

NEW SOUTH WALES

In early 2002, the New South Wales Government released a position paper that is likely to make New South Wales the first state in Australia to set compulsory benchmarks for the electricity industry that enforce greenhouse gas emission reductions.

The NSW Government's **Sustainable Energy Development Authority** (SEDA) supports the introduction of innovative sustainable energy technologies and practices through a variety of targeted programs:

BUSINESS ENERGY EFFICIENCY PROGRAM

This program includes:

- **Energy Smart Business** – A partnership program with 170 businesses committed to implementing energy efficiency.
- **Energy Smart Government** – Aims to assist NSW Government agencies to meet the Premier's energy reduction targets of 15 percent by 2001/2002 and 25 percent by 2005/2006.
- **Energy Star** – A joint initiative of Commonwealth, State and Territory Government agencies aimed at promoting the manufacture, distribution and use of energy-efficient office equipment and home electronics.
- **Building Greenhouse Rating Scheme** – A voluntary program for commercial office buildings, designed to enable building owners, managers and tenants to get market recognition for superior greenhouse performance.

RESIDENTIAL ENERGY EFFICIENCY PROGRAM

This program includes:

- **Energy Smart Products** – A new initiative designed to increase consumer demand for energy-efficient technologies.
- **Energy Smart Homes** – The end goal is to ensure that 75 percent of new homes built in NSW are energy efficient.
- **Energy Smart Hot Water** – Designed to encourage NSW residents to install energy-efficient water heaters and assist local government authorities to implement the Energy Smart Homes Policy.
- **Reach For The Stars** – A partnership between white goods manufacturers and retailers aimed

at encouraging consumers to purchase those appliances with highest possible efficiency. This program is jointly funded by **SEDA**, the **Sustainable Energy Authority of Victoria**, and the **Australian Greenhouse Office**.

- **Energy Smart Information Centre** – This provides practical, impartial advice on all aspects of residential energy efficiency and renewable energy applications.



EnergyAustralia's PV power station at Singleton NSW. Picture courtesy: EnergyAustralia.

RENEWABLE ENERGY PROGRAMS

Renewable energy initiatives by **SEDA** include:

- **Green Power** – An accreditation program that monitors the purchase and delivery of Green Power which enables a certain percentage of customers' electricity to be generated from qualifying renewable sources by energy providers.
- **Renewables Investment Program** – A financial assistance program for the installation of new renewable energy projects of greater than 25kW capacity.
- **Photovoltaic Rebates** – This program promotes and administers the PVRP scheme in NSW in line with AGO guidelines.
- **Wind Monitoring Program** – Wind is monitored at 25 sites, with the information made available to industry.
- **Bioenergy Development Program** – Encourages the development of a variety of projects that convert biomass to renewable energy, either as electrical energy or as a gas or liquid fuel.
- **Hydro Development Program** – The development of hydro stations on existing dams and weirs where there is no adverse impact on the local ecology.

state government initiatives

- Renewable Energy Project Facilitation – Support for a list of current renewable energy projects, particularly in wind, hydro and biomass. Provides specific facilitation for these projects.
- Cogeneration Investment Program – A financial assistance program for the installation of new small-scale cogenerators.
- Cogeneration Development Program – Established to provide assistance for companies to carry out feasibility studies and case studies of potential cogeneration projects.
- Mine Waste Gas Program – A AU\$2.5 million, four-year program to identify mine waste gas potential in NSW and assist industry in developing this resource.



Solar street light. Picture courtesy: Australian Greenhouse Office, Photographer Arthur Mosthead.

GENERAL INITIATIVES DEVELOPED BY SEDA

These include:

- Sustainable Energy Export Program – A program to facilitate export on behalf of sustainable energy businesses across Australia.
- Demand Side Management Program – Aimed at assisting network service providers and electricity retailers to implement Demand-Side Management solutions.

VICTORIA

The **Sustainable Energy Authority of Victoria** supports development and use of sustainable energy solutions, including solar hot water systems, through a rebate program. It also administers the **Australian Greenhouse Office's** Photovoltaic Rebate Program within the state and provides energy advisory and education programs and services.

QUEENSLAND

The Queensland Government has a number of policies and programs in place to foster the development of sustainable energy through its Cleaner Energy Strategy. This includes a requirement for electricity retailers in Queensland to source 15 percent of their power from alternative sources to coal, with at least 13 percent from gas, and the remainder from renewable sources by 2005.

Other programs (some joint Commonwealth–State programs) include: the Solar Hot Water Rebate Scheme, Photovoltaic Rebate Program, Remote Area Power Supply Rebate Scheme, Renewable Remote Power Generation Program, Energy Efficiency in the Built Environment, Energy Efficiency in Local Government, Energy Efficiency in Industry, a Smart Allies Directory, Government purchasing of 'Green Energy', and the formation and operation of **QSEIF** (see below). In addition government fleet vehicles will be fuelled on E10 ethanol/petrol-blended fuel from 2003.

The Queensland Government purchases 5 percent (approximately 50GWh/a) of its non-transport energy demand from 'green energy' sources to set a base demand and facilitate development of new renewable energy sources. Green energy is sourced specifically for Parliament House and several government offices including that of the Premier of Queensland.

The **Queensland Sustainable Energy Innovation Fund (QSEIF)** is administered and funded by the Queensland Government. Queensland aims to be a market leader in energy innovation and sustainable energy practices by supporting innovative projects that deal with the research, development, demonstration or commercialisation of renewable energy and energy efficiency. **QSEIF** has to date funded 27 projects, granting up to AU\$200,000 to each in a series of competitively bid solicitations (refer to Chapter 5).

SOUTH AUSTRALIA

The **South Australian Government's Energy SA** administers the State Energy Research Advisory Committee, which supports energy research projects. **Energy SA** also administers the Commonwealth Government's renewable energy rebate programs in the state.



WESTERN AUSTRALIA

In Western Australia, the recently established **Sustainable Energy Development Office** provides funding and grants to support renewable energy and energy efficiency projects. It also administers the state-funded **Alternative Energy Development Board**, which provides grants for research, demonstration and education projects in renewable energy and energy efficiency; a state-funded Solar Water Heater Rebate program and the Commonwealth Government renewable energy rebate programs.

TASMANIA

Tasmania's **Office of Energy Planning** administers the Commonwealth Government's renewable energy rebate programs in the state. The **Department of State Development** and the **Industrial Supplies Office** are both supporting the emerging local wind manufacturing industry.

GREEN POWER

Launched in 1997 by the NSW Government, the Green Power Accreditation Program was one of the first of its type in the world. Based on stringent environmental auditing and reporting requirements, the Program now accredits eligible renewable energy generators and green electricity products nationally.

Over 96 percent of Australian customers now have access to Green Power, with 15 energy retailers providing a Green Power product to residential and

commercial customers. Voluntary customer participation from 60,000 households and over 2,500 businesses has been responsible for the installation of over 60 new renewable energy projects in NSW alone, and the reduction of close to 1 million tonnes of greenhouse gas emissions over the life of the program.

The energy sold through Green Power has steadily increased each year from 40 GWh in June 1997 to 455 GWh in June 2001 and is anticipated to reach 1,500 GWh by 2010.

For more information about any aspect of the National Green Power Accreditation Program visit www.greenpower.com.au.

RENEWABLE ENERGY INDUSTRY STRUCTURE

The generation of electricity from renewable resources currently constitutes more than 10 percent of total electricity generation in Australia, with large-scale hydro-electricity as the prime source (refer to Chapter 2).

The Australian renewable energy industry comprises over 2,000 relatively small companies involved in manufacturing and installation, a number of large manufacturers and a range of utilities, government agencies and non-government organisations. It employs more than 20,000 people and is one of the fastest-growing industry sectors in the country. A survey conducted for **SEDA** showed that the industry was growing at an astounding 20 percent per annum and was worth AU\$1.2 billion in 1998 for New South Wales alone. [continued page 26]

Rocky Point sugar mill.
Picture courtesy: Stanwell Corporation.

sustainable energy in the queensland government



Poona Lake, Great Sandy National Park, Queensland.
Picture courtesy: Tourism Queensland.

The Queensland Government is committed to the development of sustainable energy sources and practices through its Cleaner Energy Strategy and implementation of a range of renewable energy and energy efficiency programs. This sets an ideal climate for sustainable energy innovation and investment in Queensland.

The Queensland Government has taken the lead in the development of a national energy program through the adoption of its Cleaner Energy Strategy in May, 2000.

The strategy aims to generate long term economic growth, attract new sustainable industries and meet Queensland's environmental obligations, according to Premier Peter Beattie.

"The Cleaner Energy Strategy is a long-term blueprint to ensure Queensland realises its full economic potential," Mr Beattie said.

"The key objectives include a requirement for electricity retailers in Queensland to source 15 percent of their power sold in the state from alternative energy sources (i.e. other than coal) – at least 13 percent from gas and the remainder from renewable sources – from January 1, 2005."

The strategy is implemented by the Office of Energy, which was established within the Treasury Department in March, 2001.

Cheap, internationally competitive energy in growing quantity is essential to underpin Queensland's future growth.

The Premier points out that great growth opportunities exist in minerals processing, food manufacture and biotechnology.

"As a state, Queensland must compete in an aggressive global market for investment," he says.

"Industrial investors are seeking services that meet modern expectations of competition, reliability and sustainability.

"This is particularly the case for energy."

Premier Beattie acknowledges that coal will continue to play a prominent role in Queensland's energy supply but adds that the state must strengthen its position by offering a greater diversity of cleaner energy sources.

"In the absence of a national Greenhouse policy, the energy market is failing to recognise the benefits of lower greenhouse gas emissions," he says.

"The Queensland Energy Policy seeks to meet these challenges by encouraging the establishment of a competitive market for gas, and the development of other sustainable energy options to complement our continuing strength in coal-fired power.

"The package of cleaner energy initiatives creates, for the first time in Queensland, an energy policy which seeks to satisfy the complex, often competing, demands of growth, efficiency and sustainability."

The Queensland Government is committed to ensuring that electricity consumers obtain the price benefits of a competitive energy market, while ensuring that the greenhouse impacts of energy generation are being appropriately managed.

The majority of Queensland's energy comes from non-renewable fossil fuels.

The Cleaner Energy Strategy promotes the increased use of renewable energy resources such as solar, wind, bagasse from sugar mills and mini-hydro plants.



Ulysses butterfly, Daintree, Far North Queensland.
Picture courtesy: Tourism Queensland.



The Government's objective is to diversify Queensland's energy sources and develop a cleaner and more sustainable energy mix.

This will result in better use of existing resources while offering significant development opportunities for regional Queensland.

The Government is also strongly committed to helping Queenslanders use energy more efficiently to lower energy costs and reduce greenhouse gas emissions.

Greater use of renewable energy and continued improvements in energy efficiency are vital to help reduce greenhouse gas emissions, the Government believes.

Under the energy policy, the Queensland Government will spend more than \$50 million over the next five years on programs targeted at supporting renewable and innovative energy technologies and reducing greenhouse gas emissions.

There are a number of key agencies working cooperatively in the quest to reduce of greenhouse gases created by electricity generation.

These departments include:

- The Treasury Department (Office of Energy)
- The Environmental Protection Agency
- The Department of the Premier and Cabinet
- The Department of Public Works

The Office of Energy promotes sustainable development within the Queensland energy sector and is involved in a range of activities that reflect the importance of a sustainable approach.

These activities involve developing and evaluating

policies and initiatives through flexible and responsible decision making that allows environmental, economic and social outcomes from the energy sector to be maximised.

The Office of Energy is responsible for the development of renewable energy policies and initiatives, and provides advice on renewable energy issues.

The Environmental Protection Agency (EPA), as the lead State Government agency in renewable energy, has developed a range of incentive programs and rebate schemes to encourage Queensland's residents and businesses to use renewable energy sources.

As part of the Government's commitment to reducing greenhouse gas emissions, a Sustainable Industries Division has been established within the EPA.

This division works to promote energy efficiency and renewable energy throughout the State to achieve increased investment in sustainable energy systems, technology and practice.

The EPA also provides sustainable energy related technical expertise, advice and facilitation to industry and other government agencies.

The Department of Public Works supports innovations that conserve energy, reduce greenhouse gas emissions, save costs and improve the quality of the built environment for Queenslanders.

In the 1999/2000 State Budget the Department of Public Works earmarked \$500,000 to start a \$2 million, four-year program to help cut greenhouse gas emissions through the trial of energy-efficient building design and technology, and alternative power technology in the government's car fleet.



The Kareeya Hydro, Central Queensland.
Picture courtesy: Stanwell Corporation.

Left: Fairymead Sugar Mill Bundaberg, Queensland.
Picture courtesy: Natural Resources and Mines.

sustainable energy in the queensland government



Wind turbines at Windy Hill Farm near Ravenshoe, North Queensland.
Picture courtesy: Stanwell Corporation.

RENEWABLE ENERGY PROGRAMS

The EPA plays a major role in achieving the Government's priorities and assisting with the implementation of the 2000 Queensland Energy Policy.

The schemes that the EPA administers are funded by both the State and Federal Governments. These schemes include:

SOLAR HOT WATER REBATE SCHEME

The Solar Hot Water Rebate Scheme was introduced in September 1998 to increase the use of solar water heating in domestic applications throughout Queensland.

Householders who buy a solar hot water system, replacement panel or tank may apply for a rebate under the scheme.

The scheme has been extremely successful and with the introduction of Renewable Energy Certificates (REC's) the demand for solar hot water systems has increased dramatically.



Rooftop solar panels. 120 Edward Street, Brisbane, Queensland.
Picture courtesy: Environmental Protection Agency.

Throughout the 2000/01 financial year 4077 rebates were given out totalling \$2,822,300. As of February 2002, 3491 rebates totalling \$2,546,300 have been given for solar hot water systems for the 2001/02 financial year.

THE QUEENSLAND SUSTAINABLE ENERGY INNOVATION FUND

The Queensland Sustainable Energy Innovation Fund (QSEIF) promotes commercialisation of innovative, renewable energy and energy efficiency technologies.

The fund will target projects that establish Queensland as a leader in sustainable energy technologies.

QSEIF will invest \$5 million over the five years 2000-2005. To date there have been a number of successful projects including commercialisation of a solar pool chlorinator, an energy efficient reservoir mixer and a geothermal power station.

THE PHOTOVOLTAIC REBATE PROGRAM

The Photovoltaic Rebate Program (PVRP), which commenced on 1 January 2000, offers cash rebates to householders and owners of community-use buildings who install grid-connected or stand-alone photovoltaic (solar) systems.

Up to \$31 million is available over the expected four-year life of the program.

The EPA operates the program in Queensland on behalf of the Commonwealth Government.

To date 35 grid-connected photovoltaic systems have been installed under the PVRP, requiring rebates totalling \$2,018,367.

This program also provides rebates for systems installed on community use buildings such as schools and local government buildings, provided that the installation can be demonstrated to have educational and interpretative merit.

Using the Community Use PVRP and Queensland Government and industry support, the EPA has developed the Solar Cool Schools pilot program.

This program is installing 2kW photovoltaic power systems in 17 schools across Queensland and providing 'hands on' education in solar power technology to Queensland students.



THE REMOTE AREA POWER SUPPLY REBATE SCHEME

The Remote Area Power Supply (RAPS) Rebate Scheme commenced in December 1998.

The RAPS scheme provides financial assistance to owner-occupier households whose properties are not connected to the electricity grid and who install stand-alone power systems, incorporating renewable energy components, at their principal place of residence.

Solar panels on a property, Outback Queensland.
Picture courtesy: Environmental Protection Agency.

Solar concentrator, Queensland.
Picture courtesy: Stanwell Corporation.

To date there have been over 1000 systems installed under the scheme, including 315 in 2001. Rebates granted throughout 2001 totalled \$1,829,822.

The scheme will be replaced in June 2002 by a Commonwealth funded program under the Renewable Remote Power Generation Program which will continue to support off grid properties to install renewable energy systems.



Tailrace of water near the Kareeya Hydro, Central Queensland.
Picture courtesy: Stanwell Corporation.



sustainable energy in the queensland government



Outback sunset over waterhole, Longreach, Queensland.
Picture courtesy: Tourism Queensland.

THE RENEWABLE REMOTE POWER GENERATION PROGRAM

The Renewable Remote Power Generation Program (RRPGP) is a Commonwealth Government program administered by the EPA in Queensland.

The RRPGP will provide \$32 million over the next four years to support programs aimed at replacing diesel generators with renewable energy based systems.

Under the RRPGP there are three Queensland programs:

RENEWABLE ENERGY DIESEL REPLACEMENT PROGRAM (REDRS)

This program targets off grid electricity production and provides rebates of 50 percent for the installed cost of renewable energy systems. There is no set cap on rebates.

Large commercial installations are encouraged as well as smaller installations that are not eligible

under other schemes or those that have received the maximum allowance under other schemes and wish to expand their existing system.

Throughout 2001, 15 rebates totalling \$198,293 were granted under REDRS.

WORKING PROPERTY REBATE SCHEME

Rebates of up to \$175,000 will be available to family-owned working properties that install Remote Area Power Supply (RAPS) systems incorporating renewable energy generation. WPRS will provide funds for up to 30-40 large systems per year.

Following its launch in early 2001, six applications have been received to date. Rebates on these applications are estimated at \$594,900.

Rooftop solar panels. 120 Edward Street, Brisbane, Queensland.
Picture courtesy: Environmental Protection Agency.





RENEWABLE ENERGY PUMPING SCHEME

The Renewable Energy Pumping Scheme provides 50 percent rebates (up to \$5000 per property) for the installation of renewable energy pumping systems that replace diesel pumping systems.

The pumping systems must be used for agricultural purposes.

In addition to the rebate schemes available to householders and businesses, the Sustainable Industries Division has established partnerships with key industry organisations and local governments to implement energy efficiency programs.

ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT

A partnership between the EPA and the Property Council of Australia as well as major Queensland builders and developers has seen the establishment of the Building Greenhouse Rating Scheme in Queensland.

This scheme enables the assessment of commercial, particularly high-rise, buildings for water and energy efficiency.

It can show how to substantially reduce ongoing costs for property owners and tenants.

The scheme benchmarks a building's greenhouse impact on a scale of one to five, one star being the most polluting and five stars the least.

By implementing basic design and fit-out principles in Queensland's first eco-efficient high rise building at 120 Edward Street, Brisbane, annual savings are estimated to be \$166,432.

This is clearly a substantial saving translating into better long-term economic sustainability for owners and tenants.

Using energy more efficiently can save businesses on their energy bills and reduce greenhouse gas emissions.

By using the rating scheme, companies can gain a competitive advantage by promoting their building or tenancy as a cost-effective, environmentally friendly place to work.

The Department of Public Works is currently involved in research including:

- Smart louvre windows
- Energy-efficient glasshouse
- Angular selective skylights
- Natural lighting light pipes
- Smart hopped window panels



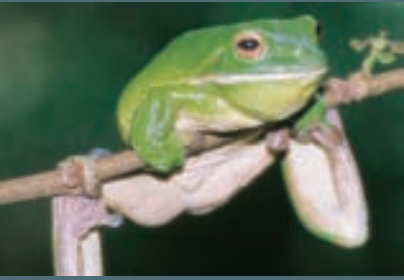
Above: Granite boulders, Girraween National Park, Southern Downs, Queensland.

Picture courtesy: Tourism Queensland.

Left: Energy-efficient building design, Queensland.

Picture courtesy: Environmental Protection Agency.

sustainable energy in the queensland government



Green tree frog, Daintree,
Far North Queensland.
Picture courtesy: Tourism Queensland.

GREEN ENERGY USE

The purchase of green power has been shown to be one of the most cost-effective ways of reducing greenhouse gas emissions and supporting renewable energy projects.

The Queensland Government is currently the largest purchaser of 'Green Energy' in Queensland and in Australia, purchasing 'Green Energy' as five percent of its total electricity purchases.

The Government's purchase of 'Green Energy' will also provide significant support for the establishment of new renewable energy projects in Queensland, such as Australia's largest wind farm, Windy Hill, on the Atherton Tableland.

ENERGY EFFICIENCY IN LOCAL GOVERNMENT

The Local Government Energy Efficiency program, a joint initiative between the Local Government Association of Queensland and the EPA, was established to reduce energy use in local government through demand management practices and strategies.

This program assists local government in Queensland to incorporate energy efficiency and alternative energy technologies into their operations through demonstration and education.

The goal of the partnership is to achieve a 20 percent reduction in energy use by local governments over the next five years. The partnership is expected to achieve:

- Reductions in greenhouse gas emissions
- Reduced need for costly energy infrastructure upgrades

Energy audits will be conducted with local governments, targeting a number of key areas of energy efficiency including:

- Water supply
- Street lighting
- Council buildings

ENERGY EFFICIENCY IN INDUSTRY

The Industry Greenhouse Partnerships Program is a joint initiative between the EPA and Commerce Queensland to facilitate greenhouse gas abatement by industry in Queensland.

This program is open to business and industry to implement innovative projects which will result in significant greenhouse gas abatement, normally at least 1000 tonnes carbon dioxide a year for ten years.

Funding is available to businesses to enable them to conduct an energy audit and then develop an action plan.

Partners are required to implement 75 percent of identified actions which show an internal rate of return greater than 20 percent, over five years.

Queensland coal mine.
Picture courtesy: Natural Resources and Mines.





Building exterior. 120 Edward Street, Brisbane, Queensland.
Picture courtesy: Environmental Protection Agency.

ENERGY SMART ALLIES DIRECTORY

The Energy Smart Allies Directory is an online database of businesses in the sustainable energy industry.

The EPA is currently assisting the Sustainable Energy Industry Association of Australia to work with local governments to develop the database to better promote local sustainable energy industry businesses.

The EPA's 'Energy Smart Allies' program aims to promote organisations that have the ability to provide cost-effective energy efficiency solutions and sustainable energy practices and products and services that reduce the generation of greenhouse gases.

It brings energy efficiency know-how and available technologies to the customers who need them.

The Energy Smart Allies Program is a free service and provides benefits to companies through:

- Promotion of that company's business activities
- Promotion of the sustainable energy products and services industry
- Helping suppliers develop a competitive advantage and achieve a wider distribution of products and services

The Energy Smart Allies Directory is available on the internet (www.sustainableenergyqld.com) and therefore accessible by business nationally and internationally.

The directory, is a great opportunity to promote an organisation's cost-effective energy efficiency solutions and sustainable energy technologies.

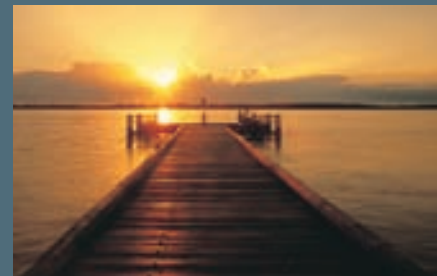
CONCLUSION

The Queensland Government's commitment to the development of sustainable energy resources stems from two major considerations:

- The government wishes to introduce electricity generating alternatives to coal to foster competition between fuels in this state and
- The government is aware of its obligations under the Kyoto Protocol international agreement of 1997, which seeks to reduce the output of greenhouse gas emissions throughout the world.

The Cleaner Energy Strategy, the creation of the Office of Energy and clearing the way for trading in carbon credits demonstrate Queensland's commitment to achieving those aims.

Apart from a desire to introduce more competition into the Queensland energy market, the government seeks to reduce the state's dependence on coal as the state's dominant energy source and look to more diverse, clean energy options.



Above: View to Bribie Island, Caloundra, Golden Beach.
Picture courtesy: Tourism Queensland.



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state government initiatives



Blayney wind farm under construction.
Picture courtesy: Pacific Power International.

Australia has a wide renewable energy resource potential and vast, sparsely populated areas that are remote from electricity networks or gas infrastructure. This has led to Australia having a history of active renewable energy research and development, with the implementation of wind generators, solar water heaters and world-class photovoltaics (PV) research. It has led the world in the use of PV for telecommunication links and also in the development and use of hybrid energy systems for remote-area power supply.

The **Commonwealth Scientific and Industrial Research Organisation (CSIRO)** has been at the forefront of renewable energy research and development for decades. It has led developments in passive solar house design, solar water heaters, small-scale bioenergy gasifiers and energy storage systems. Its early work in electrically conducting ceramics has now led to the formation of **Ceramic Fuel Cells Ltd** (see case study in Chapter 3). **CSIRO Energy Technology** has been involved in improved energy conversion of coal, and has recently set up a Centre for Distributed Energy and Power, which will consolidate its work on renewable energy and transition technologies for coal and gas.



Ethanol plant, Shoalhaven Starches, Bomaderry, NSW. Picture courtesy: Manildra Energy Australia.

The government provides R&D support through the **Australian Cooperative Research Centre for Renewable Energy (ACRE)**, the **Centre for PV Engineering, University of NSW** and a number of smaller renewable energy research groups based in universities across Australia. This research infrastructure ensures that the industry is supported by a range of R&D facilities and expertise, which in turn will encourage innovation and allow fast responses to market trends.

The increased activity in renewables has also seen a dramatic rise in the number of renewable energy companies listed on the Australian Stock Exchange, including **Pacific Hydro Ltd**, **Renewable Energy Corporation Ltd**, **Energy Developments Ltd**, **EnviroStar Energy Ltd**, **EnviroMission Ltd**, **Advanced Energy Systems Ltd**, **Sustainable Energy Systems Ltd**, **Environmental Solutions International Ltd** and **Pinnacle VRB Ltd** and pending IPOs (Initial Public Offerings) from companies such as **Novera Energy Ltd** (previously Primergy). These companies are seeking renewable energy projects in Australia and overseas.

EXPORT FOCUS

The Commonwealth Government provides industry development, investment and export assistance through such organisations as **Invest Australia**, **AusIndustry** and **Austrade**, which undertake renewable energy specific trade promotions and other activities from time to time. The Australian and West Australian Governments have also funded the International **Centre for Application of Solar Energy (CASE)**, which is linked to UN projects in the Asia Pacific region and operates out of Perth, Western Australia.

Integral Energy has been supported by the **AGO's** Renewable Energy Commercialisation Program (RECP) to develop long-term business for small- and medium-sized (SME) Australian manufacturers of renewable energy products, particularly in the South Pacific and Southeast Asia. Following financial, management and technical assessments by Integral, six renewable energy SMEs were included in its International Environmental Strategies Program (IESP), and now receive business development assistance to export their products, including diagnostic analysis, quality assurance, marketing and export programs.

macquarie bank – energy. infrastructure. innovation. success.

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Macquarie Bank is a pre-eminent provider of investment banking and financial services. We operate at the forefront of the infrastructure industry with a global team of finance specialists and over AU\$8 billion of infrastructure investments under management.

ABOUT MACQUARIE

Macquarie provides specialist investment, advisory and financial services in major international markets. Our approach is driven by a deliberate focus on areas of business where our particular skills and expertise can deliver real value to our clients. As a result, in areas such as infrastructure we have established leading positions in a range of market segments and regions internationally.

Established in 1969, Macquarie Bank is listed on the Australian Stock Exchange and ranks as one of Australia's top 25 companies by market capitalisation. Macquarie has reported successive years of record profits and consistent growth since 1992, and currently employs over 4,500 people in 15 countries.



INVESTMENT BANKING EXPERTISE

Macquarie's investment banking activities include wholesale advisory services, infrastructure funds management, structuring, stockbroking and underwriting. Over 1,000 staff worldwide provide a depth of service including specialist capabilities in:

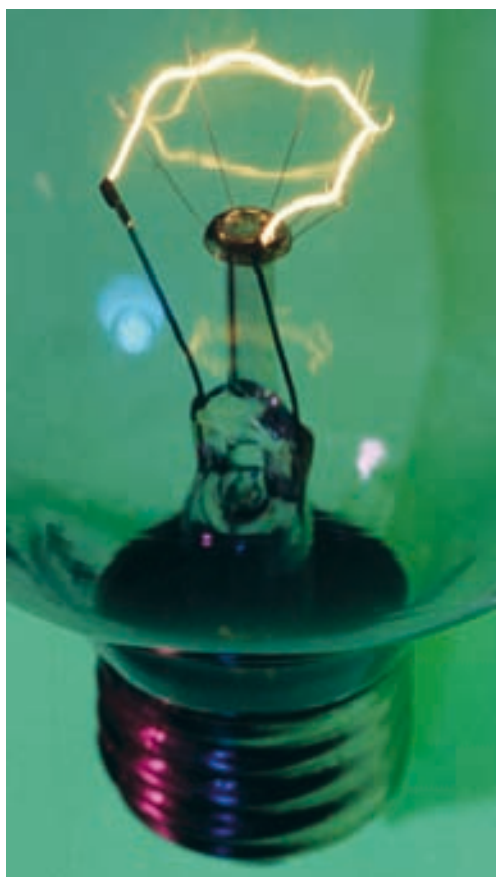
- project financing
- mergers and acquisitions, takeovers and corporate restructuring advice
- specialised fund management
- leasing and structured finance
- institutional and corporate stockbroking services
- equities research

A MARKET LEADER IN INFRASTRUCTURE

In the last 12 months, Macquarie has successfully completed infrastructure transactions with a total value of over \$A20 billion. Macquarie's position as market leader in Australia has been confirmed by our role in several notable infrastructure transactions both in Australia and internationally.

In the area of sustainable energy, Macquarie has undertaken a number of successful advisory roles. In Australia, these include the acquisition of Southern Hydro, and the development of the Smithfield Cogeneration, Osborne Cogeneration and Valley Power projects. Internationally, we acted as financial adviser in relation to the acquisition of Richmond Hill Hydro in Canada, the Dundee Waste-to-Energy Project in Scotland, and the acquisition of 40 per cent of Contact Energy (with a portfolio of hydro, geothermal and gas-fired plants) in New Zealand.

Macquarie is a global leader in the management of infrastructure investments, with over AU\$8 billion in listed and unlisted infrastructure funds under management. Investments include more than 30 assets located in 10 countries across all five continents. Macquarie is constantly seeking quality investment opportunities for existing and potential funds and is actively reviewing potential investments in the global sustainable energy sector.



Macquarie Bank's Sydney office in the GPO heritage building.



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state government initiatives

As part of the Renewable Energy Action Agenda, an export network has been established, involving trade missions led by established companies with assistance provided to new companies. It is expected that this will encourage export activities by a wider range of Australian businesses.

INDUSTRY ORGANISATIONS

As the industry has matured over recent years, the emphasis has shifted from research to commercialisation. This has seen the establishment of a variety of industry organisations, including the **Sustainable Energy Industry Association (SEIA)**, the **Renewable Energy Generators of Australia (REGA)**, the **Australian EcoGeneration Association (AEA)**, the **Australian Wind Energy Association**

(**AusWEA**), the **Australian Alternative Technology Association (ATA)**, **Bioenergy Australia** and an umbrella group, the **Renewable and Sustainable Energy Roundtable**. The **Electricity Supply Association of Australia (ESAA)** has also been involved in renewable energy activities and runs an annual Renewables and Sustainable Power Conference.

The **Australian and New Zealand Solar Energy Society (ANZSES)** has also played an important role in fostering information exchange and stimulating community interest in renewable energy over the past three decades.

Sydney Olympic Boulevard with grid connected PV lighting towers. Picture courtesy: BP Solar.



conclusion

Australia has been at the forefront of sustainable energy development for several years. In recent times this industry has been spurred on by government policies and programs, business requirements and consumer preferences and demands. Australia is starting to diversify its energy mix from predominantly centralised, large-scale generation, mainly based on coal, to a diversity of sustainable energy solutions. This transformation has been supported by a mandated market for renewable electricity, energy efficiency programs, advanced infrastructure and an educated and skilled workforce, large potential markets in the Asia-Pacific region, comparative cost advantage and political stability in Australia. The Australian skill base that has grown through the development of the Australian sustainable energy industry is highly geared to the export market.

australian greenhouse office – initiatives to address the uptake of renewable energy

partner

The Australian Greenhouse Office is the lead Commonwealth Government agency providing support for renewable energy.

The Australian Greenhouse Office is seeking to meet Australia's international greenhouse commitments through effective domestic action in a way that advances our national interests in terms of:

- Ecologically sustainable development
- Playing our part globally
- Supporting efficient and competitive industries
- Promoting employment and regional development



Denham wind farm.
Picture courtesy: Western Power.

RENEWABLE ENERGY

With AU\$380 million available over five years, the Australian Government, through the Australian Greenhouse Office, has made a strong commitment to increase the use of clean renewable energy in Australia. Key initiatives include:

- World-first legislation that guarantees enough new renewable electricity is generated over the next 10 years to supply 4 million people. By 2010 the Mandatory Renewable Energy Target will have increased the contribution of renewable energy sources in Australia's electricity mix by 9,500 GWh a year. This initiative is being achieved through an innovative market in renewable energy certificates, and is expected to deliver in excess of AU\$2 billion of new investment in renewable energy in Australia

- Development, with industry, of an Action Agenda strategic plan to guide the development of a sustainable and internationally competitive renewable energy industry in Australia which has annual sales of AU\$4 billion by 2010
- Initiatives to address financial and institutional barriers to the uptake of renewable energy, assessment of renewable energy resources, development of standards for equipment and training and accreditation of system designers and installers
- Increasing the uptake of renewable energy technologies in remote areas, saving more than 50 million litres of diesel fuel per annum and substantially improving the quality of life of those who live there
- Increasing the use of photovoltaic technology, to enable householders and owners of community buildings, such as schools, to convert sunlight into electricity
- Commercialisation of new technologies and applications to generate and use renewable energy including photovoltaics, bioenergy, solar thermal, wind and tidal power.



Sugar cane harvesting. Bagasse, fibrous residue from crushing cane is a source of bioenergy.



Solar Pond Project, Victoria.



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