Australian Business Council for Sustainable Energy

Inquiry into Sustainable Cities 2025

Submission to the House of Representatives Standing Committee on Environment and Heritage

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Australian Business Council for Sustainable Energy

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Introduction

The Australian Business Council for Sustainable Energy (BCSE) welcomes the opportunity to make a submission to the House of Representatives' Standing Committee on Environment and Heritage Inquiry into Sustainable Cities 2025. The BCSE has endeavoured to provide an effective, considered submission that benefits from ongoing BCSE engagement with the Australian sustainable energy industry in addition to leading research and analysis in this field. As such, this submission focuses on the sustainable energy industry, which is defined below.

The sustainable energy industry is critical in the context of developing sustainable cities in greenhouse terms by 2025. Sustainability in this submission refers to the stabilisation and eventual reduction of greenhouse gas emissions in order to avoid detrimental change in climate. Great potential exists in Australia to meet sustainability in the energy sector. Provided with the correct policy framework, the sustainable energy industry is poised to meet customers' energy needs in a manner that reduces greenhouse emissions while simultaneously increasing economic activity, jobs and investment.

The BCSE asserts that from 2006 all new commercial buildings and all Government office buildings should have zero net greenhouse emissions. Household greenhouse emissions from energy use should be limited to one tonne per person (nearly a one-third reduction). Industry should be required to report on energy use and meet economic energy efficient and sustainable generation measures. These goals are currently achievable and already in practice by some leading organisations.

The correct policy framework to achieve these goals relies on an effective mix of policies, which are detailed in this submission. Fundamentally, however, the policy framework rests on three premises. Firstly, minimum energy performance standards must be mandated in order to achieve acceptable levels of sustainability. Secondly, market based measures that provide investment signals for renewables and greenhouse abatement must be implemented in order to efficiently allocate resources. Finally, industry support measures need to be introduced that address impediments and support continued innovation and cost reductions.

Sustainable cities in 2025 should be characterised by the efficient use of energy and would have renewable energy systems incorporated as part of the urban infrastructure.

About the BCSE

The Australian Business Council for Sustainable Energy (BCSE) is the peak industry association representing the sustainable energy industry. The BCSE was formed in September 2002 through the merger of the Australian EcoGeneration Association (AEA) and the Sustainable Energy Industry Association (SEIA). The BCSE represents the broader sustainable energy industry covering renewables, waste-to-energy and gas-fired generation as well as energy efficiency.

The BCSE has more than 250 organisations as members ranging from installers and designers of renewable energy systems to large project developers and equipment manufacturers and including both energy retailers and energy service providers.

See Attachment 1 for details about the sustainable energy industry in Australia.

Summary of policy recommendations

The BCSE recommends the following policy initiatives and measures to support the development of sustainable cities by 2025:

1. Ratify the Kyoto Protocol and participate in the development of an effective international emissions trading scheme.

2. In the transition to emissions trading, implement a mandated greenhouse emission intensity requirement on electricity retailers so that the greenhouse emission intensity of electricity sold progressively reduces.

3. Expand the Mandated Renewable Energy Target (MRET) to a real 10 per cent by 2020 in an extended scheme and support the development of a renewable energy industry that can deliver longer-term cost effective emission reductions.

4. Implement a nationally mandated zero building energy emissions standard for all new commercial buildings and all government buildings from 2006.

5. Initially require that existing residential buildings be rated for their energy performance prior to resale. For rental properties, the building's energy performance to be disclosed in new leases. Progressively introduce a limit on household emissions from energy use of one tonne per person.

6. Require industry to report on energy use and greenhouse emissions and progressively move to best practice energy performance with Government to provide industry support through best practice programs.

7. Develop electricity market arrangements that deliver a level playing field for sustainable energy through a move to more cost reflective pricing. Address electricity industry impediments to the implementation of sustainable energy options. This includes standard connection and lowest cost metering options for sustainable generation.

8. Provide financial and regulatory support for the development of an energy services industry including the establishment of cogeneration and energy efficiency targets and the establishment of an energy services action agenda. This should also include the implementation of a public benefit fund that enables distributed energy options to effectively compete with conventional energy supply options.

9. Provide an appropriate method for deeming Renewable Energy Certificates (RECs) for solar photovoltaic (PV) systems within MRET.

10. Implement a mandated minimum five star ABGR energy and greenhouse performance standard for all buildings, including renovations, by 2010. Ratings to reward renewable generation such as PV systems and solar water heating.

11. Expand funding support for research, development, demonstration and commercialisation of greenhouse abatement technologies.

2. Ensure equitable access to and efficient use of energy, including renewable energy sources.

The sustainability imperative

Increasing levels of greenhouse gas emissions from human activity is an important global issue, as recognised by the Australian Government's acceptance of the United Nations Framework Convention on Climate Change (UNFCCC). The Minister for the environment, Dr David Kemp, has expressed the requirement for a global reduction in greenhouse emissions of between 50 and 60 per cent by the end of this century[1]. To meet this requirement, it is crucial that the development of Australia's cities results in a declining greenhouse emission intensity.

Thus the contemporary 'green agenda' challenge for cities is to avoid adverse global environmental impacts from greenhouse gas emissions. This challenge must be an important concern for the Committee, who are in a key position to contribute to the development of appropriate policy response. The contribution would also provide a just response to heightened community concern over climate change.

Australia has historically enjoyed a competitive energy cost advantage which has been underpinned by access to abundant reserves of coal. Coal, which has high greenhouse emission intensity, currently provides a fuel for over 80 per cent of our electricity generation and electricity consumption is projected to grow by over 2 per cent per year[2].

The largest source of greenhouse gas emissions in Australia is energy supply. The 2001 National Greenhouse Gas Inventory, released in September 2003, cites that stationary energy sector emissions in 2001 totaled 260 Mt, 48 per cent of net national emissions. Electricity generation emissions alone, which account for 35 per cent of total emissions, have increased by 52.3 Mt (40.5 per cent) from 1990 to 2001. This highlights the requirement that the emission intensity of electricity supply must be reduced significantly.

Australia has access to world-class sustainable resources that can continue to support its relative energy cost advantage in a carbon-constrained world.

The building sector (including commercial, residential, government and educational buildings) and the industrial sector each have potential for increased energy performance by means of improved energy efficiency and low-emission intensive generation. In particular, residential and commercial buildings account for significant energy consumption and their numbers are rapidly growing each year. According to the United States Department of Energy's Centre for Sustainable Development, buildings consume 40 per cent of the world's total energy.

2.1 How might we implement a shift from the existing large-scale energy generation and distribution infrastructure towards an alternative model?

A positive shift in the configuration of energy supply is a critical step in the reduction of greenhouse gas emissions. This will require a transfer from the current scenario of centralised generation and high-emissions to an alternative model that incorporates low emission distributed generation and high energy performance (energy efficiency). Actions required for the implementation of this model and to achieve the targets set out the

[1] In an address to the House of Representatives on 20 August 2002

[2] National Electricity Market Management Company (NEMMCO), 2003, 'Statement of Opportunities'

Introduction above are detailed below. Refer to Attachment 5 for specific policy options to drive energy efficiency.

1. Internalise the cost of carbon into economic decision making so as to guide economically efficient investment;
2. Ensure that appropriate pricing signals are provided to customers that the cost their energy use imposes on the electricity system;
3. Directly reward the recognised benefits of distributed generation and energy efficiency and remove impediments to further development; and
4. Build local industries of low emission renewable generation and energy services that deliver high energy performance.

These actions are discussed below.

1. Create a low-carbon efficient economy
Energy consumption in Australia is growing significantly. Projections by the Australian Bureau of Agricultural and Resource Economics (ABARE) show that electricity consumption is expected to grow by 52 per cent by 2020. Importantly, however, residential and commercial electricity consumption is growing at a faster rate than the average; 57 per cent and 68 per cent respectively.

Significant investment is required to meet our growing demand for electricity. The Electricity Supply Association of Australia (ESAA) estimates that $30 billion of electricity network and generation infrastructure is required to meet Australia's growing power needs over the next ten years. It is thus imperative that a carbon emissions cost is incorporated into these future investment decisions. The optimum economically efficient outcome is one where investment and consumption decisions incorporate the cost of carbon throughout the whole energy supply chain.

An international emissions trading scheme is generally seen as the most cost effective long term method in achieving this outcome. However, it is also recognised that transition schemes such as mandatory greenhouse reduction targets for electricity retailers will be effective in the short to medium term and not have a material impact on electricity prices[3].

Implementing a national market based greenhouse scheme, that leverages off schemes such as the NSW Benchmark scheme, will be critical in introducing greenhouse costs into decision making that result in lower greenhouse intensity of supply and economic solutions necessary to deliver the deeper greenhouse cuts that will be required in the future.

Greenhouse intensity schemes are complimented by mandated measures such as the Mandated Renewable Energy Target (MRET) for industry development in addition to development of mandated minimum energy performance standards (both are discussed below).

2. Correct electricity market distortions
Electricity consumers must be provided with efficient prices signals so as to make informed and appropriate choices about energy supply and consumption options.

Current electricity prices that are paid by many customers do not reflect the true cost that their energy use imposes on the electricity system of production and transmission. Also, incorrect low price signals result in decisions on energy being a low priority for end use

[3] Allen Consulting Group, 2002, 'Report on the cost effectiveness of introducing greenhouse intensity benchmarks', commissioned for the Council of Australian Government Energy Market Review.

customers. Distorted price signals facilitate unchecked growth in investment in electricity supply infrastructure and increasing use of emission intensive energy. In addition, failure to provide customers with the appropriate price signals disadvantages energy efficiency and renewable energy options. These options would be cost effective from an electricity industry perspective as well as from a societal perspective that values externalities.

A particularly important issue is that end use customers do not receive price signals for their use of power at peak times; these prices are smeared across all energy customers. Peak power needs determine the total required network and generation capacity. The negligible peak price signal has facilitated a rapidly growing uptake in air conditioners that further increase peak demand, where customers typically pay less than 5% of the true cost of supplying the peak power in summer. Peak demand is further discussed below and a more detailed discussion is included as Attachment 3. A move to customers paying demand based charges, particularly those that have air conditioners, would start to address this problem. This would require the progressive roll-out of interval meters.

In addition, discounted off peak electricity prices for water heating make it much more difficult for solar water heaters and other energy efficient appliances to compete.

3. Reward benefits, remove impediments
Electricity market barriers exist to the implementation of sustainable energy. The result is that it is more difficult to implement energy efficiency and renewable energy applications. These approaches face more hurdles in comparison to conventional energy supply options. Distributed energy options including demand side management (DSM) compete through the electricity supply chain in supplying energy and energy services to customers. These options also compete at the retail level (not just at the wholesale market level). This makes them one of the few means of providing competition to the service provided by monopoly network businesses, by offsetting need for network investment.

Peak Demand: Distributed generation and energy efficiency avoid network costs over time by reducing energy consumption during times of peak demand. No economic reward is attributed to this benefit. Concurrently, energy use during these times is not accurately priced. As mentioned above, customers typically pay less than 5% of the true cost of supplying the peak power while, for example, customers that install solar electricity systems typically only receive 43 per cent of the value that they create.

A move to more efficient pricing that provided clear signals for customers is imperative. In addition, financial incentives should reward customers for installing distributed power systems and/or energy efficiency measures.

Connection barriers: Difficulties also exist in negotiating access and connection arrangements for installation of grid-connected, distributed generators. The requirements of distributors and retailers for connection vary, and can be costly, complex and protracted. For example, customers purchasing a PV system are required to install an additional, separate meter. This serves no technical or safety role and merely adds to the cost and delays in installing the system. This is further discussed in Attachment 4.

The BCSE recommends that, in order to address connection impediments to distributed generation, national access guidelines, standard connection agreements and lowest cost metering options for sustainable generation should be developed.

Regulation climate: The manner in which electricity businesses are currently regulated means that they have little incentive to support or promote alternative energy supply options. The BCSE advises the following policy approaches to be supported and implemented by Government in order to address impediments within the regulatory framework:

(i) electricity distributors are not financially penalised for undertaking sustainable energy options rather than conventional network augmentation. The regulatory arrangements should provide financial incentives for distributors to consider alternative supply options;

(ii) in areas of impending network congestion, standing pricing offers be made available to demand side management and distributed generation alternatives[4]; and

(iii) electricity distributors be required to develop strategies and implement pricing approaches that encourage energy efficiency and implementation of greenhouse abatement activities.

(iv) Government should ensure that corresponding financial support is provided to sustainable energy technologies such as PV and solar water heating while failures in current energy market pricing (that disadvantage such technologies) are rectified.

4. Build local industry

Building industry capacity and capability would lead to the continued falling of installed costs as well as supporting increased employment and exports. The development of the renewable energy industry and energy services industry are discussed below. See Attachment 1 for further detail about these industries.

The Government has an important contribution to make to the development of a sustainable energy industry and a leadership/demonstration role to fulfil by implementing a nationally mandated zero building energy emissions standard for all government office buildings from 2006. Further, all Governments departments and agencies (including hospitals, schools, universities, police stations, community facilities) implement economic sustainable measures from 2006.

The first target above can be achieved immediately by the purchase of Green Power for electricity and implementation of economic energy efficient measures. All energy efficiency measures can be implemented by establishing a funding facility so that capital is provided to government departments and agencies where a minimum return of 2 to 3 percent above the long term bond rate is demonstrated[5]. An alternative approach that could also be adopted is to allow the first ten years of expected energy savings to be brought forward and used to fund the expenditure on energy efficiency equipment. In measuring the return on investment, or cost savings, a greenhouse cost[6] should also be included as part of the assessment.

While industry development is explained in two separate categories below, it is important to note that in terms of economic efficiency, renewable generation and energy efficiency are inextricably linked. Reducing energy consumption with energy efficient measures in buildings, for example, also reduces the investment required in local generation. In addition, there is increasing evidence that social awareness of energy issues and energy efficient practice is heightened by involvement with the installation of renewable energy systems. This occurs in both residences and schools, for example.

[4] This approach is currently under consideration by the Independent Pricing and Regulatory Tribunal (IPART) in NSW

[5] Can also access private sector funding where returns are guaranteed such as under an energy performance contract

[6] Equivalent to penalty under the greenhouse intensity scheme

Renewable energy industry: Renewable energy is a significant means in meeting greenhouse constraints. Moreover, with growing global installed renewable capacity, costs have fallen significantly. This trend is expected to continue resulting in competitive costs of renewable energy in the next decade. Australia is well placed to benefit from this growth with its world class renewable resource base including wind, biomass and solar. Developing the renewable energy industry provides significant new investment and jobs.

Renewable energy enjoys strong community support as shown by the results of a recent Newspoll survey; 83 per cent of persons were prepared to pay extra for electricity if an additional 10 per cent of it comes from renewable sources.

The Mandated Renewable Energy Target (MRET) has been an important initiative in developing the renewable industry to date. Unfortunately the target is too low to deliver a vibrant industry that is generating an increasing proportion or energy relative to conventional supply. The BCSE advocates an expansion and extension of the 9,500 GWh target to a real 10 per cent increase of generation in order to deliver meaningful industry development and to meet the $4 billion renewable energy sales target under the Renewable Energy Action Agenda. The BCSE's detailed position on MRET is included in our submission to the MRET review. In addition, the BCSE recommends that the provisions for deeming RECs to solar PV within MRET should be made appropriate to the technology. RECs should be deemed to the life of systems up to 100 kW in size.

Additional measures to facilitate the renewable energy industry development in a cost effective manner include the following:

- Streamlining of planning and network augmentation processes that currently constrain the development of wind energy.
- Expansion of the developer component of the PV Rebate Program which is currently funded by the Australian Greenhouse Office to support grid connected PV in new residential developments. This is again an important promotion and demonstration program that builds community support and commitment for renewable energy.
- Development of an extensive solar PV program for schools. This program would help to build community support for renewable energy and can become an important promotional and demonstration initiative.
- Protecting renewable fuel sources is also an important issue for developing sustainable cities. Solar access rights are critical for further uptake of solar PV systems and solar water heater systems.

Energy Services Industry: It is well recognised that energy efficiency will be an important and cost-effective contributor to reducing greenhouse emissions in Australia. The National Framework on Energy Efficiency Working Group (E2G2) has reported that commercially available energy efficiency measures would reduce stationary energy use by 9%, create an additional 9,000 jobs and increase GDP by $1.8 billion.

The energy services industry is comprised of suppliers of energy services and products rather than the supply of energy itself. The industry focuses on customers' energy needs including lighting, heating, cooling and energy management solutions for the life-cycle of a facility. Cogeneration is also an example of an energy efficient solution that can economically meet a customer's energy needs.

The energy services industry has the potential to deliver an increase in energy performance and its associated benefits and to meet the targets for residential, commercial and industry sectors set out in the Introduction above. As such, it is imperative that the energy services industry is supported to build industry capacity and capability. This will include the development of an energy services industry action agenda. The BCSE also recommends Government support for a number of activities such as:

- Financial incentives for the implementation of energy efficient measures
- Development of standards and accreditation
- Provision of training
- Development of effective rating tools that include minimum energy performance standards
- Development of toolkits for various end-user sectors such as; local government, process industries, community facilities, retail buildings, commercial buildings etc.
- Development of information and eduction material
- Support for promotion and marketing to end use customers
- Support for the funding of cogeneration feasibility studies, energy audits and energy performance contract facilitators.

The BCSE strongly advocates the eventual implementation of mandated minimum energy performance standards across the broader economy for existing buildings and facilities. This includes the implementation of a mandated minimum five star ABGR energy and greenhouse performance standard for all buildings, including renovations, by 2010. All ratings are to reward renewable generation such as PV systems and solar water heating.

Electricity supply businesses have done very little to date in supporting energy efficiency and demand side management (DSM). They are presiding over significant growth in electricity consumption that now creates a need for billions of dollars of expenditure to meet peak power needs. The implementation of a 'public benefit fund' for increasing energy efficiency and DSM has been successfully used in the United States.

Financing for the DSM fund could be sourced from a number of areas, including as a proportion of future capital expenditure, a $/kWh charge, as $/kW on peak power needs or determined as a proportion of historical over-investment in network assets.

The rationale for charging all customers is that efficiency costs less per kWh saved than supplying power from new power plants and network infrastructure. Since it is standard practice to require all customers to pay for supply side investments, it is reasonable to ask them to pay a portion of (more cost effective) demand-side investments.

2.2 How can the uptake of renewable energy for residential and commercial properties be promoted?

Customers are seldom aware of the adverse environmental impact of their energy consumption and supply choices. Customers are also seldom aware of the benefits from energy efficiency and renewable energy options. This needs to be rectified through improved disclosure and labelling and continually reinforced through promotional and communication material. Mandated minimum performance standards for all residential and commercial buildings (including renovations and upgrades) and a greenhouse emission abatement targets of household energy emissions limits of one tonne per person, would inevitably involve customers in energy decisions and issues.

Educational outreach to the community would also be achieved by supporting the implementation of renewable energy systems for new residential property developments, solar demonstration on schools and targets for Government facilities. These measures have been described previously.

Zero emission targets for commercial buildings and greenhouse limits per person would facilitate an improved understanding and appreciation of the environmental benefits of renewable energy and increased sales of Green Power. Government has an important role to play in expanding Green Power by ensuring that it increases the level of purchase for its facilities. In addition, the Green Power premium should be tax deductible.

2.3 What are the impediments to utilising renewable energy sources in residential, commercial and industrial areas and how might these be addressed?

Impediments to further uptake of renewable energy generation are explained in Section 2.1, 'Reward benefits, remove impediments', above.

2.4 Should renewable energy generation be promoted at the single dwelling level or across city regions?

Renewable energy should be promoted across both sectors. Different renewable energy resources also usually lend themselves to different scales of applications.

Rooftop PV and SWH applications represent a significant market sector. There are nearly 8 million dwellings in Australia, a significant proportion of which have rooftops that can support a solar energy system. Importantly, over 150,000 new homes are built each year.

There are also considerable opportunities to incorporate renewable energy into the broader urban environment through applications such as Building Integrated solar PV where the electricity generation system is included as part of the building fabric. Promotion should achieve increased awareness of these technologies amongst architects and property developers. A number of examples of such systems are included as part of Attachment 3, including the University of Melbourne, CSIRO, Newcastle, and Kogorah Town Square, NSW. Therefore, promotion should occur at both the single dwelling level, across city regions such as councils as well as potential partners in distribution.

There are also a number of renewable bioenergy applications where waste can be used to generate electricity. In addition, renewable projects include the use of landfill gas and sewage gas. Municipal waste projects utilising a number of technologies are also under development. Some recent examples of waste to energy projects are also detailed in Attachment 3, including Cronulla cogeneration facility, NSW, Suntown landfill gas project, Gold Coast and Brooklyn landfill gas project, Victoria. These renewable technologies are regional solutions and should be promoted as such.

Government support for research and development and for local manufacture of innovative distributed technologies in Australia would provide further renewable solutions for integration within cities at both levels.

2.5 Are there economic, and hence social, implications of a city increasing its use of green power and developing new complexes which are predominantly self-sufficient in terms of energy generation?

Economic and social advantages include increased energy security, reductions in peak demand and reductions in the need to increase network capacity (which requires an estimated $5 billion in additional investment by 2010 in NSW alone). These implications have been detailed above (Section 2.1 in particular).

2.6 Should higher efficiency standards be mandated for all new dwellings, appliances and business operations?

Mandated minimum energy performance standards for appliances and for new residential buildings (currently being introduced in Victoria) have been demonstrated to deliver effective outcomes and net economic benefits.

Minimum energy performance standards for equipment and appliances, are already being implemented, and are expected to deliver greenhouse savings in excess of 11.6 million tonnes per annum at a negative cost of $30/tonne. The value of energy savings more than offset the costs.

The Victorian Government's mandated minimum "five star" energy efficiency requirement for new residential houses has also identified a significant emission reduction with a net economic contribution to the Victorian economy.

Importantly the National Framework on Energy Efficiency Working Group E2G2 has estimated that, over the next 12 years an additional $32 billion of national investment in energy efficiency projects (with simple payback periods of better than 4.5 years) could occur if market barriers are addressed. As energy efficiency delivers savings in energy costs and greenhouse gas emissions at a profit, not a cost, this will provide an increase in GDP of $1.8 billion and create more than 9,000 new jobs.

In the case of energy efficiency, the BCSE believes that mandated minimum energy performance standards should be introduced which compliment existing standards. Additional measures that should be undertaken are as follows:

- Implement a nationally mandated zero building emissions standard for all new commercial buildings from 2006.
- Further expansion and extension of minimum standards for equipment and appliances.
- Implement a mandated minimum five star ABGR energy and greenhouse performance standard for all buildings, including renovations, by 2010. Ratings to reward renewable generation such as PV systems and solar water heating and include base building and tenancy. Building owners can be provided with a number of options to comply; they can implement energy efficiency measures, purchase green power or purchase abatement certificates.
- Mandated requirement that all existing residential homes be rated for their energy efficiency prior to sale or rental.

It is important to recognise that energy costs are not an important driver for most customers and that many cost-effective energy efficiency investments fail to take place. The intent of the above mandated regulatory requirements is to effectively internalise a greenhouse cost and ensure that cost-effective investments actually do take place. Not undertaking cost-effective energy efficiency means that other sectors of the electricity industry need to invest in generation and network infrastructure at typically much longer pay-backs. This reduces net income for Australia with subsequent adverse impacts on employment.

2.7 How can residential and commercial developments incorporate renewable energy generation into planning and construction?

Technically there are many ways in which renewable energy systems can be incorporated into as part of the building fabric. These have been discussed in Section 2.4 and a number are included as case studies in Attachment 3.

On a commercial basis, however, the benefits are seldom understood and considerable more effort needs to be undertaken to promote renewable energy options to architects, designers and planners.

Minimum performance standards and regulatory requirements to install renewable energy systems on new homes have been shown to be effective policy approaches.

Minimum emission targets would drive innovative sustainable solutions.

Attachment I

Growth and opportunities provided by sustainable energy

The sustainable energy industry comprises renewable energy, energy efficiency and gas-fired generation. The sustainable energy industry is estimated to be growing at approximately 25 per cent per annum according to a survey undertaken by Mark Ellis and Associates[7] (MEA).

The MEA survey found that direct sales for the industry in the 2001/2 financial year were estimated to be $3.8 billion. When adjusted using Australian Bureau of Statistics multipliers the total economic contribution increased to between $6.8 and $9.6 billion. The sustainable energy industry directly employed an estimated 17,000 full-time people and was responsible for a total employment contribution of between 37,300 and 57,900 full-time employees. Approximately 21 per cent of the surveyed companies made sales overseas. The survey did not include the contribution of gas fired generation and cogeneration.

Sustainable energy is poised to be able to meet the challenge of reducing greenhouse emissions in a manner that will simultaneously increase economic activity, jobs and investment. The Allens Consulting Group report commissioned by the Sustainable Energy Development Authority (SEDA)[8] found that implementing policy measures to support renewable energy and energy efficiency would lead to an improvement in economic efficiency rather than imposing an economic cost. The measures were projected to boost competitiveness and output in NSW (which is forecast to rise by 0.17 per cent, equivalent to more than $500 million per annum). In addition it would provide more than 1000 additional jobs in NSW (4100 nationally).

Installed sustainable power generation capacity as at 31 December 2002 was 18,097 MW[9] and represented 39% of Australia's total installed generation capacity of 46,496 MW. On an energy basis sustainable power represented approximately 22 percent of total electricity generation (47,800 GWh).

The impacts and opportunities for the different components of the sustainable energy industry are considered separately:

Renewable Energy

The global market for renewable energy has seen tremendous growth over the last five years and is forecast to continue to grow significantly. For example, global wind power capacity has quadrupled over the past five years, growing from 7600 MW at the end of 1997 to more than 31,000 MW at the end of 2002. This represents an annual growth rate of more than 30 per cent per annum with $US7 billion of wind projects being built in 2002 alone.

The solar photovoltaic (PV) industry has seen similar growth. The market for solar PV has grown by around 35 per cent annually for the last five years to a $US3.5 billion market in 2001. The solar water heater industry is also growing significantly, particularly in Europe and China. As an example, sales in Europe have increased by 40 per cent over the last few years with sales growth expected at over 20 per cent per annum into the future.

[7] Australian Sustainable Energy Survey (December 2002) – Estimating the contribution of the sustainable energy industry to the Australian Economy, Mark Ellis and Associates.
[8] Allen Consulting Group - Sustainable Energy Jobs Report (January 2003)
[9] Includes large scheduled hydro and gas-fired generation plant

These increases in capacity have lead to direct reductions in costs. Both wind energy and PV installed costs have reduced by some five per cent per annum and this will continue as installed capacity continues to grow[10].

The substantial growth in the renewable energy industry to date has occurred in countries that have developed and implemented specific strategies to promote renewable energy. These have been matched in most cases by ambitious targets to increase the market share for renewable energy.

The benefits of such an approach are widely accepted and for this reason an increasing number of countries are implementing strong proactive policies and targets for renewable energy.

The Mandated Renewable Energy Target (MRET) is an important industry development initiative that is supporting the growth of the renewable energy industry in Australia. Unfortunately the level of MRET at 9500 GWh is not sufficient to deliver the industry development objectives of the measure. The reasons for this are demonstrated and articulated in the BCSE's submission to the MRET Review.

Importantly a number of state governments also believe that MRET should be increased for example the Victorian government’s submission to the MRET review also supports this view and recommends that MRET be extended to 19,000 GWh by 2010.

The Victorian Government has also announced a number of policy initiatives including increase the share of renewables from 4% to 10% by 2010 as well as to install 1000 MW of wind energy projects in Victoria by 2006.

If Australia is to have a share of this emerging industry then it must support the growth of a domestic industry. A strong domestic market is essential to build a viable and sustainable local industry that can obtain, through exports, a sizeable share of this substantial global market.

Energy Efficiency

The report by the Allen Consulting Group “Sustainable Energy Industry Report” (January 2003) for SEDA, identifies the following energy efficiency sectors:

Commercial – industrial energy efficiency. Improving the energy usage practices in industry, the efficiency of appliances used by industry and the energy efficiency of buildings can enhance sustainability through reduced greenhouse gas emissions and avoided economic costs. In general, Australia currently lags behind world’s best practice in this field and currently has limited capacity in terms of manufacturing of related equipment and in the provision of energy efficiency services.

Industry – small cogeneration. Thermal efficiency can be raised from an average of around 30 per cent for the traditional gas power stations up to around 85 per cent in smaller scale of cogeneration facilities. The greenhouse gas savings and economic savings can be commensurate with the energy efficiency gains. The application of these technologies is limited to specific industrial sites, although it is considered that the potential market for the technology could rise from about 5 per cent of stationary energy needs currently supplied to about 10 per cent. A supportive policy environment is needed in order to offset identified market and regulatory failures.

Demand management (DM) drivers. Traditionally growing energy needs have been met with a supply side response with ‘build and generate’ options. In contrast, demand management (DM)

[10] THE BCSE Supplementary submission to the MRET Review Panel includes a detailed analysis of experience curves for wind energy and PV.

approaches involve investments that lead to reduced or changed patterns of energy demand. Studies about DM in Australia and overseas consistently indicate average commercial rates of return on DM investments of over 20 per cent. DM has the potential to drive material efficiencies in the Victorian economy.

Some significant demand-side actions, such as minimum energy performance standards for equipment and appliances, are already being implemented, and are expected to accelerate savings over the coming decade. These will deliver greenhouse savings in excess of 11.6 million tonnes per annum at a negative cost of $30/tonne. The value of energy savings more than offset the costs!

The Victorian Government's mandated minimum "five star" energy efficiency requirement for new residential houses has also identified a significant emission reduction with a net economic contribution to the Victorian economy.

Importantly the National Framework on Energy Efficiency Working Group E2G2 has estimated that commercially available energy efficiency measures would reduce stationary energy use by 9%, create an additional 9,000 jobs and increase GDP by $1.8 billion.

Improvements in end-use energy efficiency is one of the most cost-effective ways to reduce greenhouse gas emissions, energy costs, and broader environmental impacts of energy supply and use. And because it generally involves the substitution of services and manufactured goods for energy, it also increases net employment. Policies to stimulate energy efficiency and the development of an energy services industry should therefore be a key part of the policy response to deliver sustainable cities.

Attachment 2

Addressing Peak Demand

Extract from November/December EcoGeneration Magazine (pp. 8-9)

Addressing peak demand

Those that put greater strain on our electricity network — such as air conditioner users — are not paying for the costs they impose. At the same time, those that reduce demand — embedded generators for example — are not seeing the benefits they deserve. But this anomaly can be rectified.

The National Electricity Market Management Company (NEMMCO) released its Statement of Opportunities (SOO) on 31 July 2003. The SOO outlines the electricity supply and demand outlook for the next 10 years and makes an assessment of the level of power reserves available to meet peak demand.

Key findings of the SOO were that strong growth in demand for power, due to significant increases in sales of air conditioners, brought forward by two years the time by which additional generation was required. All States will need to build additional generation by 2005–06 to meet this growing summer power demand.

Growing power needs

Electricity consumption in National Electricity Market (NEM) States over the course of the next 10 years is expected to grow by 27 per cent (see Figure 1). Projections of energy in this document are on a sent-out basis and include transmission losses and the energy consumed by end-use customers.

Growth in peak electricity demand is expected to be even more marked, growing by 3 per cent per annum to 2013. Figure 2 illustrates the combined impact across NEM States. The latest projections are an increase of 432 MW over the projections to 2010 included in the 2002 SOO. Growth projections in consumption and peak demand are shown in Table 1.

Infrastructure requirements

The Electricity Supply Association of Australia (ESAA) estimates that $30 billion of electricity network and generation infrastructure is required to meet Australia's growing power needs over the next 10 years.

Significant growth in peak summer demand, caused by growing air conditioner sales as mentioned above, will require considerable network investment, particularly in NSW and Queensland.

In NSW, for example, the Independent Pricing and Regulatory Tribunal (IPART) is in the process of determining the regulated revenue requirements for the electricity distribution businesses. In submissions to IPART NSW distributors identified more than $4 billion in new network investments required over the next five years. In addition, it is estimated that NSW electricity transmission company Transgrid will spend more than $1 billion in transmission investment over the next five years. A total of more than $5 billion is required to be spent in NSW on network augmentation over the next five years.

The expectation is that peak summer demand will increase by 1500 MW in NSW by 2007/08. This growth is driving the significant expenditure on infrastructure.

The $5 billion in new investment equates to a staggering $3300 per kW. The requirement for further investment in peak generation (e.g. gas turbines) to meet this demand, equates to as much as an additional $1 billion.

Subsidising air conditioners

The current market and pricing arrangements in the NEM create the absurd situation where customers that install and operate air conditioners are imposing significant costs onto the electricity system, but this cost is not internalised so doesn't need to be factored into their decision making.

While these customers are protected from the cost consequences of their purchasing and operating decisions, the costs they impose are borne by other customers by smeared electricity tariffs.

This is illustrated with an example of a customer in NSW who purchases a 1 kW air conditioner (for simplicity, as most are larger). If the customer operates the unit for 100 hours a year then the cost for this is 12 cents per kWh under the default domestic tariff. The customer, therefore, pays $12 per annum to operate the air conditioning unit.

The 1 kW air conditioner increases the peak summer demand by nearly 1 kW, requiring investment in additional network and generation investment. Considering the network investment requirements in NSW, this amounts to $3300 per kW. Some two-thirds of this could be avoided by reducing peak demand, then the investment that could be avoided amounts to $2200 per kW. Additional generation costs (gas turbines) require an extra $600 per kW.

Therefore, a customer who installs and operates a 1 kW air conditioner imposes investment costs of $2800 per kW and annual operating costs of $4 per annum. This amounts to an equivalent annual cost of nearly $300 per annum based on a 10-year simple payback. The $300 cost per annum should be compared with the actual cost paid by the customer of $12 per annum. The result is that the customer who installs and operates an air conditioner is paying just 4 per cent of the cost actually imposed on the electricity system.

It is not surprising that air conditioning sales are increasing in this scenario. The ongoing cost to customers of operating

Solar power on the CSIRO Energy Centre in Newcastle helps reduce peak energy demand.

air conditioning equipment is minuscule and is unlikely to even enter into the customer's purchasing decision.

Unfortunately, this situation has adverse impacts on the ability for sustainable energy products and services to compete in the current market, such as domestic photovoltaic (PV) systems and well-designed energy efficient homes. Homes that have shading or eaves, for example, will be cooler in summer and will reduce peak power demands. The benefits of these options, however, are not valued.

Distributed generation disadvantaged

Small-scale domestic power generation systems include PV systems as well as micro cogeneration systems that can use engines, fuel cells and microturbines. Using PV as an example, a well located system would be expected to operate at 80 per cent of its nameplate capacity during times of system peak. In NSW, peak summer power needs tend to occur between 12 midday and 6 pm, which correlates extremely well with the output of a PV system.

A customer installing a PV system should be able to include a cost advantage of more than $2800 per kW. This is because installing a PV system obviates the need to invest $2800 per kW in electricity infrastructure. Indeed, the customer has had the power infrastructure installed on their own roof.

Table 1 Growth projections from 2002 to 2010

State	Consumption growth (%)	Peak demand growth (%)
Queensland	37	47
NSW	28	29
Victoria	20	34
SA	16	35
Total NEM	**27**	**35**

Considered in a macro context, if PV systems were to meet 10 per cent of the 1500 MW growth in peak demand over the next five years then it would avoid the need for expenditure of $430 million in network and generation investment.

Appropriate price signals

The best solution to the problem of people not paying the true cost for using air conditioners is to require these customers to be charged a peak demand component of $300 per kW per annum. To properly account for this customers will need to install electric interval meters. Customers that install a domestic generation system (e.g. PV) are required to install a separate meter, which can cost up to $500. The typical output of a 1 kW PV system is 1400 kWh per annum with a retail value of about $170. Considering the value that a typical 1 kW PV system provides to the system, the customer is realising a very small proportion of the benefits they deliver (in the order of 43 per cent).

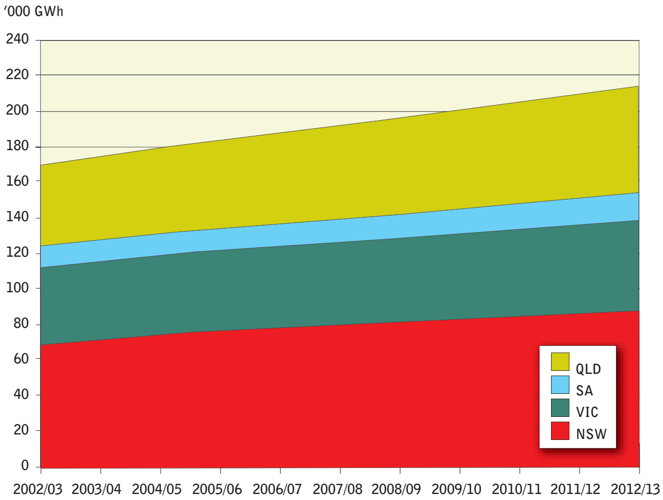
The result is a system where customers who add to the system peak are required to pay very little, just 4 per cent of the cost that they impose. At the same time customers who reduce the system peak by installing local generation receive just 43 per cent of the value that they create.

It is, therefore, not surprising that customers continue to install air conditioners at increasing rates and that very few customers ever consider installing local generation.

To address this problem the BCSE proposes the following:

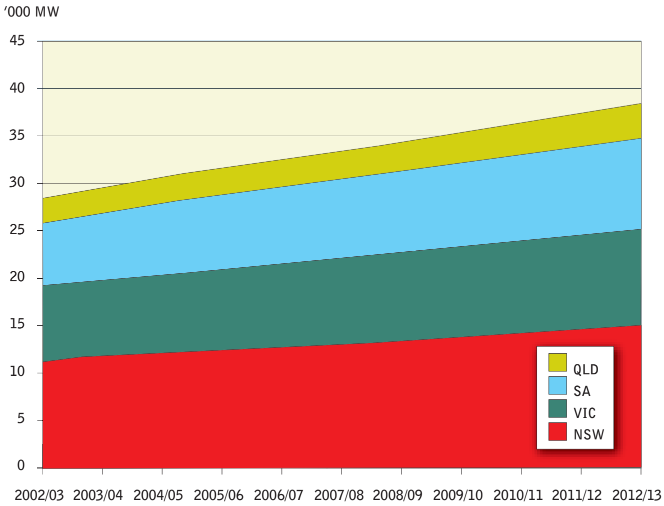
- The requirement to install separate metering for domestic customers with embedded generation should be removed. This is a significant barrier to entry and serves no useful technical or safety purpose; and
- Customers who install local generators should be automatically provided with a rebate on the basis of future system capital costs determined on a $ per kW basis. As an example, a customer who installs a PV system in NSW should receive a rebate of up to 80 per cent of $2800 per kW.

Figure 1 Projected power consumption in NEM States



Source: NEMMCO

Figure 2 Projected peak power demand in NEM States



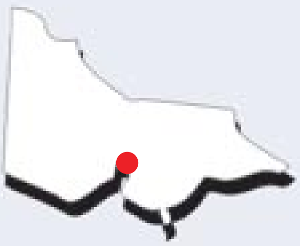
Sustainable Energy Case Studies

- University of Melbourne, Carlton, Vic
- CSIRO, Newcastle, NSW
- Kogorah Town Square, Kogorah, NSW
- Cronulla cogeneration facility, Cronulla, NSW
- Suntown landfill gas project, Arundel, Gold Coast, Qld
- Brooklyn landfill gas project, Brooklyn, Vic

University of Melbourne Building Integrated Photovoltaic System

BCSE
Australian Business Council for Sustainable Energy

Grid-connected, renewable distributed generation, Victoria



Owner:	University of Melbourne
Capacity:	40 kWp
Location:	University Square, Parkville, adjacent to the Melbourne CBD
Cost:	$1.55 million
Commissioned:	May 2002
Architects:	Metier3
Principal Consulting Engineers:	Arup
Solar Design and Commissioning:	Sustainable Technologies International
Supply of panels:	BP Solar
Supply and Commissioning of Inverters:	Power Solutions Australia
Electrical Contractor:	O'Donnell Griffin (Victoria)
Cells:	21,400 x BP Solar polycrystalline cells
PV laminated panels:	148 panels of 8 different sizes, totalling 426m²

For more information:

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Arup
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The site

The University of Melbourne project is Australia's first large-scale solar power array to be fully integrated into the façade of a commercial building. Photovoltaic panels form the top level of the northern façade of Building A, a new eight-storey building, part of the new University Square campus. The need to keep the solar wall consistent with the façade format meant the panels and inverters had to be matched electrically rather than physically, (as might be the traditional approach).

Plant and equipment

The solar design by Sustainable Technologies International will generate more than 40,000 kWh of electricity every year, enough to power 20 average households. The array is rated at 40 kWp with 10 single-phase solar-grid-interactive inverters supplied by Power Solutions Australia. Six are rated at 5 kW and four at 6kW — providing 3-phase power. All inverters have in-built data logging and data ports and are capable of being dialled up via a modem from a remote computer. This enables the performance of each inverter and the array to be monitored and a future overall monitoring and real-time display system to be added.

An unusual feature of the system is that it consists of a variety of panel sizes, each with a different number of cells, and therefore different output voltages. The panels are connected together (in series) into groups, and so the groups too have different nominal voltages. Each group is connected to a single inverter, so the inverters are each designed to have an input voltage characteristic to match the relevant group.

Photovoltaic cells

Polycrystalline cells were selected, primarily because of the project's budget and because of the cell colour. The PV cells are encapsulated between two layers of heat-strengthened glass. The outer layer is 6 mm low iron layer to reduce transmission losses. Polycrystalline cells are laminated in a 2 mm thick resin interlayer with an inner layer 6 mm clear float glass.

Fabrication

The polycrystalline cells were manufactured at BP Solar's factory in Sydney. The cells were then laminated in Germany by Flabeg. The laminates were then sent to Permasteelisa in Melbourne, who fitted the laminated panels into their curtain wall framing system. Once assembled, the panels were packed into palettes, brought to the site and hoisted into plantroom area. The method of façade construction used is known as a "unitised" or "panelised" technique. This is where glazing is fitted into frames off site and then simply bolted into place on site from inside the building. The PV laminates provide a flush façade finish and a renewable power generation system that is fully integrated into the building fabric.

Outside support

University of Melbourne won a competitive grant of up to $755,000 from the Australian Greenhouse Office Renewable Energy Commercialisation Program to assist the project, which had a total value of $1.55 million.

Kogarah Town Square Photovoltaic Power Station

Off-grid, distributed generation, renewable, New South Wales

Owner:	Kogarah Town Square Body Corporate
Capacity:	160 kWp
Location:	Kogarah Town Square, 5 km south of Sydney CBD
Commissioned:	May 2003
Capital cost:	$2 million
Project developer:	Hightrade
Power station developer:	EnergyAustralia
Construction contractor:	EnergyAustralia and Ridge Roofing
Operator:	Kogarah Council
Fuel source:	Solar
Suppliers:	Uni-Solar, BP Solar, Crest, Q Steel
Photovoltaic technology:	2800 m^2 PV on roof; 394 × Uni-Solar 64 W, 964 × Uni-Solar 128 W and 104 × Sola Nova Glass 110 W.
Inverters:	58 Sunpower SP1200 & SP2500

For more information

EnergyAustralia
Phil Gates
Tel:02 9269 7366
Email: pgates@energy.com.au

The site

Kogarah Town Square is a development of residential, commercial and retail spaces, public library and car parking, occupying a total area of approximately 10,000 m^2. The redevelopment provides a demonstration of the feasibility of sustainable urban design.

A holistic state of the art environmental engineering design includes a roof integrated photovoltaic (PV) power station designed by EnergyAustralia. The energy produced will supply Kogarah Town Square's living and working environment with excess sold to the grid.

Technology

The entire roof of Kogarah Town Square was redeveloped, including the roof membrane and rainwater accessories such as gutters and downpipes. This was attractive to the developer as it minimised the number of contracts to be managed. PV modules were placed on all roof surfaces rather than just the north-facing roofs.

A Solardek system was selected for the main part of the roof owing to its design flexibility and ease of installation. This system utilised Uni-Solar PV laminates and Colorbond steel with a specially designed steel sheet profile. The Uni-Solar amorphous technology performs well in hot weather. In addition, transparent glass PV modules have been placed on an awning and a glass roof in the building.

The energy produced by all the PV modules is connected to the electricity grid via 58 Sunpower inverters that are computer monitored and can be displayed locally and over the internet via custom-designed software developed in Australia. This program also monitors weather sensors providing temperature, humidity, insolation, wind speed and rain gauge information.

The project is expected to generate 153,000 kWh per annum, with greenhouse gas savings of 140 tonnes per annum. EnergyAustralia will purchase all of the power that is exported to the grid.

Funding arrangements and acknowledgements

The project received a Renewable Energy Commercialisation Program (RECP) grant of $1 million. The power station is accredited under the Mandated Renewable Energy Target, and SEDA provided $200,000 in return for the right to create RECs. The developer funded the rest of the $2 million project cost from the sale of the residential and commercial space.

Cronulla Sewage Treatment Biogas Project

Biogas renewable cogeneration
New South Wales

Owner:	Sydney Water Corporation
Capacity:	485 kW
Location:	Cronulla, in Sydney's south, New South Wales
Commissioning:	June 2001
Capital cost:	$600,000
Developer:	Sydney Water Corporation
Construction contractor:	SE Power Equipment
Operator:	Australian Water Services (for Sydney Water Corporation)
Primary fuel and supplier:	Biogas from anaerobic digestion of sewage sludge from the Cronulla Sewage plant
Secondary fuel and supplier:	Natural gas
Prime mover:	Deutz TBG616 V12K
Generation:	415 Volt
Heat recovery:	Hot water at 75°C is recovered from the engine jacket and exhaust. This is used in heating sludge in the digesters to assist the anaerobic digestion process.

Wastewater biogas

Sewage wastewater can either be treated aerobically (in the presence of oxygen) or anaerobically (oxygen excluded). The anaerobic process produces methane, which in this project is collected and used to generate renewable power. If not collected and used for power production the methane would either be flared or vented to the atmosphere with adverse environmental impacts. Methane has 22 times the greenhouse gas impact of carbon dioxide.

Project overview

The Sydney Water cogeneration project forms part of an upgrade of the Cronulla Sewage Treatment Plant. This includes upgrading the level of sewage treatment processing, improving the security of the treatment process and meeting Sydney Water's commitment to ecologically sustainable development practices.

Energy offering

The power produced by the biogas generation project displaces purchases of high value electricity from the grid. The unit will be able to provide approximately 10 per cent of the power requirements of the Cronulla Treatment plant. The unit will produce 2470 MWh of power per year.

The heat produced by the engine exhaust and jacket is recovered and used to heat the sewage sludge in the anaerobic digestion process, which assists the processing of the sludge and the production of methane for the generation unit.

Producing power "on-site" increases the reliability of supply to the plant and provides a level of sewage processing during power outages.

The plant reduces greenhouse gas emissions arising from the processing of Cronulla's sewage by 17,000 tonnes of carbon dioxide each year.

Operational

The biogas cogeneration plant is designed to utilize 100 per cent of the gas produced by the digesters and can operate 24 hours, seven days a week.

More information:
Sydney Water John Petre (Commercial)
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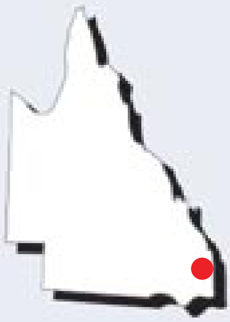
or Jean-Michel Berlioz (Technical/ Operations)
Tel: 02 9527 8310
SE Equipment Robert Inentile
Tel 07 3890 1744

Suntown Landfill Gas Plant

Grid-connected, distributed generation, renewable, Queensland



Owner:	energyimpact
Capacity:	1 MW
Location:	Arundel, Gold Coast, Queensland
Commissioned:	June 2002
Capital Cost:	$3m
Developer:	energyimpact
Construction contractor:	Energex
Operator:	energyimpact
Fuel Source:	Landfill gas from site
Gas Engine:	Caterpillar G3516
Design:	Civil, LV & HV Electrical, and Engine Package — ENERGEX Gas Extraction — LMS

For more information:

energyimpact
Greg Blake
Project Manager
Tel: 07 3407 6196
Email: gregblake@energex.com.au

The site

The project is a joint venture between the Gold Coast City Council and Energex energyimpact. Gold Coast Council's EPA licence to operate the waste facility requires the waste gas, which is approximately 50 per cent methane (CH_4), to be collected and burnt as fuel for electricity generation.

Gas created in the cells of the landfill site by the biological breakdown of deposited waste is environmentally damaging, with unpleasant odours, noxious elements and global warming potential. However, by utilising the high energy content of the gas, not only is electricity supplied to the National Electricity Market with emissions far below a conventional power station, but the local landfill gas emission problems are also greatly reduced.

Plant equipment and operation

The project involved the construction of a 1 MW generating plant driven by a Caterpillar reciprocating gas engine. A landfill gas extraction system was installed comprising a grid of vertical gas wells strategically situated across the completed landfill cells. A network of underground piping and manifolds interconnect the gas extraction wells and deliver the landfill gas to the power generation facility and flare station. The facility is expandable to 1.8 MW when additional waste cells become available to be tapped.

The landfill gas extraction and power generation facility incorporates a gas pumping station to create a vacuum on the landfill network and a flare station to burn off the gas unused in the generation of electricity. A gas conditioning plant reduces impurities to the landfill gas engine and a gas compressor provides gas at a suitable pressure to the gas engine. The landfill gas engine and generator plant are installed in a stainless steel canopy enclosure. A transformer and switching station increase voltage from the generator to high voltage, for connection to the local electricity supply grid for exporting the electricity generated.

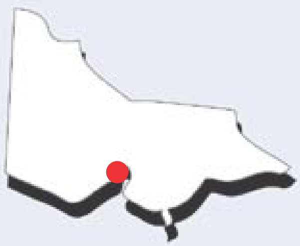
Energy purchase and supply

The plant operates 24 hours a day, seven days a week, with an output of greater than 370 MWh/month on average. Power generated from the project is sold to Energex Retail under a 10-year arrangement. The plant is accredited to the MRET renewable energy scheme and Green Power. At full output capacity the project will save the equivalent of 78,000 tonnes of carbon dioxide per annum.

Brooklyn Landfill Gas Project

Australian EcoGeneration Association

Grid-connected, renewable distributed generation, Victoria



Owner: Energy Developments
Capacity: 1 MW
Location: Brooklyn, approx 3km west of Melbourne, Victoria
Commissioned: May 2002
Construction contractors: EDL Group Operations
Operator: EDL Operations (Brooklyn)
Power purchase arrangements: Ergon Energy to purchase electricity from the site
Engine manufacturer: Caterpillar
Type: 1 x 1.0 MW Reciprocating engine

For more information:
EDL Group Operations
Jim Watt
Project Development Manager
Tel: 07 3275 5603
Email: jim.watt@edl.com.au

Fuel source and supply

The Brooklyn project is located approximately three kilometres west of Melbourne on the Brooklyn landfill owned and operated by the Twigg Group. The plant utilises methane gas extracted from the landfill and supplied to generators through a pipeline network. Landfill gas is a designated renewable energy source that is derived through anaerobic decomposition of organic waste matter.

Plant equipment and operation

The plant predominantly operates base-load subject to the availability of the landfill gas resource. The plant is expected to expand over the next 12 months and has a project life of 15 years.

Energy purchase and supply

Power is generated at 415 volts and stepped up to 22,000 volts for connection to AGL's local distribution network. The plant is a renewable generator under the Renewable Energy Act and is eligible to produce Renewable Energy Certificates (RECs). The power and RECs produced by the plant are sold to Ergon Energy under a long-term agreement.

Environmental impact

Landfill gas, which is primarily a mixture of methane and carbon dioxide, has a typical global warming potential about eight times that of carbon dioxide. Capturing what would otherwise be a fugitive emission and converting it to electricity results in greenhouse emission reductions of approximately 40,000 tonnes per annum.

In addition, another local environmental benefit is the reduction in odours from the landfill site.

Metering for PV systems

Currently, connection and metering requirements for domestic PV systems (<10 kW in size) vary. No standard or best practice approach exists for a connection agreement or for metering requirements from electricity retailers and distribution network service providers (DNSP). As a result, the connection process and requirements for the customer can be complex, protracted and expensive – creating a barrier to further uptake of PV systems.

A key issue is the typical requirement for customers purchasing a PV system to also install a separate meter or to have a single meter that can accurately measure imports and exports. There are no technical or safety reasons to have a separate metre. The stated reason for this requirement is that typical meters are not calibrated to run backwards therefore when a customer is exporting power to the grid (this typically occurs during the day when the home may be unoccupied) the level of exported power is not properly metered.

The characteristics of a typical grid connected domestic PV system installed in NSW are as follows:
Size: 1 kW[11]
Annual electricity generation: 1400 kWh
Annual electricity consumption is significantly more than this – over 6000 kWh pa
Amount of electricity exported (typically during the day when the house is unoccupied) : 400 kWh[12]

If remuneration for the PV system exports is paid at current electricity retail prices of $0.12c/kWh (there are cases in Australia where the amount is less), the amount paid for exports is $48 per annum. Advice from BCSE members indicates that the cost of installing a separate meter can be as high as $500. The most complex system required is two separate unidirectional digital meters that measure imports and exports.

It is counterintuitive that a net cost is imposed on a customer who is alleviating a demand constraint. In contrast, no such requirement is placed on customers to install separate meters when they install air-conditioners that significantly add to system peaks and create an increased need for network investment.

Additionally, while PV systems take less than half of one day to install, BCSE members have advised that connection and metering arrangements between the system owner, retailer and distributor have delayed operation of the installed system by over 3 months. Further delays have occurred when the system owner has chosen to change retailers for more competitive arrangements, which has resulted in protracted contract delays and conflicting retailer and distributor requirements.

[11] This is typical of the size of systems that have been installed to date and represents the size of system that can obtain the maximum rebate under the Commonwealth's PV Rebate Program (PVRP).

[12] This figure is for a typical NSW household, which is a family with both adults working (Australian Bureau of Statistics, 2001Census Data). The level of power exported could be much lower if the house is occupied during the day.

//// DRIVING ENERGY *EFFICIENCY*

/// **cutting** *greenhouse emissions*

/// **growing** *the economy*

/// **boosting** *jobs*

/// **november** 2003

BCSE
Australian
Business Council
for Sustainable
Energy

contents

/// ***ABOUT*** *THE BCSE*

The Australian Business Council for Sustainable Energy (BCSE) is the peak industry association representing the sustainable energy industry. The BCSE was formed in September 2002 through the merger of the Australian EcoGeneration Association (AEA) and the Sustainable Energy Industry Association (SEIA). The BCSE represents the broader sustainable energy industry covering renewables, waste-to-energy and gas-fired generation as well as energy efficiency.

The BCSE has more than 250 member organisations ranging from installers and designers of renewable energy systems to large project developers and equipment manufacturers. Members include both energy retailers and energy service providers.

Cover photographs courtesy PV Solar Tiles, Green Building Partnership (Dare Images) and Westmead Hospital.

/// PURPOSE OF THIS DISCUSSION PAPER

Using energy more efficiently is widely recognised as the most cost effective means of reducing greenhouse emissions. And numerous studies have shown there's also a serious economic benefit – the widespread application of energy efficiency programs and initiatives would significantly boost economic growth and lead to substantial increases in employment.

Interest in improving energy efficiency dates back to the early 1970s, the days of surging energy prices after the initial oil shocks. But that interest quickly dwindled and Australia's overall performance on energy efficiency has been disappointing – relatively cheap electricity prices have contributed to a consistent growth in energy consumption.

But the momentum for change is growing. Environment and industry groups have been calling for action on energy efficiency, and while governments and business have yet to act decisively they are showing an increasing interest in the issue.

Australia's electricity consumption is growing quickly – by 2010 demand is expected to rise by 60 TWh (tera watt hours, or a billion kilowatt hours) or more than 2% every year. The Electricity Supply Association of Australia believes that energy efficiency alone could deliver half of that predicted growth.

But so far action to deliver on this potential has been disappointing and as a result the BCSE has developed this discussion paper. It is the intent of this paper to move away from marginal improvements in energy efficiency and propose more ambitious policy measures. This document is not intended to be prescriptive but rather to spur policy debate and focus attention on the need for concerted action towards ambitious targets.

This paper also forms the basis on which the BCSE can work with its members to develop a blueprint to harness the potential of energy efficiency and develop a vibrant energy services industry in Australia.

The BCSE welcomes comments and suggestions on this paper and the issues raised and these can be forwarded to Julia Birch at the BCSE on julia@bcse.org.au or 03 9349 3077.

/// POLICY OPTIONS FOR NOW: DRIVING AUSTRALIA TOWARDS ENERGY EFFICIENCY

Energy efficiency programs are a golden opportunity to meet much of the growing demand for energy and at the same time deliver a jobs boost and increased economic growth while avoiding the massive expense and harmful environmental consequences associated with building new coal-fired power stations and more power lines. And the economic value of energy efficiency can only increase as we move further towards a carbon-constrained economy.

The economic benefits of energy efficiency programs have been detailed in a series of recent studies.

> A report commissioned by the South Australian government found that as a 'highly conservative' estimate that state could cut its energy use by 20% over a 20 year period and create up to 2700 jobs (Lee, R; Denlay, J 2002, Energy Efficiency Potential in South Australia).

> An ongoing national study (SEAV and Allen Consulting Group) has found that implementing 50% of the currently commercially available energy efficiency measures would – over 12 years – reduce stationary energy use by 9%, create an extra 9,000 jobs and increase GDP by $1.8 billion.

> In 2002 a British Government report found nation-wide potential for cost-effective energy savings of up to 30% with an eventual benefit to consumers of 12 billion pounds (Cabinet Office's Performance and Innovation Unit, 2002, Energy Review).

Australia has been slow to embrace energy efficiency, but this has to change. As one of the worst greenhouse polluters per capita in the world, Australia cannot afford to meet growing power needs through new coal-fired power stations. Instead Australia has to turn to a combination of energy efficiency measures, renewable energy and natural gas.

Energy efficiency will play a key role in this mix. Energy efficiency measures offer a swift and often simple way to reduce energy use, reduce energy bills and reduce greenhouse emissions. This should make energy efficiency attractive to business, industry and households alike. But to get real action – real progress – governments at all levels have to drive the agenda and make energy efficiency a priority. Here are some measures governments could immediately take to drive Australia along the path to energy efficiency.

Ten first steps to an energy efficient future

//**1** Implement a regime requiring electricity retailers to progressively reduce the greenhouse emission intensity of electricity sold. Retailers must be able to (in part) meet these targets by providing programs to reduce customers' energy use.

//**2** Implement mandated minimum performance standards for new and existing commercial buildings based on the Australian Building Greenhouse Rating Scheme (BGRS). Building owners to be provided with a number of options to comply including the use of Green Power, Renewable Energy Certificates (RECs) or NSW Greenhouse Abatement Certificates (NGACs). The minimum performance standards should initially include: a five star requirement for new commercial buildings (including fitout); existing commercial buildings to be progressively improved to achieve four star rating (five star for tenancies).

//**3** For new residential houses, implement mandated minimum greenhouse performance standards covering base building and key appliances. A minimum five star energy efficiency requirement should apply to the base building (adjusted for climate).

//**4** For existing residential buildings, introduce a requirement to perform an energy performance rating (covering base building and key appliances) prior to resale. For rental properties, require the building's energy performance to be disclosed in new leases.

//**5** Provide financial and regulatory support for the development of an energy services industry including the establishment of cogeneration and energy efficiency targets and the establishment of an energy services action agenda.

//**6** Governments must show leadership by ensuring they implement cost-effective energy efficiency projects for all departments and agencies.

//**7** Develop electricity market arrangements that deliver a level playing field for energy efficiency through a move to more cost reflective pricing. This will provide customers with appropriate economic price signals reflecting the cost their energy use imposes on the electricity system.

//**8** Require Australian industry to undertake energy audits and report its greenhouse emissions.

//**9** Require industry to progressively move to best practice energy performance, including assessment of cogeneration opportunities. Government to provide industry support through best practice programs.

//**10** Provide strategic funding support for research, development, demonstration and commercialisation of energy efficiency and sustainable energy technologies.

/// *POLICY OPTIONS FOR THE FUTURE:* *A VISION FOR AN ENERGY EFFICIENT AUSTRALIA.*

The BCSE believes that policy makers must embrace a concerted vision for energy efficiency. In this section, the report canvasses a range of proposals and sets out a far reaching agenda. Some of these proposals are bold and ambitious, some short-term, some long-term. This section focuses on improving the energy efficiency of homes and non-residential buildings, on reducing the energy intensity of Australian industry and on encouraging cogeneration and an energy services industry. The options presented here are not intended to be exhaustive or exclusive. But they merit consideration and debate.

In addition to these initiatives, there are a number of broad policy measures which must be implemented to create a truly energy efficient Australian economy. Some of these are covered in 'Ten first steps to an energy efficient future'. These policy measures include a carbon pricing scheme (in the long term emissions trading, but more immediately a national greenhouse benchmark scheme for electricity retailers), support for research and development in the energy efficiency area and fiscal support for business investing in energy efficiency. These measures apply equally to each of the sectors dealt with below.

RESIDENTIAL

Given the strong growth in residential sector energy use, decisive action is needed. A policy framework should be established to progressively move Australia to an environment where household greenhouse emissions from energy use are limited to one tonne per person. Currently the figure is about 2.8 tonnes per person.

The current growth in energy use is being driven by a combination of factors. The number of households is growing, the number of people per household is declining and the average size of new homes is increasing. The growing popularity of large capacity air conditioners is dramatically increasing the peak demand (in summer) for electricity. There are also energy-intensive trends towards central heating, brighter lighting, wider use of halogen lighting and more and larger home entertainment systems and televisions.

Other activities have the potential to become problems unless appropriate strategies are applied. For example, clothes drying is a relatively small user of household energy today but, as more people move to medium and high density housing, it could increase to as much as 10 or 15% of household greenhouse gas emissions. Similarly, large plasma TVs can use up to 400 watts, four times more than standard sized TVs. And the appliance retailing industry effectively discourages people from trading in old appliances: instead, consumers keep old refrigerators, VCRs and TVs plugged in in garages, laundries or spare rooms, wasting energy and money.

While there have been some positive moves – including improvements in the efficiency of some major appliances and a switch to lower greenhouse impact gas hot water – overall the recent results have been poor. Between 1990 and 1999, residential sector greenhouse gas emissions per person increased by 6.4% (Wilkenfeld, G; Energy Strategies, 2002, Australia's national greenhouse gas inventory – end use allocation of emissions).

Present energy efficiency strategies are simply not strong enough. While new regulations are making modest improvements in building energy efficiency, their impact is being swamped by factors such as a dramatic increase in house floor area, open plan design, and the installation of inefficient air conditioning systems. Today's new homes – and much of the equipment being installed – are not compatible with a low cost, low energy future. Future home building and home renovations provide opportunities for energy efficiency improvements.

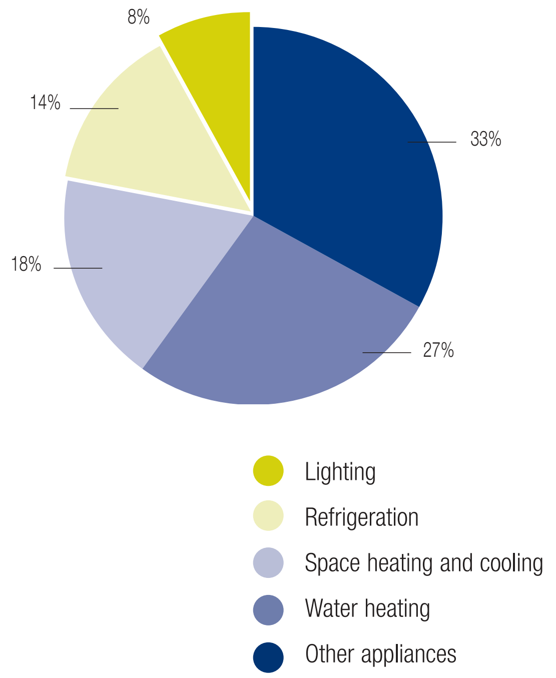


Figure 1. Australian residential sector energy-related greenhouse gas emissions by activity, 1999 (Wilkenfeld and ES, 2002). Total 63.2 Mt per annum.

MAKING THE RIGHT MOVES

Australia's overall performance on energy efficiency has been disappointing but there have been some positive moves. While there has been little progress on reducing commercial and industrial energy use, there have been some good programs in the residential sector. Three recent examples:

ACT: Energy ratings for house sales
Since March 1999, all homes advertised for sale in the ACT have had to be rated for energy consumption – as well as being available to interested purchasers, an energy performance report is actually put into the hands of the eventual purchaser as part of the sale process. Four years later, the ACT remains the only state or territory in Australia to have taken this step.

Energy rating assessments are prepared using a detailed computer-based software modelling package. It also provides options for improvements to the efficiency of the dwelling which are incorporated into the report.

NSW: Water and energy targets for new homes
From July 2004 all new homes and units in NSW will be required to achieve:

> 40% reduction in water consumption; and

> 25% reduction in greenhouse emissions, rising to 40% reduction from July 2006.

Compliance with the scheme will be judged on a points-based Building Sustainability Index (BASIX). It has been estimated that the cost of constructing a home that uses 40% less water and 40% less energy would add less than 2% to the cost of an average house and land package. Some estimates have the average family saving between $300 and $500 a year through reduced water and energy use.

VIC: 5 Star housing
From July 2005 all new Victorian homes will have to be five-star energy efficient, fitted with water saving devices and have either a solar water heater or a rainwater tank.

Within five years the scheme will lead to annual energy savings of $30-40 million and annual greenhouse emissions savings of more than 200,000 tonnes. This is equivalent to removing 45,000 cars from the roads, or planting 750,000 trees.

Over the next 20 years, the Government expects the 5 Star standard to lead to:

> Increased economic growth in Victoria of up to $570 million.

> 1,100 extra jobs.

> Enhanced competitiveness of Victoria's export industries.

> Lower energy prices as more than 30,000 houses use half today's energy consumption for heating and cooling.

Making homes work

Issues and action

Home builders do not pay the ongoing energy costs of the homes they build, and home buyers are focused on more visible features and usually give little thought to the running costs of the home. Buyers of existing homes (apart from in the ACT) have no access to information on the energy efficiency of the house they are considering purchasing.

In order to drive major improvements in the design and performance of new and existing homes, some of the future energy costs should be shifted onto the builder. With respect to appliances, energy labels exist for some major appliances but not for others. Manufacturers have to be given incentives to minimise the lifecycle energy use of their appliances.

Possible policy initiatives

> Strong performance standards should be introduced for new homes and major renovations (base building and key appliances). This should initially be a five star standard, but progressively tightened to six and then seven stars. Renewable energy systems should receive credit under the scheme.

> New homes and major extensions should have solar access and suitable roof areas for installation of solar hot water and solar electricity cells. New hot water services should be solar (gas-boosted where possible).

> For appliances, more stringent performance standards should be applied. Minimum standards and best practice standards should be established for appliances. Any manufacturer who produces appliances at below the best practice standard would have to offset the greenhouse cost of that appliance (defined as the difference between the appliance's actual performance and best practice performance) over the likely life of the appliance through the purchase and surrender of offset certificates such as RECs and NGACs.

> New homebuyer rebates and stamp duty should be scaled to reward buyers of low-energy homes.

> Research, development, demonstration and commercialisation (RDD&C) in house design and appliance design should be strongly supported so ultra-high efficiency buildings, appliances and equipment can be quickly commercialised.

Empowering consumers. Realistic prices

Issues and action:

Energy consumers should be empowered to make informed decisions and should experience the real cost of their energy choices. Residential energy tariffs are heavily distorted due to the inadequacies of the present metering systems, government policies and subsidised pricing. Energy pricing should be shifted to a more cost-reflective structure while maintaining social justice considerations.

Possible policy initiatives:

> Smart metering should be introduced, starting with new homes and large summer users. The metering should provide feedback to users, have demand management capability and be able to easily accept grid-connected power generation systems.

> Where this metering is installed, mandatory time-of-use tariffs should be applied. Demand above (say) 3 kW at times of high system demand should be charged for, and large wired-in equipment such as air conditioners and pool filters/chlorinators should be separately metered and able to be demand managed. Alternatively, the price of new equipment likely to be used at times of peak system demand should reflect the capital investment in energy supply infrastructure required to meet the increasing peak demand. Another option would be to require purchasers of high peak demand equipment to install local generation, for example PV.

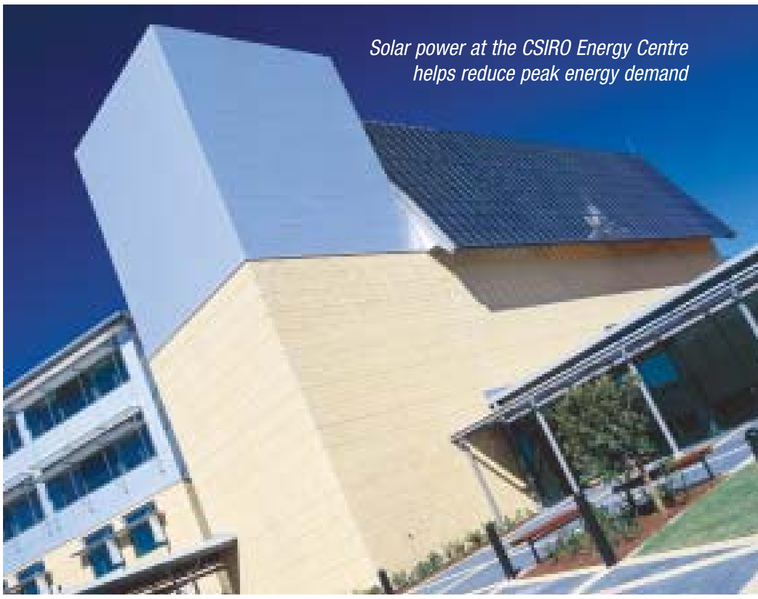
> Where it is considered inappropriate to remove subsidies (eg to rural consumers) then compensating incentives for adoption of energy efficiency and local generation should be provided: these will reduce the overall subsidy level over time while also reducing greenhouse gas emissions.

SOLARSENSE HOME – USING ONE THIRD AS MUCH POWER

At New Haven north-west of Adelaide this two-storey residence has been extensively monitored for two years showing that it uses 65% less power than the state average for a one-person home. The building features PV panels integrated into the roof structure, a solar hot water heater and skylight. The house was built with low embodied energy materials, it is well-insulated, zoned for heating and cooling and has an evaporative air conditioner in the roof space. It also features efficient major appliances and radiant ceiling heating in the lounge and dining rooms.

Monitoring shows that in 1999 the home's total energy use was 3047 kWh. The PV contribution was 1157 kWh, leaving an effective energy use of 1889 kWh. The average energy use for a one-person household in South Australia was 5469 kWh/y.

- > Buyers of existing homes (and potential tenants) should be provided with comprehensive information on the energy costs and greenhouse impacts of the homes they are considering buying (or renting).
- > Energy retailers should be required to provide benchmarking information on energy bills so consumers can compare themselves with average and good performance.



Solar power at the CSIRO Energy Centre helps reduce peak energy demand

COMMERCIAL BUILDINGS

From 2006 all new commercial buildings should have zero net greenhouse emissions. Government office buildings should also have zero net emissions. Strong policies are justified in this sector. Energy consumption is growing rapidly yet energy is such a small component of total costs for this sector that even the most aggressive and expensive strategies (such as mandatory purchase of 100% green power without reducing energy use) would add less than 0.3% to total operating expenses. And the energy saving potential in this sector is so great that the likely outcome of a sensible mix of policies would be financially beneficial. Given the strong growth in this sector, it is also important to ensure that new buildings do not become stranded assets or liabilities in a greenhouse-constrained future.

According to ABARE, if business-as-usual conditions prevail, this sector is expected to increase its electricity use by over 68% by 2020 with growth in peak summer demand being even greater. Over half of this sector's emissions result from attempts to heat and cool buildings, while a further quarter results from lighting. Refrigeration is a major issue, particularly in some retail facilities such as supermarkets. Computer centres and their inefficient air conditioning systems are a growing energy issue with substantial potential for savings.

Turnover of equipment, refits of tenancies and refurbishments are frequent in this sector. There is also significant potential for improving the efficiency of existing buildings through changes to management and maintenance. Based on limited data, it appears there is wide variation in energy use by different buildings.

The fragmentation of ownership, operation and building development create major barriers to energy efficiency. Another barrier is the reality that for most occupants of non-residential buildings, energy costs are a small component of total input costs – typically less than 0.5% of operating expenses.

But there is increasing pressure for improved energy performance (and lower greenhouse gas emissions) in this sector. For example, the City of Melbourne, where commercial buildings generate half of all greenhouse emissions, has announced a strategy for zero net greenhouse gas emissions by 2020. Local government members of programs such as Cities for Climate Protection are also adopting ambitious emission reduction targets that would necessarily require much improved performance from non-residential buildings.

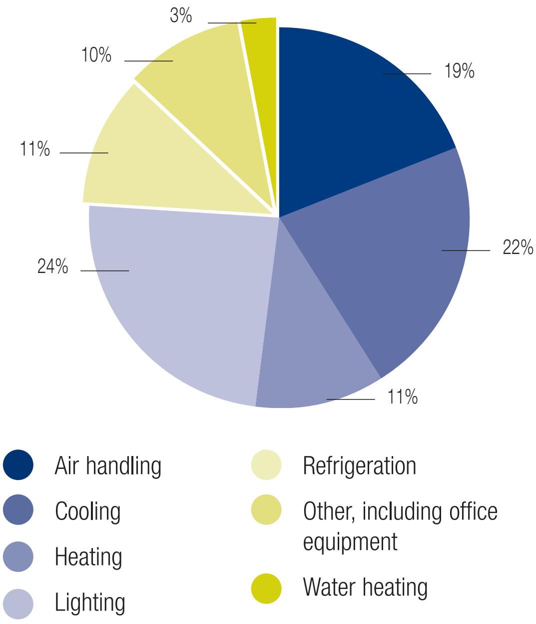


Figure 2. Australian commercial sector greenhouse gas emissions by activity, 1999 (Wilkenfeld and ES, 2002). Total 46.4 Mt per annum.

THE 60L GREEN BUILDING – ZERO EMISSIONS

Finished in September 2002 on the edge of Melbourne's CBD, the 60L Green Building is one of just a handful of zero emissions office buildings in Australia. A conventionally-built office of the same size would create about 800 tonnes of CO_2 every year. Through good design and by incorporating a number of energy efficiency features the building uses less than one third the energy of a conventional office building. Photovoltaic cells on the roof provide up to 10% of the building's power needs with the balance of the power sourced through Green Power. 60L also incorporates two solar heat pumps which provide 75% of the building's common hot water needs.

Making buildings work

Issues and action:

Buildings have relatively long lives, so it is important that new buildings and major refurbishments are compatible with a carbon-constrained economy. Building developers and buyers of equipment generally do not pay the ongoing energy bills and greenhouse costs of operation of the facilities they are responsible for.

Widely accepted Australian energy benchmarks do not exist for non-residential buildings and facilities in Australia (except for office buildings). This is despite the availability of energy consumption data. New building design should be sufficiently flexible to allow easy incorporation of emerging low greenhouse impact solutions such as fuel cells and renewable energy systems. Part of the lifecycle costs of a building's operation should be brought forward and charged to the developer to create an incentive to reduce total lifecycle costs rather than just up-front costs. Alternatively, regulations or incentives can be established to require developers and purchasers to either achieve specified levels of performance or provide incentives to meet these levels.

Possible policy initiatives:

For new buildings and tenancies:

> From 2006 new commercial buildings (excluding separately metered industrial processes and tenancies) should be net zero greenhouse emission based on a 20-year lifetime. Building developers must demonstrate compliance by submitting ABGRS commitment agreement (or equivalent), evidence of ownership of additional renewable energy sources and/or surrender required number of emission offsets such as NGACs or RECs.

> Require all new non-residential buildings and tenancies to meet an initial 5-star ABGR rating or equivalent (once appropriate benchmarks are established).

> A stronger price signal could be sent by allocating to developers the capital cost of additional energy supply infrastructure required for that building or requiring them to invest in peak demand offsets.

> All new tenancies should achieve zero net greenhouse gas emissions on a length-of-lease basis from 2006.

> For existing buildings and tenancies introduce mandated annual energy reporting and minimum energy performance standards (four star for base building and five star for tenancies). There should be options for compliance to include direct energy savings and emission offset schemes.

> Energy retailers should include benchmark data on energy bills to assist consumers.

> Equipment efficiency programs should be upgraded, covering equipment such as catering equipment, boiling water units, etc. RDD&C projects should be implemented within end-user sectors such as the food equipment industry, commercial refrigeration industry and hospital engineers networks.

Empowering consumers

Issues and action:

Energy consumers should be empowered to make informed decisions and should experience the real cost of their energy choices. Education is needed to inform energy users of the financial and environmental impacts of their energy use and how to cut these costs. At present, energy pricing for small commercial consumers is distorted and costs are often hidden (for example, as part of building outgoings in a tenancy agreement). On the other hand, most larger customers have smart metering and (to a reasonable extent) cost-reflective pricing. Experience shows that the attention of senior management has to be engaged on energy issues: a combination of compliance requirements and financial incentives (particularly taxation incentives) is needed, so that financial and operations managers can be engaged.

Possible policy initiatives:

> There should be a mandatory roll-out of smart metering and cost-reflective pricing across the sector. The metering must have the capacity for time-of-use and demand-based pricing, as well as providing feedback on energy use and cost to consumers. Separate metering for tenancies and major areas of energy use should be mandated (or at least encouraged).

> Financial incentives should be introduced for in-house metering and load management of major energy-consuming activities (such as computer centres, swimming pools, catering facilities, etc).

> Education and information programs are needed on energy billing, opportunities for savings and on the environmental consequences of energy use.

> Incentives are needed to encourage investment in energy efficiency including accelerated depreciation or tradable tax credits. The cost of such incentives can be justified through the benefits to the economy that cannot be captured by the individual businesses involved – including downward pressure on energy prices through reduced demand, lower future costs of greenhouse gas mitigation and reduced subsidies to peak demand and rural customers.

BAKERS DELIGHT – 32% ENERGY SAVINGS, 48% GREENHOUSE SAVINGS

This showcase Bakers Delight bakery in the suburb of Mascot in Sydney has cut nearly a third from the annual power bill of a standard bakery, a saving of about $4,000 a year. Greenhouse emissions have been cut even further, by 48%. This was achieved through an innovative and thorough approach to energy efficiency – improving almost every piece of equipment and changing staff behaviour.

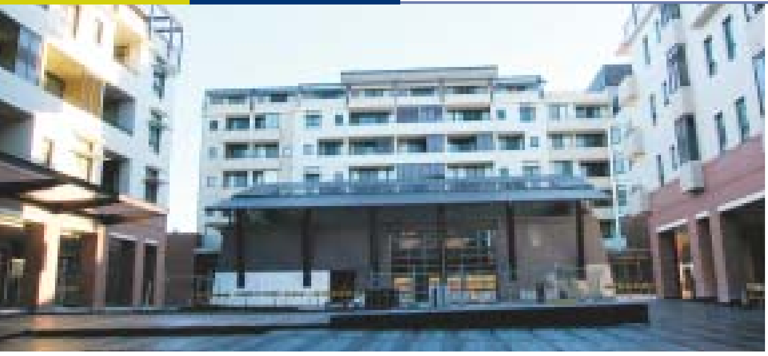
Much of the equipment was dramatically improved.

Oven – 20% energy cost savings. Door fully insulated with no glass window, improved seals fitted to all four sides of door, energy efficient light.

Oven hood – 74% energy cost savings. Design improved and adjustable variable speed drives fitted to supply and exhaust fan motors.

Lighting – 64% energy cost savings. The lighting power was reduced from 3.4 to 1.5 kW while maintaining lighting levels found in standard bakeries.

The project was a joint effort between Bakers Delight, industry suppliers and the Australian Government's Energy Efficiency Best Practice program.



Kogarah Town Square – energy efficient design and roof-integrated PV

Targeting cost-effective opportunities

Issues and action:

The most cost-effective saving opportunities should be captured first. Although data is limited, there is evidence that a small number of buildings (and practices) are responsible for a disproportionately large percentage of energy use. These buildings offer significant potential for savings. As a first step, better data is needed.

Possible policy initiatives:

> Governments should work with electricity retailers to develop benchmarks that can be used to identify and focus programs on unusually high energy (and high peak load) consumers. Benchmarking data should be incorporated into energy bills.

> Government promotional campaigns should publicise performance benchmarks. High consumers (and contributors to peak demand) should be encouraged to seek assistance to save money and energy.

Government playing a leadership role

Issues and action:

Government is a large contributor to this sector's greenhouse gas emissions and has a track record of poor performance on energy efficiency. This is particularly evident with respect to investment in measures that have payback periods of more than 1–3 years but are still cost-effective from a societal perspective. Government needs to adopt a policy of ensuring the maximum level of energy efficiency consistent with net societal benefit (including allowance for greenhouse costs).

Possible policy initiatives:

> All government buildings and tenancies to achieve zero net greenhouse gas emissions from 2006.

> Governments should provide funding for their own agencies to invest in all energy efficiency measures with a real rate of return exceeding 2–3% above the long-term bond rate.

> Annual public reporting against benchmarks must be introduced for all public sector agencies – along the lines of the scheme now applied by the Commonwealth government – but requiring performance to meet the zero net emission targets discussed above. This reporting would apply to all energy consuming activities, including the relevant share of base building energy use where a government agency is a tenant.

INDUSTRY

Between 1990 and 1999, the Australian manufacturing sector's energy related greenhouse gas emissions increased by 11%. Emissions are dominated by the metals industries – mainly aluminium and iron & steel. The levels of greenhouse gas emissions from different industries do not necessarily reflect their contribution to the economy. For example, the metals sector generates around 17 times as much greenhouse gas per dollar of gross value added as the food industry and eight times as much as the wood and paper industry.

During the early days of energy market reform, industry (encouraged by governments claiming that reform would dramatically cut prices) developed a belief that it could manage energy issues simply by negotiating a better price. More recently a more sophisticated view has begun to emerge. With prices bottoming out along with recognition that carbon pricing will eventually emerge, industry is accepting that it is the total cost of energy that really matters. Within this framework, making energy more productive by doing more with less can offset price increases, and can offer flow-on benefits in other aspects of a business.

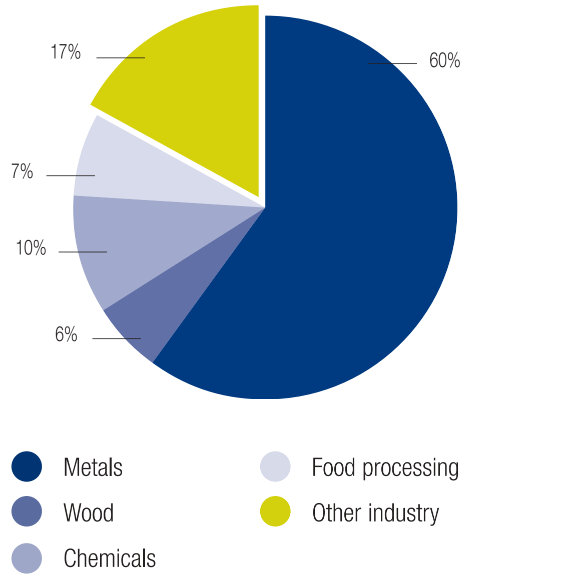


Figure 3. Australian manufacturing sector energy-related greenhouse gas emissions, 1999 (Wilkenfeld & ES, 2002)

Investing in industry's future

Issues and action:

Australian industry must invest in equipment and practices that will allow it to manage energy use and costs in a carbon-constrained future. Indeed, smart businesses are seeing opportunities to profit through negotiating better prices by managing demand at peak times and by selling emission rights such as through the NSW greenhouse benchmark scheme.

Possible policy initiatives:

> All capital investments of more than $1 million should present a strategy showing how they will incorporate all energy efficiency measures down to a 12% internal rate of return.

> Governments should offer incentives to industries that utilise energy performance contracting to implement energy efficiency and cogeneration measures.

> All modular industrial equipment should be supplied with a lifecycle energy cost datasheet.

> All equipment consuming more than (say) 5 kW must be supplied with its own meter, must be able to vary its operation, and must be able to be remotely controlled for load management purposes.

> Mandatory annual reporting of greenhouse gas emissions. This could be supplemented by a mandatory target of 2% per annum reduction based on a five-year rolling average.

> Programs (modelled on Victorian EPA regulations) requiring energy audits, greenhouse targets and compliance with greenhouse targets should be expanded.

> Accelerated depreciation or tax rebates should be available for equipment that complies with high efficiency criteria.

> All new industrial projects should work with industry development departments to ensure they are compatible with the goal of halving greenhouse gas emissions per unit of output over a 20-year life.

AMCOR – SAVING $1.5 MILLION

In 2000, packaging group Amcor approached Origin Energy with concerns about the size of its energy bill and its greenhouse emissions. The two companies developed a five-year plan to cut Amcor's energy use by 10% per unit of product. The strategy involved identifying savings opportunities and engaging employees in the process. The result? Every year Amcor is saving $1.5 million and keeping 29,000 tonnes of greenhouse emissions out of the environment.

COGENERATION

Cogeneration is the simultaneous production of useful heat and power, where surplus electricity can be exported to the electricity grid. Fuel for cogeneration is largely natural gas or renewable energy, such as the process waste in food production.

Typically, cogeneration will increase overall efficiency to somewhere in the range of 70–75%, but in certain circumstances more than 80% of the input energy can be used. This can be two to three times as efficient as a conventional power station.

There are clearly defined benefits associated with cogeneration. Energy costs to the host site are dramatically reduced; the reliability of the energy supply is improved; electricity used on-site and exported to the grid is significantly less greenhouse intensive than conventional coal sources; and demand on the electricity grid is reduced alleviating the need for expensive infrastructure work to upgrade the network to allow it to meet peak demand.

144 projects or 2495 MW of cogeneration is currently installed in Australia. The majority of cogeneration capacity (635 MW) resides in the alumina industry, followed by the sugar industry with 369 MW. The remainder of capacity exists in the paper, chemical, nickel and oil refinery industries. Approximately 53% of capacity is fuelled by natural gas, and 15% of capacity is fuelled by renewable sources.

Cogeneration including fuel cells and other on-site generation options will become increasingly viable in the future. It is therefore vital that new industrial facilities be designed so they can easily incorporate these measures.

Encouraging cogeneration

Issues and action:

There are significant barriers to the wider uptake of cogeneration among Australian industry. Australian electricity prices are artificially low as they do not include the cost of greenhouse emissions. Cogeneration is not the core business of the companies that would benefit from the measure and awareness of the technology and benefits is low. Cogeneration projects need a commitment from senior management and usually require a project champion within the host company. This can be a problem when management can change within short time frames. Long lead times are required and contractual negotiations can be complex. Some of the benefits of cogeneration, including demand side management, are often not captured by the host.

COOPERS BREWERY: SAVING 15,000 TONNES OF GREENHOUSE EMISSIONS

Thanks to rapid production increases over the last decade, Coopers decided to relocate its brewery. At its new site, Coopers chose to take an environmentally progressive approach to energy – rather than simply plugging into the grid, Coopers opted to rely on cogeneration for its steam and electricity needs.

A $6.2 million natural gas fired cogeneration plant now operates on the site. Owned and operated by AGL, the plant produces about 24,000 MWh annually. 6,000 MWh is used by Coopers, the remaining 18,000 MWh is exported back into the grid. The exported electricity is enough to supply about 3,000 average households annually. Steam is generated by using the exhaust heat of the gas turbine.

By producing its electricity and steam on site, Coopers has cut energy costs as well as reducing greenhouse gas emissions by 15,000 tonnes per annum. This is the equivalent of taking 3,200 standard vehicles off the road.

The cogeneration plant achieves 80% thermal efficiency, 2.5 times better than a conventional power station. It operates 24 hours a day, five days a week, 50 weeks a year.

Possible policy initiatives

> The introduction of an energy use threshold, equivalent to a total of 500 GJ per year or 100 tonnes of greenhouse emissions, above which a cogeneration feasibility study and energy audit is required. Cogeneration and other recommendations are to be implemented where it can be demonstrated to achieve rates of return of 12% (the level below which cogeneration projects are eligible for government funding under the greenhouse gas abatement program).

> All new industry should investigate and, if economic, install cogeneration and other energy efficiency practices.

> Introduce industry development support funding for cogeneration: this would include funding for feasibility studies and information packages for potential proponents.

> Cogeneration targets should be set to achieve 10% of total generation by 2010.

Children's hospital at Westmead investing in energy efficiency

DEVELOPING AN ENERGY SERVICES INDUSTRY

Participants in this industry provide energy services and products rather than energy itself. It directly focuses on the needs that arise from a customer's energy use – for example the supply of lighting, heating and cooling products. The energy services industry also focuses on assisting customers better manage (or reduce) their energy needs; this ranges from design and engineering to construction, operation and maintenance. It also includes energy auditors, advisers, energy managers, energy performance contractors as well as cogeneration developers.

To be able to deliver energy efficient outcomes it is imperative that an energy services industry is supported and developed. This involves the building of industry capacity and capability. Governments and industry must cooperate in developing an action agenda for the energy services industry. This was identified as a priority under the renewable energy action agenda.

Building an industry

Issues and action:

The energy efficiency and cogeneration industries have suffered in the early years of energy market reform due to the distortions and imperfections in the market frameworks. Mainstreaming energy efficiency will require many professionals and tradespeople to acquire new skills and incorporate energy efficiency into their existing activities. There is a need to rebuild these industries and retrain existing professionals and tradespeople. Governments will have to play a central role in fostering a strong industry.

Possible policy initiatives:

> Resources need to be allocated to develop training and education for professionals and trades people. All training materials that impact on energy efficiency (eg for refrigeration mechanics, lift mechanics, designers, engineers, etc) need to be revised to incorporate ongoing energy efficiency improvements.

> Accreditation schemes should be developed for energy auditors and industry practitioners.

> Training programs and cadetships should be offered to companies for in-house energy management capacity building.

> Development of toolkits for various end-user sectors including local governments, process industries, community facilities, retail buildings and commercial buildings.

> Support for promotion and marketing to end use customers.

MACARTHUR HOUSE – OVER $30,000 IN LIGHTING SAVINGS

The ACT Government has upgraded the lighting systems at its eight-storey Macarthur House headquarters leading to annual savings of $34,300 (225,000 kWh). The savings will cover the cost of upgrade in 3.2 years. The work was done under an Energy Performance Contract (EPC) with Australian company Energy Conservation Systems. Under an EPC, the energy contractor covers the cost of upgrading the building or facility. Payments are then made from the energy savings.

/// WHY ENERGY EFFICIENCY? *THE ENVIRONMENTAL IMPERATIVE*

Global warming is one of the most urgent environmental issues facing the global community. The Australian Government has accepted the United Nations Framework Convention on Climate Change (UNFCCC) report that states that significant reductions in greenhouse emissions are required if we are to avoid a damaging build-up of greenhouse gas emissions with potentially disastrous consequences.

The impacts of climate change are now becoming better understood. Scientists have concluded that global warming contributed to the severity of the recent drought and bushfires that devastated large parts of rural and regional Australia. They also warn that warming oceans threaten to destroy the Great Barrier Reef, an Australian icon. The growing community concern over the impacts of climate change is creating pressure on all levels of government to implement policies that reduce greenhouse gas emissions.

There is now a growing consensus that massive cuts to emissions – far beyond those laid down in the Kyoto Protocol – are needed to safeguard the health of the planet. Scientists say we'll have to cut today's emissions by 50 to 80% by 2050. Politicians say it's a bit less. Dr David Kemp, the Minister for Environment and Heritage, told Parliament on 20 August 2002:

> "By the end of the 21st century, if we are effectively going to address the issue of global warming, we will need to see a global reduction in greenhouse gas emissions of between 50 and 60%."

Whether it's 50, 60 or 80% cuts by 2050 or 2100, decisive action is needed. And in order to make deep cuts, emissions from electricity generation need to be reduced significantly. Electricity generation is Australia's biggest greenhouse offender, accounting for over 35% of emissions. Greenhouse emissions from electricity generation have increased by 35% since 1990, the largest increase of any sector.

Emissions from electricity are expected to increase by over 60% from 1990 to 2010 and by over 80% increase to 2020. This is out of step with Kyoto which demands that Australia's growth in emissions be kept to no more than 8% by 2010.

Codrington Wind Farm (Vic) producing green power

/// WHY ENERGY EFFICIENCY?
THE ECONOMIC IMPERATIVE

Emissions are rising because demand is rising. Electricity demand has increased by 3% per annum over the last ten years and current projections are for electricity needs to continue to grow by over 2% per annum for the next twenty years. The Electricity Supply Association of Australia (ESAA) estimates that $30 billion of electricity network and generation infrastructure is required to meet Australia's growing power needs over the next ten years.

Much of that investment will be required to meet the growth in peak power demand, which in turn is being driven by a huge increase in the sale of air conditioners. In summer, when these air conditioners are switched on, the demand for power peaks and the industry needs to be able to supply the necessary power. Australia's electricity infrastructure is becoming increasingly stressed by these times of peak demand. This in turn creates concerns for governments as voters still hold them accountable for power supply.

The National Electricity Market Management Company (NEMMCO) has predicted that all states will have to build additional generation by 2005-06 to meet this growing summer power demand. The ability to meet peak power needs in a secure and reliable manner is now exercising the minds of policy makers. To continue to build infrastructure is increasingly expensive and unsustainable. In NSW alone, it is planned that over the next five years, $5 billion will have to be spent on distribution and transmission network investment.

Efficiency measures that significantly reduce power use – particularly at peak times – would save governments, taxpayers and consumers billions of dollars, allowing the money to be spent elsewhere, creating jobs and growth.

Sutherland Leisure Centre (NSW) cogeneration as part of an EPC

Solar heat pumps

Electricity consumption growth rates by sector

	Consumption in 2001 TWh	Consumption in 2020 TWh	Growth to 2020	Share of total in 2020	Growth in peak demand to 2020
Residential	48	78	57.2%	28%	80%
Commercial and services	43	74	68.0%	26%	95%
Manufacturing and construction	71	100	38.5%	35%	46%
Mining, agriculture and other	20	32	55.3%	11%	66%
Total	**182**	**284**	**52.3%**		**68%**

Chart compiled from statistics produced by the Australian Bureau of Agricultural and Resource Economics (ABARE). The final column – 'Growth in peak demand to 2020' has been derived from NEMMCO projections that growth in peak summer power demand in the National Electricity Market will be 30% higher than the underlying growth in total consumption.

As one of the worst greenhouse polluters per capita in the world, Australia cannot afford to meet growing power needs through new coal-fired power stations and more power lines.
Instead Australia has to turn to a combination of energy efficiency measures, renewable energy and natural gas.

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