



## **Demand Side Management**

### **Energy Efficiency Potential in South Australia**

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## 1 EXECUTIVE SUMMARY

This paper reviews recent analysis of energy efficiency potential both in Australia and Internationally to demonstrate a conservative level of energy efficiency to which South Australia could aspire.

Based on a range of overseas and national studies and program, this report identifies a potential for cost-effective energy efficiency in South Australia of 20% over a 20-year period. This potential can be regarded as highly conservative. For example, the UK Government, in its 2002 Energy Review identified the cost effective potential for energy efficiency at around 30% with potential financial benefits to consumers of £12 billion<sup>1</sup>. This level of efficiency potential was noted as “consistent with estimates from other countries summarised by the Intergovernmental Panel on Climate Change”<sup>2</sup>. Researchers at the Rocky Mountains Institute, reflecting on 20 years of energy efficiency gains in the USA from the oil shocks of 1976 to 1996 noted:

“The scope for efficiency has, if anything, increased. In 1976, the argument was whether 10 percent or 30 percent could be cost-effectively saved. Now, after saving [US]\$180 billion a year, it’s 50 percent vs. 90 percent”<sup>3</sup>

The relatively mild South Australian climate may lead to lower energy savings in the building sector (residential and commercial). However, energy prices across Australia have historically been low compared to international averages. It is therefore likely that fewer energy efficiency measures have been adopted than elsewhere. In the industrial sector, potential gains are likely to be similar to, or greater than, international averages for the same reason.

Delivering energy efficiency improvements will require a concerted effort over a prolonged period. It will be necessary to both overcome barriers to implementing currently cost-effective measures and to ensure that buildings and equipment reaching the end of their useful lives are replaced with energy efficient options. The efficiency gains have therefore been set out with progressive improvement in mind over a period of 20 years. The conservative and cost-effective levels of energy efficiency that have been identified – ie, 20% saving over this period across all sectors – is based on 1998 energy use; with the domestic sector contributing 25%, commercial sector 15% and industrial sector 20%.

It is clear that there is enormous scope for implementing cost-effective energy efficiency measures in South Australia. Such measures are more economically attractive than investing in new generating capacity, be it conventional fossil-fuelled plant or renewable plant. If South Australia is to meet its greenhouse targets against a background of increasing energy consumption, then energy efficiency measures will need to take a key role alongside the deployment of renewable energy projects.

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<sup>1</sup> Performance and Innovation Unit, 2002, The Energy Review, UK Cabinet Office, <http://www.cabinet-office.gov.uk/innovation/2002/energy/report/>, Page 190.

<sup>2</sup> Performance and Innovation Unit, 2001, Energy Efficiency Strategy, UK Cabinet Office, Consultation Draft September 2001, <http://www.cabinet-office.gov.uk/innovation/2002/energy/report/working%20papers/PIUc.pdf>, pages 8-9.

<sup>3</sup> Rocky Mountains Institute Newsletter, Fall/Winter 1996, Volume XII Number 3, Snowmass, Colorado USA, <http://www.rmi.org/images/other/NLRMIfallwin96.pdf>

## 2 SUMMARY OF POTENTIAL SAVINGS

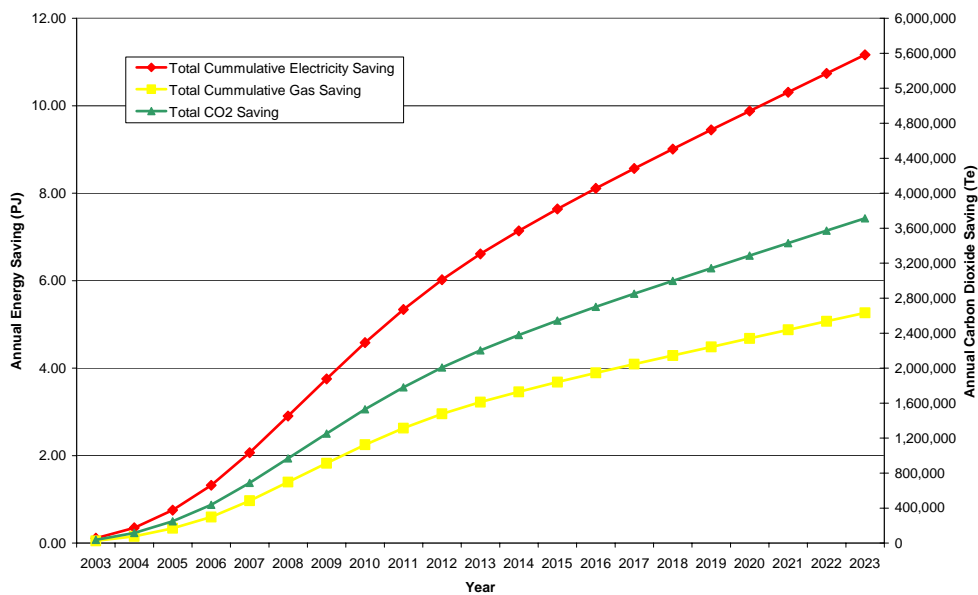
Table 1 and Figure 1 summarise the potential cost-effective energy and greenhouse gas savings available in South Australia, based on studies conducted both nationally and internationally.

	Annual Gas Saving Potential (PJ)	Annual Electricity Saving Potential (PJ)	Total Annual CO <sub>2</sub> Savings (Tt)	Estimated Annual Cost Saving (2002 \$)	Total Investment (2002 \$)
Industrial	4.01	5.22	1,818,000	\$185Million	\$371 million
Commercial	0.13	1.39	436,000	\$40Million	\$160 million
Residential	1.12	4.55	1,459,000	\$200Million	\$609 million
<b>Total</b>	<b>5.26</b>	<b>11.16</b>	<b>3,713,000</b>	<b>\$425 Million</b>	<b>\$1.14 billion</b>

**Table 1 - Summary of Potential Savings**

These savings would be driven by a little over \$1 billion of cost-effective private sector investment. In contrast to supply side solutions, which may be sourced from interstate or are likely to involve a significant quantity of international content, demand side solutions must be implemented locally and there is therefore opportunity for significant growth in the energy services sector in South Australia.

It is also estimated that this level of energy efficiency could create between 850 and 2700 net new jobs.



**Figure 1 - Summary of Energy Efficiency Potential - All Sectors**

## 2.1 Cost Benefit to Consumers

Energy efficiency measures directly reduce consumer costs and can therefore provide significant benefit, particularly as many measures have relatively short payback periods (1 to 5 years). In contrast, a sustainable future based solely on renewable energy production is likely to result in significant cost increases to consumers due to the higher cost of renewable energy sources compared to current generation – a balanced approach of energy efficiency and renewable energy could result in no significant net cost increases for consumers.

Figure 2 shows the cumulative benefit to consumers over the 20-year period (in non-discounted 2001 dollars) based on the potential electricity energy efficiency improvements and the sector energy prices used in the detailed evaluations. Only *electricity* energy efficiency measures are considered, so that the efficiencies can be compared with the costs of supplying the comparable amounts of electricity using the gas combined cycle option shown in Table 2.

It should be noted that the data presented in Table 2 are market costs for energy and do not include other real “externality” costs, such as the impacts of air pollution. Incorporating such externalities would make energy efficiency and energy from renewables more attractive.

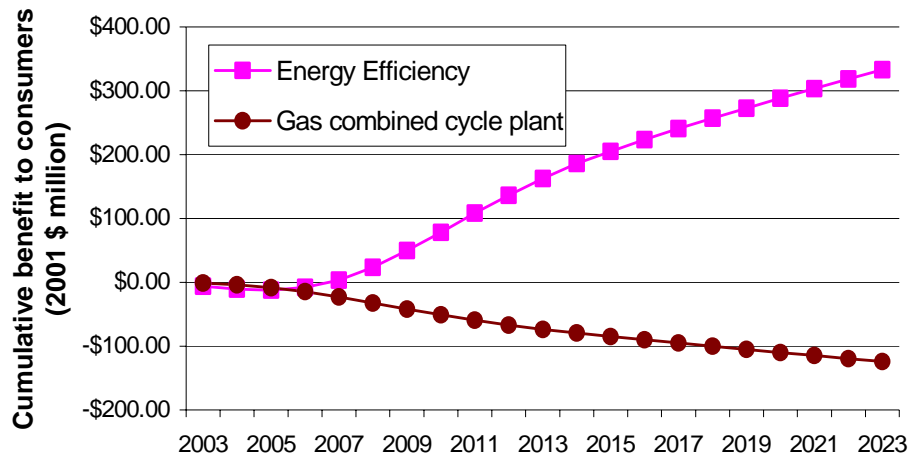


Figure 2 - Cumulative benefit/cost of energy efficiency and gas supply

### 3 ELECTRICITY SUPPLY ALTERNATIVES

Focussing on electricity, the forecast growth over the next ten years is approximately 4000GWh<sup>4</sup> (14.4PJ). From the estimates of savings potential, after 10 years approximately 1670GWh (6.02PJ) of this growth could be avoided. This corresponds to an average demand of approximately 190MW.

#### 3.1 Cost comparison

From a greenhouse perspective, an alternative to energy saving is to supply this energy from renewable resources. There are a range of technologies that could supply this energy including wind power, biomass and solar systems. The Table below compares the current costs of various supply options.

Supply Option	Percent Availability	Capacity Required	Cost of Capacity (2002 \$)	Unit Cost	Source/Basis
Solar PV <sup>5</sup>	20%	950MW	\$12,350M	40c/kWh	\$15,000/kW
Onshore Wind Turbines	30%	633MW	\$1139M	10c/kWh	SEDA - \$1,800/kW
Biomass (Direct Combustion)	95%	200MW	\$600M	5-15 c/kWh <sup>6</sup>	UK/Scandinavia \$3,000/kW
Gas Combined Cycle Plant	96%	198MW	\$257 Million	4c/kWh	\$1,300/kW
Energy Efficiency	100%	190MW	\$600 Million	3.6c/kWh	Assuming 10 year life of measures

**Table 2 - Alternative Supply Options to Meet Growth in Demand**

Table 2 indicates that energy efficiency measures are significantly more cost effective than alternative renewable technologies and compare favourably with 'cleaner' fossil fuel generation. The table does not take into account the additional costs associated with transmission, distribution and retail margin, which would typically add a further 10c/kWh or more to most small consumers' bills. Energy efficiency measures do not attract these additions and may in fact off set network augmentation costs. This data is backed up by international evidence. In particular, the UK based Energy Saving Trust estimates that the Energy Efficiency Commitment (a measure imposed on retailers to reduce their customers' energy consumption) achieves savings at a cost of 1.55p/kWh for electricity compared to a purchase price of 6.7p/kWh.

<sup>4</sup> Electricity Supply Industry Planning Council, Annual Report 2001/2002

<sup>5</sup> Based on 25 year life and Adelaide Conditions with 1kW peak cell producing 1800kWh per annum

<sup>6</sup> Low range assumes waste fuels are 'free', high range assumes energy crops

### 3.2 Employment comparison

Not only is energy efficiency a highly cost-effective alternative to the supply of energy, it also provides greater local economic benefits, such as employment. Table 3, sourced from analysis undertaken by Greenpeace Australia, demonstrates the employment benefits of energy efficiency.

Technology	Direct jobs per A\$ million invested	Direct jobs per unit of energy generated/saved
Oil shale	0.5	46.3
Coal mining and power generation		116
Solar electric	3.5	
Solar thermal electricity	248	
Wind		542
Energy efficiency	35-50	400-860

**Table 3 - Direct employment potential of various energy options (source: Greenpeace Australia<sup>7</sup>)**

From Table 3 it can be seen that renewable energy supply and energy efficiency both offer greater employment benefits than energy produced from fossil fuels. The employment benefits of renewables and energy efficiency are comparable on a per unit of energy basis. However energy efficiency creates an order of magnitude more employment than renewables per dollar invested.

Chapter 7 provides further details on the employment and local economic benefits of energy efficiency.

<sup>7</sup> Figures quoted in Greenpeace Australia, Jobs and the Oil Shale Industry, <http://www.greenpeace.org.au/climate/archive/nonewoil/jobsbrief.html> and based on research that is referenced on the web site.

## 4 INDUSTRIAL SECTOR ANALYSIS & DISCUSSION

Energy saving opportunities in the industrial sector are many and varied. There are some measures that will have wide, generic, application, whilst others may be sector specific. In many cases, even generic solutions require careful examination and tailoring to specific company circumstances. Measures appropriate to the industrial sector include:

- Building fabric improvements
- Lighting systems
- Energy efficient motors
- Variable speed drives
- Compressed air system controls and leakage minimisation
- Steam/hot water system insulation and leakage minimisation
- Process control improvements
- Heat recovery
- Cogeneration
- Process design changes

### 4.1 International / National Studies of Energy Efficiency Potential

There is a wealth of data available on industrial energy efficiency improvements from around the world. The overwhelming majority of studies, research and practical programs have demonstrated that there are significant cost effective savings to be made in the industrial sector. Individual country studies and examples are backed up by the Inter-Governmental Panel on Climate Change, Working Group III contribution to the Third Assessment Report, which predicts similar energy saving potential.

#### Data from SEDA

The Sustainable Energy Development Authority of NSW (SEDA) has prepared a range of case studies, examples include:

- Steam Trap Maintenance Program – Internal Rate of Return: 88%
- Compressed Air System Refurbishment – Internal Rate of Return: 38%

SEDA estimates that most businesses could save 20% on their energy costs by implementing cost effective energy efficiency measures.

### Commonwealth Enterprise Energy Audit Program (EEAP)<sup>8</sup>

The EEAP operated between 1991 and 1997 and provided subsidised energy audits to business (50% of the cost up to a maximum of \$5000). Approximately 1200 businesses participated in the scheme. An ABARE<sup>9</sup> evaluated various aspects of the program and found that:

- On average each firm received 5.8 recommendations and implemented 4.7; an implementation rate of 81%.
- The total net present value of EEAP to those businesses participating was \$189 million, assuming an 8 % discount rate and five year investment life. The costs to the Government of administering the EEAP averaged \$165,000, giving a total cost of about \$1 million for the 6 years that the program ran. This, combined with the audit costs of \$8.7 million, of which the Government funded half, indicates that EEAP was a cost-effective program.
- Most businesses (93%) thought that the EEAP audit had been worthwhile. It also increased awareness of energy efficiency and acted as a ‘springboard’ for further actions.

### UK Energy Review

The UK Government’s Performance and Innovation Unit published a comprehensive ‘Energy Review’ in February 2002<sup>10</sup>. The review concluded that improvements in energy efficiency should be a key contributor to ensuring a sustainable and reliable energy supply for the UK in the long term; targets of a 20% improvement in energy efficiency by 2010 and a further 20% in the following decade are proposed.

The report draws on a number of UK and international studies and concludes that potential *cost effective* savings in the industrial sector are 24% and the technical potential is 36%<sup>11</sup>. It is worth noting that this is against a background of higher energy costs and long running energy efficiency best practice programs and industry support – it is thus likely that the potential savings for South Australia could be significantly higher.

### US Research

There have been numerous programs and studies of energy efficiency carried out in the US. These studies have generally shown that cost effective savings are achievable. A report published by the Electric Power Research Institute (Barakat and Chamberlin, 1990) estimated that the maximum technical potential ranged from 24% to 44% of projected energy use by the year 2000, whilst a report prepared by the Rocky Mountain Institute (Fickett et al. 1990) placed the technical potential for savings at 75% by 2010.

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<sup>8</sup> This section taken from IPART Enquiry into the role of demand management and other options in the provision of energy services, Interim Report, April 2002

<sup>9</sup> ABARE, Energy Efficiency Investment in Australia, 1998, ABARE Research Report 98.2

<sup>10</sup> Performance and Innovation Unit, 2002, The Energy Review, UK Cabinet Office, <http://www.cabinet-office.gov.uk/innovation/2002/energy/report/>, Page 6

<sup>11</sup> Performance and Innovation Unit, 2001, Energy Efficiency Strategy, UK Cabinet Office, Consultation Draft September 2001, <http://www.cabinet-office.gov.uk/innovation/2002/energy/report/working%20papers/PIUc.pdf>, page 8.

In general, there is an acknowledgement that energy efficiency potential is increasing as new technologies emerge and that the cost-effective potential, whilst significantly less than the technical potential, is also increasing at a similar rate.

### Summary

There have been numerous programs targeting energy efficiency in many countries around the world and even more numerous studies as to the potential impact. The results of these studies are quite variable, but very few show energy efficiency potential of less than 10% and most predict cost-effective savings well in excess of this. A conservative estimate might place technically feasible savings at around 30-40%, with cost effective savings in the range 15 to 25%.

## 4.2 What can be achieved in South Australia?

Historically, energy prices (particularly electricity) have been relatively low in Australia, there have been few programs targeting energy efficiency and it is therefore likely that energy efficiency potential is towards the top-end of international estimates. However, there may also be a smaller proportion of energy intensive industries where large cost effective savings may be more readily achieved. Whilst similarly large savings may exist in smaller industries, it is likely to be significantly more difficult to tap this potential.

It would not be unreasonable to assume that cost-effective savings of some 20% are achievable in the industrial sector in South Australia. This improvement would translate into the energy and greenhouse gas savings as indicated in the table below. The calculations assume that 70 percent of the energy savings will come from electricity and the remainder from gas, this is based on there being a significantly larger number of technologies available to reduce electricity consumption combined with the possibility that some energy savings will be achieved by fuel switching from electricity to gas where this is more economic.

	Annual Use <sup>4</sup>	Annual Saving Potential <sup>5</sup>	Annual CO <sub>2</sub> Saving Potential	Estimated Annual Cost Saving
Industrial Electricity	16.54PJ (4600GWh)	5.22 PJ (1450GWh)	1,610,000Te <sup>1</sup>	\$145 million
Industrial Gas	29.65PJ (8200GWh)	4.01PJ (1114GWh)	208,700Te <sup>2</sup>	\$40 million

**Table 4 - Potential Energy Savings in Industrial Sector**

Notes:

Data Source: South Australian Energy Flows 1998/99 – July 2001, Energy SA

Note 1: At 1.109 kg/kWh or 308Gg/PJ (This may over estimate the long term annual benefit)

Note 2: Assumes gas is combusted efficiently with CO<sub>2</sub> factor of 52Gg/PJ

Note 3: Cost savings based on 2002 dollars at \$100/MWh for electricity and 1c/MJ for gas

Note 4: Estimated are based on 1998/99 energy use and do not account for growth in energy use over the 20 year period.

Note 5: Assumes that efficiencies, once taken up, continue to provide savings for the remainder of the 20 year period.

In practice, these energy efficiency benefits would be delivered over a relatively long time frame. Whilst some energy efficiency retrofits are cost effective at any time (e.g. lighting and control schemes), others are only cost effective at replacement time – e.g. energy efficient motors. Any energy efficiency improvement target needs to take this natural replacement cycle into account. With many items of equipment have life-spans of 10 to 20 years, it is likely that to

achieve the current cost-effective potential would take a minimum of ten years. In practice, it would take several years to raise the profile of energy efficiency significantly, which may then bring forth a large number of ‘immediately cost effective’ energy efficiency measures over a short time frame, with replacement type measures spreading out over later years. Figure 3 illustrates how the total energy savings potential shown in Table 4 might be achieved over a period of 20 years.

Much of the research also points to the fact that rate at which technologies become cost-effective has paralleled the take-up rate for currently cost-effective measures. This suggests that, for some time to come, there will always be cost effective measures to implement and as such, the curve should continue to increase beyond 2023.

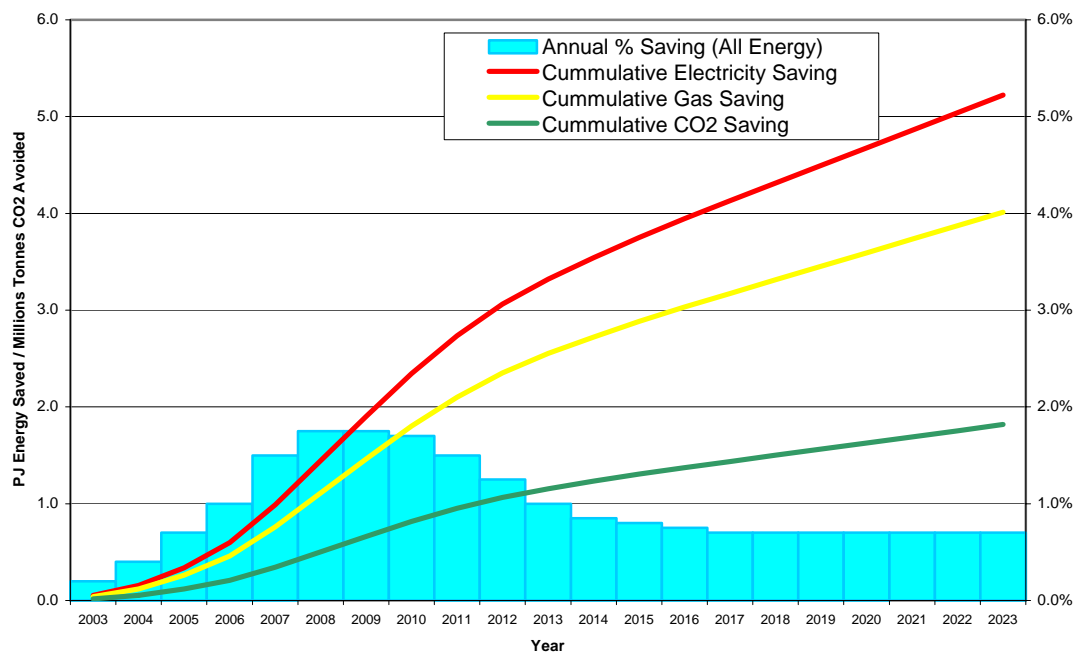


Figure 3 - Potential Energy Savings in the Industrial Sector

### 4.3 Investment in Industrial Energy Efficiency Measures

The savings indicated in Figure 3 are based on the implementation of cost-effective measures. These are assumed to have a simple payback of 2 years on average. This equates to annual spending (in 2002 dollars) rising from \$1.6M per annum to \$14.4M per annum during the initial peak of activity and falling to \$5.75M per annum in later years. Unlike supply side solutions, which may be constructed using inter-state resources, demand side projects must be implemented locally and it is therefore likely that a reasonable proportion of this investment would be spent within SA. The expenditure would include capital items, but would also include a significant labour element ranging from project identification (e.g. energy consultancy work) through implementation (electrical and mechanical design and site work) through to ongoing maintenance.

## 5 COMMERCIAL SECTOR ANALYSIS AND DISCUSSION

In the commercial sector, there are a greater range of generic solutions than in the industrial sector, although measures may still need to be tailored to specific building types. Examples of appropriate measures include:

- Building fabric improvements
- Lighting system improvements (and greater use of natural light)
- Heating and cooling system and control improvements
- Energy efficient motors
- Energy efficient electronic goods (computers, photocopiers etc)
- Cogeneration

### 5.1 International / National Studies of Energy Efficiency Potential

Individual country studies and examples are backed up by the Inter-Governmental Panel on Climate Change, Working Group III contribution to the Third Assessment Report, which predicts similar energy saving potential.

#### Data from SEDA

Many of SEDA's business case studies are from the commercial (or service) sector. A few examples include:

- Lighting Project with an investment cost of \$2,500 and annual savings of \$60,948
- Fast food store redesign, including lighting and cooking appliance improvements, with an investment cost of \$68,000 and annual savings of \$31,500
- Car park ventilation control system with an investment cost of \$27,000 and annual savings of \$8,910

#### The UK Energy Review

The UK energy Review analysed savings potential in the commercial sector and estimates that the technical potential for energy savings was 39%, with currently economic potential at 21%, with about half of that potential being achievable by 2010<sup>12</sup>. The report notes that small-scale cogeneration could have significant potential in the commercial sector. In the South Australian context, small-scale co-generation may be less attractive until cost-effective packages complete with absorption chilling systems are readily available. However, such systems are already under development and could be viable within a few years.

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<sup>12</sup> Performance and Innovation Unit, 2001, Energy Efficiency Strategy, UK Cabinet Office, Consultation Draft September 2001, <http://www.cabinet-office.gov.uk/innovation/2002/energy/report/working%20papers/PIUc.pdf>, page 6.

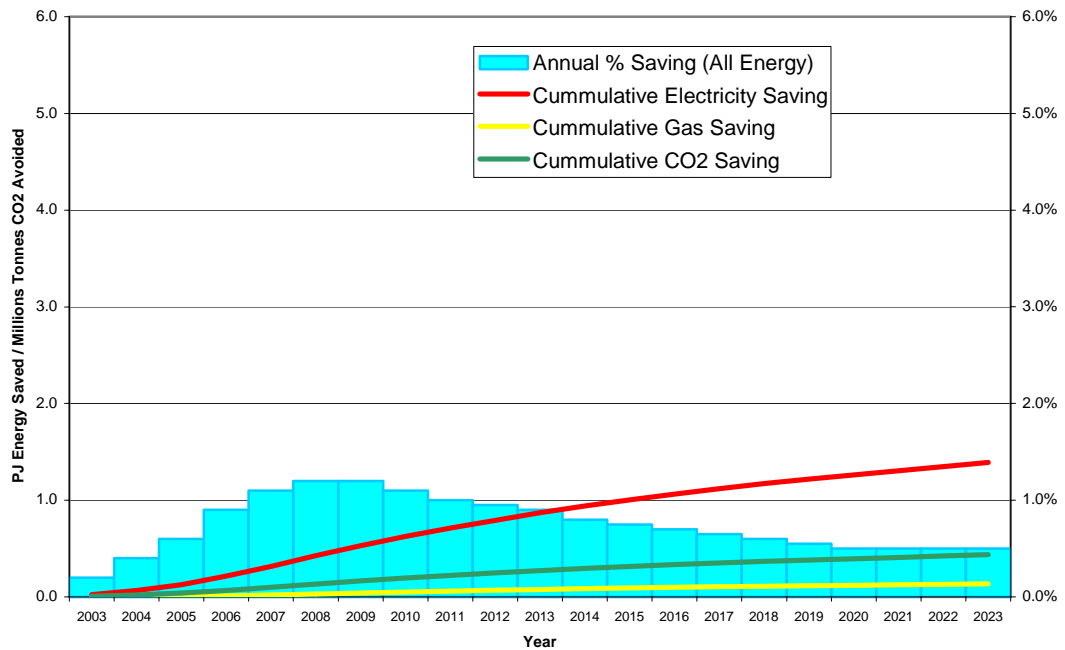
## 5.2 What can be achieved in the Commercial Sector in South Australia?

Whilst historically low energy prices may have led to less efficient use of energy, it may also be the case that many energy efficiency improvements may not lead to such significant savings in the buildings sector as may be obtained in colder climates. For this reason, the potential saving has been estimated at approximately 15%. This improvement would translate into the energy and greenhouse gas savings as indicated in the table below. In this commercial analysis, the proportion of savings attributable to electricity is 90% in the early years, falling to 70% in later years. This is on the assumption that many gas savings will result from improvements to building fabric, which will be carried out only at refurbishment, as they are unlikely to be cost-effective at other times. Furthermore, the rate of improvement is expected to be spread over a longer period for the same reasons. Early gains may be obtained through lighting system improvements and the use of more energy efficient office equipment.

	Annual Use	Annual Saving Potential	Annual CO <sub>2</sub> Saving Potential	Estimated Annual Cost Saving
Commercial Electricity	8.12PJ (2255GWh)	1.39PJ (386GWh)	428,970 Te	\$39 Million
Commercial Gas	2.06PJ (572GWh)	0.13PJ (36GWh)	6,980 Te	\$1.3 Million

**Table 5 - Potential Energy Savings in Commercial Sector**

Notes: As Table 1



**Figure 4 - Potential Energy Savings in the Commercial Sector**

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### **5.3 Investment in Commercial Energy Efficiency Measures**

The savings indicated in Figure 4 are based on the implementation of cost-effective measures. For the commercial sector, where building lifetime and tenancy agreements are long and therefore investment risk is lower, the average payback for measures is assumed to be 4 years. This equates to annual spending (in 2002 dollars) rising from \$1.6M per annum to \$8.4M per annum during the initial peak of activity and falling to \$3.3M per annum in later years.

## 6 RESIDENTIAL SECTOR ANALYSIS AND DISCUSSION

The residential sector presents an opportunity to implement a range of generic solutions. Some of these are very cost-effective and could be delivering benefits within a short timescale, others are less cost-effective, but still viable, and are likely to be phased in over a longer period. The passive design of homes is one of the key factors in determining household energy use and, whilst there are a range of retrofit measures, more fundamental improvements, though improved building standards, will only have a significant impact in the long term due to the slow turnover of building stock.

A range of areas where gains can be made are highlighted below:

- Lighting – e.g. greater use of compact fluorescent lighting
- Appliance efficiency – through star ratings and minimum standards
- Improved controls – e.g. heating/cooling
- Hot water service improvements – insulation, solar, controls
- Retrofit passive measures – insulation, shading, draft proofing
- New-build passive design

### 6.1 National/International Studies of Residential Energy Efficiency

#### South Australia

From 1993 until 1996, a joint project between the then ETSA and the SA Housing Trust sought to establish the potential energy and greenhouse gas emissions savings in small households. The program included technical measures, such as energy efficient appliances, and behavioural measures delivered through information and education. The project showed that providing behavioural information and feedback alone was not very effective due to the low cost of energy – in fact, there was some evidence that energy use increased in those houses with greater knowledge of operating costs. However, those households that received technology and behavioural solutions achieved savings of between 28% and 55% in all electric homes and 23% to 45% in gas homes.

## UK Energy Review

The UK Energy Review reports potential cost-effective savings of 37% and a technical potential of 54%<sup>13</sup>. This is based on a number of studies, but also includes data from the UK's Energy Efficiency Commitment on Retailers, that has been delivering energy efficiency measures in the domestic sector since 1993. The report notes that stock turnover, installer capacity and householder attitudes will limit the take-up of these measures.

## 6.2 What can be achieved in the Residential Sector in South Australia?

It is apparent from the South Australia based study that significant savings are possible in the residential sector. This is backed up by research elsewhere and by technical analysis of the effectiveness of individual measures, such as compact fluorescent globes or the use of energy efficient appliances. Whilst in colder climates the potential energy savings may be greater, it is also relevant to note that the quality of housing stock in SA is likely to be relatively poor in terms of thermal performance. With householders aspiring to comfortable conditions, it is likely that the use of heating and cooling systems will increase further, which will tend to make passive measures such as insulation more cost effective for individual households.

From the savings identified in the SA study, an efficiency gain for residential energy efficiency improvement in the order of 25% would seem reasonable and achievable. This would lead to the savings indicated in the table below. For this sector, electricity is assumed to contribute 70% of savings.

	Annual Use	Annual Saving Potential	Annual CO <sub>2</sub> Saving Potential	Estimated Annual Cost Saving
Residential Electricity	14.41PJ (4000GWh)	4.55PJ (1264GWh)	1,400,000Te	\$190 Million
Residential Gas	8.26PJ (2295GWh)	1.12PJ (311GWh)	58,000 Te	\$13.4 Million

**Table 6 - Potential Energy Savings in Residential Sector**

Notes: As Table 1 but cost savings based on 2002 dollars at 15c/kWh for electricity and 1.2c/MJ for gas

Many energy saving measures in the domestic sector are likely to come from the replacement of appliances and refurbishments / new build and are thus likely to be achieved over a longer period. There are some low capital cost measures, such as the use of compact fluorescent lighting, low flow shower heads and insulation to hot water tanks that could be stimulated by appropriate programs and may therefore deliver earlier benefits.

Figure 5 illustrates how the 25% saving might be achieved over a period of 20 years. Early years savings grow rapidly with extensive education and awareness campaigns and incentives for low cost energy saving measures. There is then continued gains from appliance replacements (with high efficiency units), building passive measures and new housing stock.

<sup>13</sup> Performance and Innovation Unit, 2001, Energy Efficiency Strategy, UK Cabinet Office, Consultation Draft September 2001, <http://www.cabinet-office.gov.uk/innovation/2002/blueprint/report/working%20papers/PIUc.pdf>, page 4.

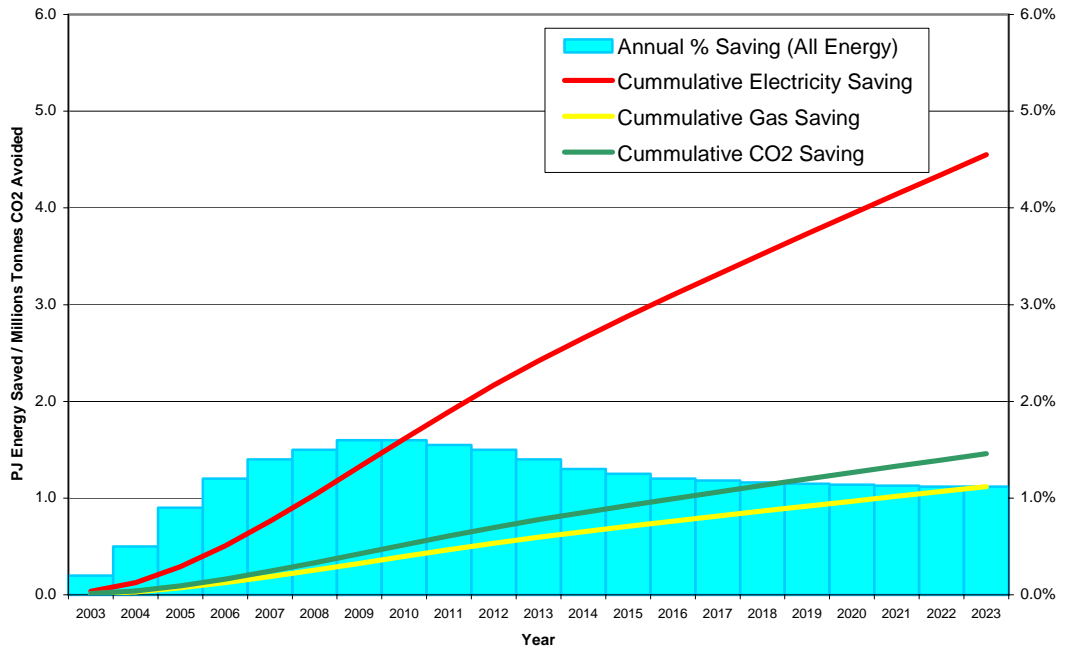


Figure 5 - Potential Energy Savings in the Residential Sector

### 6.3 Investment in Domestic Energy Efficiency Measures

The savings indicated in Figure 5 are based on the implementation of cost-effective measures. In the domestic sector, there are a range of measures which have very short payback periods – such as appropriately installed compact fluorescents, draft proofing and low flow shower heads, however, other measures which can result in much greater savings can have longer payback periods – e.g. solar water heating and roof insulation. Overall, domestic measures are assumed to have an average simple payback of 3 years. This equates to annual spending (in 2002 dollars) rising from \$2.7M per annum to \$21.6M per annum during the initial peak of activity and falling to \$15.2M per annum in later years. Virtually all of this investment should flow through South Australian businesses; either through retail sales of energy efficiency measures and efficient appliances or through domestic trades businesses such as plumbers and electricians etc.

## 7 LOCAL ECONOMIC POTENTIAL

Compared with the supply of energy, energy efficiency has been shown to be a net generator of employment and other local economic benefits. The key reasons for this include:

- Energy efficiency is generally more employment intensive than energy generation;
- Investments in energy efficiency tend to stay in the local economy more than investment in energy generation;
- Consumer savings made from reduced utility costs are invested in activities that generate more local economic activity than investment in energy generation.

### 7.1 International studies

A number of international studies have assessed the employment creation potential of energy efficiency.

#### The American Council for an Energy-Efficient Economy

In a 1992 study<sup>14</sup> on the employment and economic development potential of energy efficiency in the USA, the ACEEE found that achieving 20% energy efficiency over the period of 1990 to 2010 would:

- Almost completely counter predicted growth in energy use.
- Create 293,000 new jobs by 1995, 471,000 new jobs by 2000 and nearly 1.1 million jobs by 2010 on a net basis. The 2010 figure “represents approximately a 0.7% increase in the predicted employment level that year”.
- Increase personal income by 0.5% in 2010.

The report notes, “The positive employment and income results are due primarily to the relatively low labor intensity of the energy sectors ... compared to the economy as a whole”. Ninety percent of the net jobs created are a result of consumer and business “energy bill savings and re-spending of those savings.”

#### Cities for Climate Protection

The International Council for Local Environmental Initiatives (ICLEI) has reported<sup>15</sup> on “the economic power of energy efficiency” as part of its US Cities for Climate Protection program.

In one case study, a US\$654 350 investment in energy efficiency programs by the City of San Jose stimulated US\$8.5 million in private sector investment. The City estimated that over an 11-

<sup>14</sup> Geller, H., DeCicco, J. and Laitner, S., 1992, Energy Efficiency and Job Creation – Executive Summary, American Council for an Energy-Efficient Economy, <http://www.aceee.org/pubs/ed922.htm>

<sup>15</sup> ICLEI, Cities for Climate Protection Fact Sheet: The Economic Power of Energy Efficiency, ICLEI Cities for Climate Protection – US, Berkeley CA, <http://www.iclei.org/co2/fact/fact.htm>

year period, this would increase net employment by 1753 jobs, generate US\$33 million incremental wages and salaries, and increase local spending by US\$20.8 million.

The report cites that energy conservation produces a higher “multiplier effect” (the amount of economic activity generated in a local community by different combinations of spending and investment) than energy production and even ordinary consumer spending. This is shown in Figure 6.

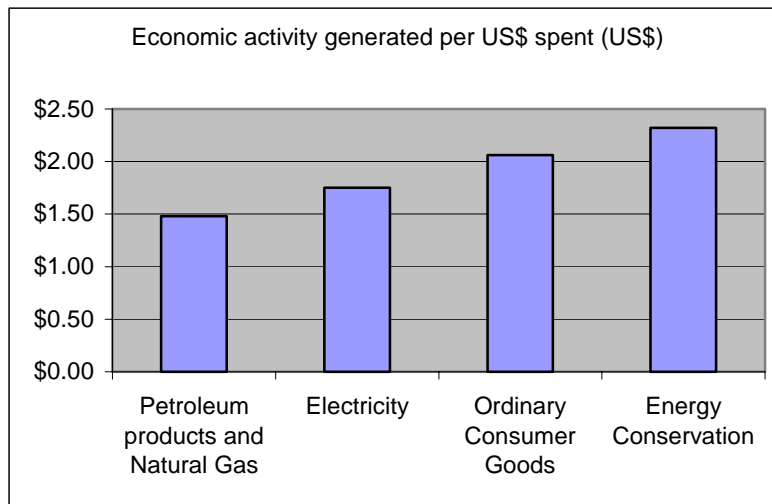


Figure 6 – The multiplier effect (source: ICLEI Cities for Climate Protection – US)

### The European Union SAVE Program

The EU’s non-technical energy efficiency program, SAVE, commissioned a report on the employment impacts on energy efficiency investment programs<sup>16</sup>. The study reviewed 44 energy efficiency investment programs in 9 EU countries and found that “employment gains have been an indirect consequence in virtually every case”.

The study found employment creation “a desirable side effect” of energy efficiency investment. “Per million Euros of total expenditure (government and private) energy efficiency programmes typically resulted in 8 to 14 additional person-years of employment”. The jobs are often in sectors, skill groups and locations that are priorities for employment policies.

<sup>16</sup> Wade, J., Wiltshire, V., and Scrase, I., 2000, National and Local Employment Impacts of Energy Efficiency Investment Programmes – Final Report to the Commissions April 2000 Volume 1: Summary Report, Association for the Conservation of Energy, London, UK, <http://www.ukace.org/pubs/reportfo/SAVEjobs.pdf>

## 7.2 What can be achieved in South Australia?

From some of the studies quoted above and other studies it is possible to estimate the additional net employment that could be generated from the levels of energy efficiency and investment outlined in this report.

Comparing the potential for energy saving in South Australia over the 20 year period (as shown in Table 1) with that estimated in the ACEEE report, it can be estimated that around 850 net new jobs would be created.<sup>17</sup>

Using another approach, a number of other studies have related employment to dollars invested in energy efficiency. Based on three such studies, it can be estimated that the level of potential investment (as shown in Table 1) would result in the creation of 2700 new jobs<sup>18</sup>.

From these comparisons net employments in the range of 850 to 2700 could be expected from the level of energy efficiency outlined in this report. Whilst this analysis is quite preliminary, it does demonstrate the worthwhile potential for job creation associated with energy efficiency.

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<sup>17</sup> The ACEEE study estimated that saving 20,800 PJ of energy over 20 years would create nearly 1.1 million new jobs in year 20 – or a ratio of 52 jobs per PJ of energy saved.

<sup>18</sup> The three studies are quoted in a Friends of the Earth UK Briefing, “Reaping the Double Dividend – Climate Change and Jobs”, [http://www.foe.co.uk/resource/briefings/double\\_dividend.html](http://www.foe.co.uk/resource/briefings/double_dividend.html): (1) 75,000 jobs from US\$3.1b investment in US DSM, (2) 1850 jobs from 1745 million DM investment and (3) 100-115 net and 70-80 indirect jobs from £20 million of DSM investment.