DRIVING ENERGY EFFICIENCY

/// cutting greenhouse emissions
/// growing the economy
/// boosting jobs

/// November 2003
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.
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 (R&D&D&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/yr.
> 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.

**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.
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.

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 CO₂ 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.
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.
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.
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.

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.

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.
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.

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 retain 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 (e.g. 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.
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.

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 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.

Electricity consumption growth rates by sector

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

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.