Developing the Australian Market for Energy Efficient Buildings

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ABSTRACT

On December the 4th 1997 the Sustainable Energy Development Authority (SEDA) launched the Energy Smart Business program to encourage investment in energy efficiency and to transform the energy services market within Australia. An additional market based tool for the commercial building sector was launched on 2nd September 1999. This Building Greenhouse Rating scheme aims to give market recognition to energy efficient (and hence greenhouse efficient) commercial buildings.

This paper describes the market barriers to the wider utilisation of energy efficient technologies and practices in the commercial property sector in Australia. The strategies employed by the Energy Smart Business program and Building Greenhouse Rating scheme to overcome these barriers are discussed, with reference to specific examples. Crucial to the success of these programs is the marketing of the programs themselves, the results they are achieving and the achievements of program participants.

The paper also includes a discussion of the primary goal of both of these programs, market transformation. How these programs can be handed over to the private sector or phased out, while sustaining the levels of investment in energy efficiency achieved is a key issue.

Overview

In 1996 the New South Wales (NSW) State Government created the Sustainable Energy Development Authority (SEDA). SEDA was established in response to the escalating concern about the enhanced greenhouse effect, coupled with the prospect of reduced electricity costs as a result of de-regulation. SEDA's mission is to "reduce greenhouse gas emissions in NSW by investing in the commercialisation and use of sustainable energy technologies".

SEDA manages a range of voluntary programs that focus on improving energy efficiency in all sectors of the community including government, commercial, industrial and residential. SEDA also manages programs to encourage the growth of the renewable energy generation industry.

This paper focuses on two programs SEDA has developed to improve both the energy efficiency of commercial buildings and the profile of energy efficiency in the commercial building sector. These programs are the Energy Smart Business (ESB) program and the Building Greenhouse Rating (BGR) scheme.

Energy Smart Business has been operating since December 1997 and has partnerships with over 170 organisations in NSW. As with all SEDA programs, it is a voluntary program. It requires a commitment from partners to implement all cost-effective energy efficiency projects in no less than 75% of their operations over a five year period. In return for this commitment, SEDA provides technical assistance in identifying, evaluating and implementing the projects. The prime focus of the program is implementation of projects, although SEDA are starting to work with partners on the establishment of energy management systems and policies.

The Building Greenhouse Rating scheme is one of SEDA's most recent initiatives and was launched in September 1999. The program is designed to give market recognition to buildings that minimise their greenhouse gas emissions. A simple five star rating scale is used to illustrate the performance of office buildings. The scheme allows office building occupants to assess their current office space on a valid, absolute scale, and also provides landlords with the ability to rate their buildings to attract tenants.

Energy Use and Greenhouse Gas Emissions

The Australian commercial sector spends around $US 2.4 billion each year and is responsible for over 35 million tonnes of carbon dioxide emissions (Pears, 1998). This is the sector with the fastest growing energy use in Australia. With two thirds of the sector's energy consumption sourced from electricity, this growth is expected to have a significant impact on the future level of Australia's greenhouse gas emissions. Greenhouse gas emissions from the sector are expected to increase from 32,200,000 tonnes of CO_2 to 62,800,00 tonnes in the years 1990 to 2010 (Emet Consultants, Solarch Group, 1999).

Australia's electricity is very intensive in greenhouse gas emissions. In NSW, 93% of our electricity is produced in coal fired power stations, with 6% coming from hydro electric schemes and 1% from renewable sources. Therefore, any reduction in electricity consumption, either through efficiency or fuel switching, can greatly reduce Australia's and NSW's greenhouse gas emissions. Electricity is responsible for 89% of total greenhouse gas emissions and natural gas for 7% of emissions (Emet Consultants, Solarch Group 1999).

The deregulation of the electricity market in NSW in 1996, particularly in NSW, saw electricity prices plummet. Many large customers were able to negotiate very low prices on their first contracts (in some cases down to $US 0.03 per kilowatt hour). Although prices are now increasing, energy costs are well below those in many other parts of the world (ESAA, 2000).

Barriers to Energy Efficiency

Both the Energy Smart Business program and the Building Greenhouse Rating scheme have been designed specifically to overcome a number of barriers to the uptake of energy efficiency by the commercial sector. The program features that address specific barriers are discussed later, but there are a number of general barriers that both programs aim to overcome.

The availability of the best and average efficiency technologies in the Australian market was compared to that of the American market in a study undertaken by SEDA in 1999. The study found that the best practice energy efficient technologies available in the US

are also available in Australia. Therefore, lack of availability of energy efficient technologies should not be a major barrier to energy efficiency in Australia.

The reason for the slow uptake of these efficient technologies was found to be due more to purchasers making choices based on initial cost (as opposed to lifecycle cost) or not being aware of the benefits of alternative technologies. Raising the profile of energy efficiency, and educating industry about the benefits of energy efficiency technologies is clearly a major requirement for energy efficiency programs in NSW.

There were a number of other issues that SEDA identified. Table 1 shows the main issues and SEDA's strategy to overcome them.

Table 1. Strategies for overcoming barriers to energy efficiency.

Market barrier	Strategy to overcome barrier
Low supply of energy services providers.	The Energy Smart Allies program was established to promote providers of energy efficiency products or services.
Low demand for energy reduction solutions.	The ESB and BGR programs create demand through program milestones and through publicised events and seminars.
Lack of understanding of the benefits of many energy efficient technologies.	Commercialisation of new technologies is supported by SEDA. This is primarily through promotion of the technology and publication of case studies, and in some cases may include financial assistance.
Lack of incentive for companies to account for the environmental impact of energy use.	The ESB and BGR programs provide public recognition for companies that are successful in using energy in an efficient manner. The programs may also be a tool for companies to demonstrate that they have taken early action on reducing emissions if this becomes an issue in the future.

Energy Smart Business

Program Design

Energy Smart Business is a voluntary, partnership program for businesses operating within NSW. The program is based on a Memorandum of Understanding (MoU) between SEDA and the participating companies, known as partners. Partners make a commitment to implement cost effective upgrades (with an internal rate of return >20%) across at least 75% of their facilities within 5 years of joining the program.

In return, SEDA provides technical and implementation assistance through external contractors called Partner Support Managers (PSMs). These private sector, energy management companies provide assistance in the identification, evaluation and commissioning of projects and operating practices. So partners can be confident they are

receiving reliable, independent information. The PSMs are contractually prohibited from performing or supplying any of the services or products they recommend.

SEDA also provides a range of marketing support to partners that are meeting their commitments. This includes providing information and strategies for internal communication of the benefits of energy efficiency and the promotion of partners' achievements externally. We also have a recognition program – the Energy Smart Green Globe Awards – to acknowledge and publicise those partners that have completed various stages of the program.

The three main objectives of the ESB program are to:

- create lasting direct CO_2 emission savings;
- accelerate the uptake of energy efficient technologies and strategies; and
- leave a lasting imprint on the sustainable energy market. (i.e. create market transformation).

The targets for the ESB program are to:

- have 25 PJ of commercial and industrial energy use under partnership
- reduce energy consumption by 3.75PJ, and
- reduce greenhouse gas emissions by 480,000 tonnes of CO_2.

Overcoming Market Barriers

In designing the Energy Smart Business program a number of barriers to energy efficiency were recognised and mechanisms incorporated into the MoU to overcome those barriers. The barriers identified and strategies to address them are as follows:

- *Energy efficiency projects are often required to provide a payback in under two years, while other projects, with longer paybacks, are approved because they are considered core to business.* As a result, the MoU requires a commitment by the Partner to implement energy efficiency projects that provide an internal rate of return of greater than 20%. This rate was chosen because it was high enough to provide an attractive return on investment for most businesses (typical return on funds in Australian industry are around 5 to 12% (Huntley 1999)), whilst being low enough that there are numerous low risk projects that can be implemented.

- *There is no time imperative for improving energy efficiency as it is generally not critical to core business functions.* Energy Smart Businesses commit to the following timeline, which allows project implementation to be integrated into normal business planning cycles.

  1. prepare an action plan, outlining how subsequent milestones will be achieved, within three months of joining the program
  2. upgrade a representative space (usually a small project that can be accommodated within an existing capital or maintenance budget) within 6 months of signing the MoU
  3. upgrade 20% of operations within 15 months
  4. upgrade 50% of operations within 24 months, and
  5. upgrade at least 75% of operations within 5 years. This minimum requirement gives flexibility to partners. They can opt not to invest in facilities where there are business constraints such as plans to divest operations or end a lease.

- *In most businesses, energy management is not resourced adequately since it is not a core business concern. Either no staff member has responsibility for energy management, or the energy manager has other, often more critical, tasks.* The MoU requires that a senior staff member be allocated the responsibility for the ESB program, and energy management in general. In addition, the fully funded energy services professional (PSM) that SEDA provides to partners is an additional resource to assist the fulfillment of the program milestones above.
- *It is difficult for businesses to keep up-to-date with the latest and most appropriate energy efficient technologies.* The provision of a PSM also addresses this issue. The PSMs, as energy management professionals, have the expertise in energy efficiency practices and technologies so the partners don't have the burden of having to acquire this information themselves.
- *There is often a lack of senior management commitment in pursuing energy management. As energy is often seen as a fixed cost, or is a small proportion of overall costs, management focus tends to be on other issues.* The Chief Executive Officer or Managing Director of the Partner must sign the MoU to demonstrate top level commitment to the program and energy efficiency. Senior management are encouraged to demonstrate their commitment through opportunities to be present at program meetings and briefing sessions, and by being quoted in promotional material, articles and advertising, and through networking functions.

Program Achievements

The ESB program was officially launched on 4 December 1997, with 13 Partners, which varied considerably in size and operations. They represented 7 market sectors including: clubs, education, electricity and gas supply, museums, property development, retail and refrigerated storage. In just over 2 years of operation the ESB program has grown substantially in terms of the number of partners, SEDA staff and PSMs, and boasts some significant achievements.

Starting with a team of 3 in late 1997, the ESB team has grown to 10 dynamic staff members. One significant achievement has been transforming a group of engineers, scientists, journalists and marketers, into a well integrated team selling both the program and, more importantly, the concept of profitable energy efficiency. SEDA's staff currently manage 5 PSM companies, which in turn employ 15 people to work with over 170 partners.

The partners range from small retail shops to large corporations. They include regional, national and international companies, along with a number of universities and local government organisations. The partners represent 40 different market sectors, including accommodation, air travel, meat product manufacture, chemical/plastic/pharmaceutical manufacture and electrical equipment and appliance manufacture. A full list of ESB Partners is available on the SEDA website (www.seda.nsw.gov.au).

At the end of February 2000, the identified potential energy saving across all partners was 20.3% of the total energy consumption of partners prior to joining the program. This is in line with predictions of potential cost-effective savings that were made before the program started. As each partner is involved in the program for 5 years, the identification of projects will continue over that period, leading to an expectation that the average savings identified

will well exceed the 20% originally estimated. The identified savings for commercial partners over the same period, averaged 23.4% of their total consumption.

The investment required to achieve these energy savings is over $US 52 million, and the savings on energy bills is expected to be over $US 16 million per annum. The identified projects have an average return on investment of 31% - well above the 20% hurdle rate specified for the program. Table 2 shows the corresponding CO_2 and GJ savings. Interestingly, despite the low energy prices in NSW, it has been possible to identify cost-effective energy efficiency projects for every company that has joined the program.

Table 2. Program Results

	Investment ($US)	Savings per Annum ($US)	Return on Investment (%)	Energy Savings (GJ)	CO_2 Savings (Annual tonnes)
Identified projects	52 million	16 million	31	3 100 000	450 000
Implemented projects	8 million	3.6 million	45	667 000	107 000

At the end of February, 2000 there had been nearly $US 8 million invested in projects, creating over $US 3.6 million of savings per annum. This translates to greenhouse gas emission savings of over 107,000 tonnes per annum. Our recognition strategy, the Energy Smart Green Globe Awards, has encouraged many partners to implement projects faster than required in the MoU so they can realise the energy and cost savings earlier, and receive the public recognition of the work they are doing.

Figure 2 shows that, as of the end of February 2000, the CO_2 savings identified under the program exceeded the target for the end of February by over 100,000 tonnes per annum. Implemented savings are also above our target for the period. Our focus is on finding ways to accelerate the implementation of projects, in order to close the gap between the identified and implemented savings.

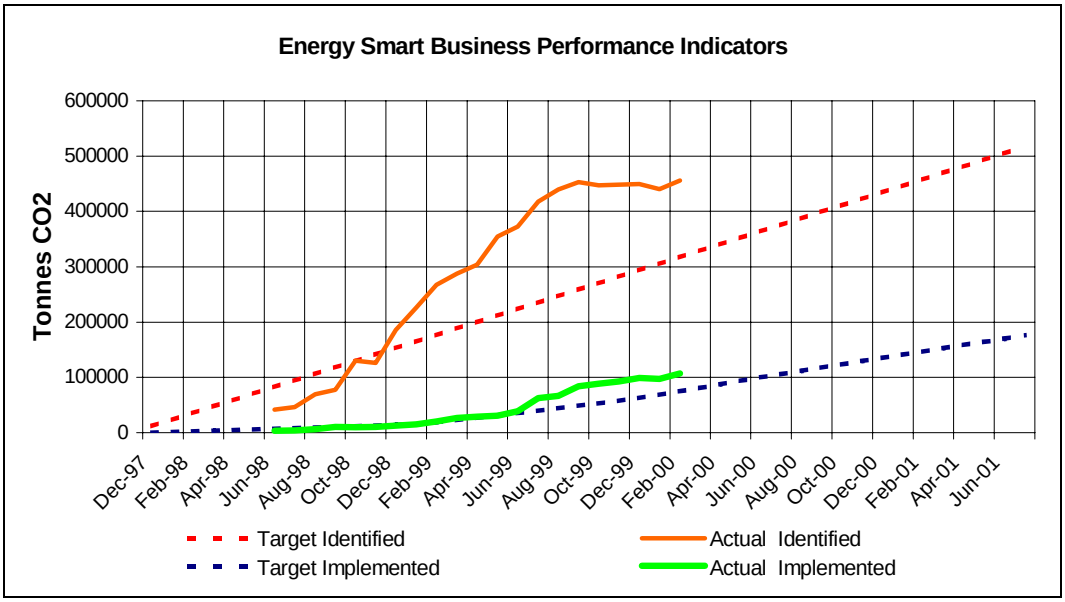

Figure 1. ESB Target Reduction in Greenhouse Gas Emissions

SEDA has been able to achieve good leverage with the money invested in the program to date. It has cost us $US 2.69 per lifetime tonne of CO_2 saved by our partners. For every dollar we have invested in the program, our partners have invested $2.68, and this figure continues to improve.

Partners are now starting to achieve the program milestones faster. This is leading to a new focus on getting energy management systems integrated within the organisation. Methods for achieving this are currently being formulated.

Building Greenhouse Rating

Program Design

The Building Greenhouse Rating scheme is a voluntary program for office buildings. It enables building owners, managers and tenants to get market recognition for superior greenhouse performance, and to identify ways in which their performance can be improved. The scheme was developed with the assistance of the key industry associations for the commercial building sector. These organisations include the Property Council of Australia, Master Builders Australia, the Royal Australian Institute of Architecture, the Australian Institution of Refrigeration and Heating, the Real Estate Institute of Australia and the Facilities Managers Association.

Initially, the scheme is focussing only on office buildings, as they are responsible 27% of greenhouse gas emissions from the commercial sector (Emet Consultants, Solarch Group, 1999). The scheme aims to reduce greenhouse gas emissions from commercial buildings by providing market recognition for low greenhouse impact. By raising the awareness of the environmental impact of commercial buildings we can expect to see low greenhouse impact become a competitive advantage, once tenants will start to consider this in their choice of office space. Promoting best practice in the design, operation and maintenance of commercial buildings should also increase the uptake of sustainable energy technologies.

The scheme is based on a five star rating scale and ratings can be awarded for the base building (central services), a tenancy or the whole building.

- Base Building Rating – assesses the greenhouse emissions performance of a building in terms of the services traditionally supplied as “common” services to the tenants, such as air-conditioning, lifts and common area lighting.
- Tenancy Rating – assesses the greenhouse emissions performance of the tenancy in terms of the energy use associated with services under the direct control of the building occupier or tenant, such as lighting, office equipment and any supplementary local air-conditioning.
- Whole Building Rating – assesses the greenhouse emissions performance of the whole building, encompassing all energy use within the building.

The ratings are based on energy related greenhouse gas emissions, normalised to account for climate and how the building is used. The normalisation factors for climate, operating hours and office equipment density ensure all buildings receive an equitable rating. The rating methodology and software rating tool are freely available, so self assessments can be performed. However, ratings can only be promoted when they have been officially reviewed by a SEDA assessor and fees have been paid.

The rating is a performance based scheme that provides simple performance indices based on the carbon dioxide emissions per square metre. SEDA is currently developing another mechanism that will be applicable for new buildings and major refurbishments, where, obviously, performance data is not available. The 'commitment' agreement is still being formulated, but will require the owner/developer to estimate the actual performance that the premises will achieve when they are operational. Notification of the estimate will be submitted to SEDA in the form of an energy management statement, which will be verified by a SEDA assessor. The statement will include:

- Building details including installed equipment and systems.
- Estimate of energy consumption and greenhouse gas emissions.
- Occupancy and equipment that will be adopted.
- Installation and commissioning procedures that will be adopted.
- Star level for the commitment agreement.

If, once the building is operational, it falls short of the agreed star level, remedial action will be required.

The rating scale is based on available data on office building energy use within NSW and elsewhere in Australia, and is shown in Table 3. The following guidelines were used to determine the rating scale:

- A small number of poorly performing buildings should lie outside the rating scale.
- An average performing building should receive two stars.
- Excellent buildings that are well managed should receive four stars.
- Five stars should be attainable through exceptionally good design and operation, using market leading innovations.
- The three rating types should be self-consistent, so a three star base building and three star tenancy would equal a three star whole building.

The expected distribution of ratings for existing buildings is shown in Table 4.

Table 3. Star rating bands in kg/m^2 within which greenhouse emissions (GE) fall.

Star Rating	Whole Building Greenhouse Gas Emissions (kg/m^2 p.a)	Tenancy or Base Building Greenhouse Gas Emissions (kg/m^2 p.a)
Out of range	GE>345.	GE>173
One	345>GE>290	173>GE>145
Two	290>GE>235	145>GE>118
Three	235>GE>180	118>GE>90
Four	180>GE>125	90>GE>63
Five	GE<125	GE<63

Table 4. Estimated % of floor space falling into each rating band.

Star Rating	Whole Building Rating	Tenancy Rating	Base Building Rating
Out of range	12%	16%	13%
One	27%	11%	22%
Two	41%	34%	31%
Three	19%	30%	24%
Four	1%	8%	9%
Five	0%	1%	1%

Each rating type has a minimum scope of services associated with it. If other services are included within the available energy data, their energy use can either be deleted through the use of additional metering or can be bundled in as part of the rating.

The rating covers all services supplied to office users of a building, including tea rooms, cafeterias, gymnasiums, swimming pools or computer centres for the sole/primary use of occupants of the rated space. Public shops, gyms or computer centres that service external sites are excluded from the rating.

Overcoming Market Barriers

One of the most significant barriers to energy efficiency in the commercial building sector is often opposing the goals of the developers, builders, contractors, owners, managers and tenants. The processes associated with project development, design, construction, commissioning and operation of commercial buildings involve serious barriers to energy efficiency. These barriers are outlined in Table 5.

Table 5. Stages in design, construction and operation of a building (Pears, 1998)

Stage	Participant(s)	Comments
Design	-developer -council (approvals) -specialist consultants or contractors -project manager	Focus is on maximising profitability of project with little regard for ongoing costs Specialists may work independently, and may not share information that could assist optimisation Fees are often based on project cost rather than performance – analysis and details are the first casualties of cost-cutting Bidding for lowest tender often cuts into budget for design and analysis Any delays due to requirements for energy analysis may adversely affect remuneration of local government staff whose employment contracts are often linked to the number of development approvals processed
Construction	-project manager -builder -subcontractors	Process is very fragmented, so details of specifications can be lost, changes made from design specifications
Commissioning	-project manager -contractors	Studies show buildings are rarely commissioned correctly
Tenant Fitout	-separate contractors	Can lead to changes in layout, lighting etc which impact on energy use May involve only part of building, and may occur at intervals over building life
Maintenance	-building manager -contractor	Often done to a very low standard – little benchmarking or supervision
Refurbishment	-developer -contractors	May be whole or part of building Aim is to improve rental potential

The BGR scheme has been designed specifically to overcome these traditional barriers. The scheme provides a method of benchmarking and raising awareness of building performance. It gives tenants, owners and managers a means to assess and compare their premises against others. By providing this awareness the scheme also provides the motivation to improve building performance.

Official ratings under the scheme are granted for a twelve month period, after which they must be renewed. This is a critical feature of the scheme. Since maintenance and operating practices have such significant impacts on energy consumption the annual rating ensures a continual focus on energy management.

For tenants, the scheme offers another method for selection of premises. As the scheme assesses the energy efficiency of the building, tenants will be able to select premises that will have lower outgoings.

The commitment rating agreement for new buildings and major refurbishments addresses the fragmentation of the design and construction process. Buildings that have such an agreement in place will require greater integration of design process. Ongoing monitoring and evaluation will be necessary throughout the construction and operation of the building to ensure performance meets the specifications. Change of specifications during construction and inadequate commissioning procedures will be eliminated.

Program Achievements

Since the launch in September 1999, interest in the program has been growing in all sections of the commercial building sector. SEDA has presented the scheme to many industry forums and individually to most property owners, operators, trusts, major banks and major tenants in Sydney. Architects and design engineers are also being educated on the program, and how they can use it as a tool to differentiate themselves from their competition.

Councils with significant levels of commercial development in their area are also showing a strong interest in the program. Most are looking first to their own facilities, but are then interested in encouraging buildings in their local area to adopt the scheme. They see the scheme as a tool to assist in their development approval processes, a way to benchmark building performance.

The NSW Government Energy Management Policy is encouraging smaller agencies to use the BGR in their tenancy and to require 3 star plus base buildings when seeking new premises. The government agency with responsibility for locating the majority (~80%) of government tenants will use the BGR as one criteria in the selection of new premises.

There are now well over 50 buildings carrying out preliminary ratings, and determining whether to proceed to official ratings immediately or to upgrade their buildings first. SEDA has developed, and continues to develop, a range of tools to advise on effective upgrades. These include technical manuals, educational seminars and case studies, and are often integrated with Energy Smart Business activities. Already, five official ratings have been performed: two tenancy; one base building; two whole building. Another nine official assessments are currently taking place (two tenancy ratings and seven whole building ratings). As understanding and awareness of the scheme increases this is expected to rise rapidly.

One of the most significant achievements of the program has been to attain the co-operation and support of many national industry associations. The support of the associations has been critical in stimulating so much activity and interest in the scheme. It has also been an instrumental factor in encouraging the broadening of the geographical coverage of the program. Discussions are currently taking place with other states and the federal government about expanding the scheme nationally.

In addition to expanding the program nationally, there is significant interest in extending its applicability to other building types. This may include retail, warehouse, gyms and swimming centres. Extending the scheme to these building types is a longer term objective than the national extension.

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