CHAPTER 14
MAKING ENERGY A PRIORITY IN SCHOOLS: AN EVALUATION OF THE QUEENSLAND SOLAR SCHOOLS INITIATIVE

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Abstract

As Australia faces significant climate change, we as a nation are confronted by the challenge of how to rapidly adjust from a culture of excessive energy consumption and high greenhouse gas emissions to one of minimising our environmental footprint and achieving sustainability. A current example in Queensland is an initiative of the Queensland Department of Education, Training and the Arts. In that Department's 2005-2006 Annual Report, the energy expenditure for the 2004-05 school year was just over AUD$21million. Students and staff consumed 335.6 Kilowatt hours of electricity per capita and produced an estimated 176 Kilotonnes of carbon dioxide emissions. The Department has made energy a priority area and supports several key Initiatives to help reduce energy consumption in schools. One major program in these Initiatives is the Queensland Solar Schools program sponsored by the Environmental Protection Agency and state energy providers (see www.solarschools.net/qld/about.aspx). Under this Initiative seventy-eight state schools and seventeen non-state schools have received solar photovoltaic power systems.

The purpose of this chapter is to examine whether the installation of solar photovoltaic power systems is an effective catalyst for stimulating energy efficiency and energy conservation behaviours in schools. This is investigated by presenting data and findings from a mixed-methods program effects study of the Queensland Solar Schools Initiative. Evidence of energy efficiency measures and energy conservation behaviours being promoted and practiced in schools is provided by analysing survey responses collected from both solar schools and non-solar schools. The question of whether schools with solar photovoltaic installations come to view and use energy differently from schools without renewable energy technology is examined and contextualised within another program that sets out to achieve energy savings in schools – Energy Efficiency in Schools (kp.cqu.edu.au/ research/results/eeis2003plain_english. htm).

INTRODUCTION

A heavy reliance on coal-fired powerhouses for stationary electricity has made Australia one of the highest greenhouse gas producing countries per capita in the world (Clean Energy Future Group, 2004; Roarty, 2000; World Wildlife Fund Australia, 2003).

Australia has the fourth highest energy footprint per person at 3.41 global hectares and Australia's total ecological footprint equals 6.6 global hectares, which is three times the average global footprint (World Wildlife Fund, 2006). Worldwide acceptance of climate change has forced governments, industries, businesses, communities and individuals to reconsider the way energy is produced and consumed.

Queensland is both the fastest growing and one of the most energy intensive states in Australia (Department of Energy, 2006). According to the Queensland Department of Energy (2006, p. 2) consumers in Queensland demanded more than 8200 megawatts (MW) in 2006, "making Queensland the second highest consumer of electricity in Australia". The state's energy is derived primarily by black coal, which accounts for more than 90% of the electricity generated in Queensland. However, the Queensland Government is attempting to diversify the state's energy generation by investing in renewable energy projects.[i] As a means to increase investment in renewable sources of energy, the Queensland government has partnered with energy providers through the GreenPower Initiative by agreeing to purchase renewable energy for State Government Buildings, including schools.

In 1999, the Queensland Environmental protection Agency (EPA) used a grant of $25 000 from the Queensland Energy Innovation Fund to sponsor a solar schools feasibility project in partnership with Stanwell Corporation whereby, two state schools received 2.5kW grid connected solar PV power systems. The Queensland *Solar Schools* Initiative grew out of this feasibility project. Three state government owned energy providers – Stanwell Corporation, Ergon Energy, and ENERGEX – have partnered with the EPA in the Queensland *Solar Schools* Initiative. Between 2001-2006, seventy-eight state schools and seventeen non-state schools have received solar photovoltaic (PV) installations. Government and energy industry sponsors believe that the *Solar Schools* Initiative provides a valuable educational resource for students while reducing overall electricity usage costs in schools as well as raising community awareness of renewable energy technology, thereby increasing the uptake of GreenPower[ii] products offered by energy retailers.

MAKING ENERGY A PRIORITY IN SCHOOLS

The United Nations Decade for Education for Sustainable Development (2005-2014) states that:

[i] Renewable energy projects include a 12 megawatt (MW) wind farm in north Queensland, a 30 MW biomass cogeneration plant in southeast Queensland, and a 1.5 MW macadamia nutshell (biomass) cogeneration plant at Gympie (Department of Energy, 2006).

[ii] According to the Australian Government GreenPower website (www.greenpower.gov.au) "GreenPower is government accredited, renewable energy sourced from the sun, the wind, water and waste. Accredited GreenPower reduces greenhouse pollution and is purchased on your behalf by your electricity company." Customers nominate how much of their electricity must be green and pay an additional fee. Energy providers must then source this amount of electricity from renewable energy sources. Ergon Energy offers Clean Energy from Ergon, while ENERGEX offers earth's choice.

> *Education for sustainable development is a life-wide and lifelong endeavour which challenges individuals, institutions and societies to view tomorrow as a day that belongs to all of us, or it will not belong to anyone. This educational effort will encourage changes in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations (UNESCO, 2005).*

The Queensland Department of Education, Training and the Arts has shown its support for these objectives by establishing the Queensland Environmentally Sustainable Schools Initiative (QESSI) whose mandate is to "establish a network of environmentally sustainable schools that demonstrate curricula connections and environmental action based on ecological sustainable development principles" (Department of Education, Training and the Arts, 2006a). QESSI aims to help schools develop sustainability action plans in order to manage their resources more efficiently by focusing on the four key areas of energy, water, waste and biodiversity.

According to the 2005-2006 *Annual Report*, the State school energy expenditure for the 2004-05 school year was $21 932 000, with students and staff consuming 335.6 Kilowatt hours (KWh) of electricity per capita and producing an estimated 176 Kilotonnes of CO_2 emissions. While not an active stakeholder in the *Solar Schools* Initiative, the Department has acknowledged that energy is a key environmental area and has committed to reducing its energy footprint by taking steps to make schools more energy efficient by retrofitting lighting and appliances at a number of schools as well as signing up one thousand State schools to GreenPower products offered by energy providers.

Prior to the establishment of QESSI, energy education was still a priority for Education Queensland and the Department collaborated with the EPA on the *Power for a Sustainable Future* resource kit, which was provided to every state school in 2000. A website (see www.sustainableenergy.qld.edu.au) was also developed to supplement and reinforce the energy education resource kit which is intended to support curriculum key learning areas of Science and Studies of Society and Environment (EPA, 2004). Education Queensland also partnered with the EPA and Ergon Energy to fund the Energy Efficiency in Schools programs offered to schools through the North Keppel Island Environmental Education Centre, the Holloways Beach Environmental Education Centre, and the Southeast Queensland Environmental Education Centre (Purnell, Sinclair & Gralton, 2002).

THE ENERGY EFFICIENCY IN SCHOOLS PROGRAM

In the Energy Efficiency in Schools program, students from a number of schools developed action plans that detailed energy efficiency measures to be adopted at their school following the students' participation in an Environmental Education Centre residential camp. Students visited coal mines, toured a coal-fired electricity generation

plant, examined energy efficient appliances and learnt about alternative energy. Students learnt first hand about energy efficiency practices and examined issues such as greenhouse gas emissions produced from coal-fired powerhouses and alternative energy produced by solar and wind. A number of students involved in the Energy Efficiency in Schools program took a multiple-choice test prior to and following the residential camp. Overall, students scored less than 40% correct prior to the camp and over 70% correct on the test following the camp (Purnell, 2004; Purnell & James, 2006).

A major outcome from the residential camp was a student generated energy action plan with a target of at least a 15% reduction in school energy usage over the next twelve months. The most successful school achieved a 50% reduction in electricity usage in the year following the program through retrofitting and monitoring that were part of the school's energy action plan. The next most successful school achieved a 28% reduction in electricity consumption (Mickel, 2004), while most participating schools achieved a 10% or more reduction in energy usage. Schools that achieved at least a 15% reduction in electricity consumption within one year following the residential camp were offered a $5000 reward to use on further measures to reduce electricity consumption (Mickel, 2004). This financial incentive influenced students and staff's energy behaviours and helped reduce electricity consumption. The outcomes of the Energy Efficiency in Schools program had a direct impact on the participants and their school communities – particularly through the implementation of school action plans to change energy behaviours and reduce energy consumption. Of interest, a number of the schools' action plans included the 'adoption' of local businesses to assist in the reduction of electricity usage at these businesses.

SOLAR SCHOOLS PILOT PROGRAM (2001-2003)

With the introduction of the Photovoltaic Rebate Programme (PVRP)[iii], the *Solar Schools Pilot Program* was developed by the EPA Sustainable Industries Division in order to install seventeen 2kW grid connected solar PV systems in schools across Queensland. The Queensland Government contributed $7 700 for each system, with an additional rebate of up to $10 000 available from the PVRP. According to the EPA (2005), each solar PV system reduces 3.6 tonnes of greenhouse gases a year and saves the school approximately $500 on power bills.

The EPA partnered with Stanwell Corporation, who supplied technical expertise and equipment as well as training and educational components. Due to a change in Stanwell management, the energy provider pulled out of the pilot program leaving the EPA looking for other energy industry partners to sponsor the remainder of the planned solar school installations (personal email communication with N. Martin,

[iii] The Australian Government allocated an initial $31 million over four years (2000-2004) to provide cash rebates "to householders, owners of community use buildings, display homes builders and housing estate developers who install grid-connected or stand-alone photovoltaic systems" (AGO, 2007). In 2003, an additional $5.8 million was provided to extend the programme through 2005, and another $11.5 million to extend the programme through 2007.

EPA Senior Technical Officer, 10 October 2004; personal telephone communication with C. Robertson, EPA Consultant, 1 December 2005). In 2003, the EPA partnered with Ergon Energy. Under the *Solar Schools Pilot Program*, seven solar PV installations were sponsored by Stanwell Corporation, five by EPA, and five by Ergon Energy.

SOLAR SCHOOLS URBAN PROGRAM (2003-2005)

In 2003, the EPA launched the *Solar Schools Urban Program* in partnership with Ergon Energy and ENERGEX. Funding for this program came as part of an agreement with both energy distributors to purchase green energy for State Government Buildings. Schools could apply for an additional $8 000 PVRP rebate, to be received by the installer after installation. In addition to the educational objectives of the pilot solar schools program, this partnership brought with it the goal of increasing the uptake of GreenPower products. There is some indication that the uptake of GreenPower products has increased in communities with solar schools but no definitive evidence that the two occurrences are linked. At the end of 2005, which marked the closure of the *Solar Schools Urban Program*, approximately forty schools had received grid connected solar PV systems.

SOLAR SCHOOLS GOES BUSH PROGRAM (2004-2006)

In addition to the installation of solar PV systems on urban and regional state schools, the *Solar Schools Goes Bush Program* was launched in 2004. The Queensland EPA and the Australian Government jointly fund this program, which targets diesel based remote, isolated and indigenous schools. Forty-eight schools have been scheduled to receive a 5kW system, which will produce about 8 Mega Watt hours of electricity per year, reduce reliance on diesel, and save schools approximately $1 000 on energy costs (EPA, 2005). Rebates are available through the Australian Greenhouse Office's Renewable Energy Diesel Replacement Scheme (REDRS).

EVALUATING THE QUEENSLAND SOLAR SCHOOLS INITIATIVE

As outlined in the previous sections, the Queensland *Solar Schools* Initiative has gone through a variety of phases and a number of energy industry sponsors have partnered with the EPA on this project. Between 2001-2006, ninety-five schools received solar PV installations because Government and energy industry sponsors believe that the Queensland *Solar Schools* Initiative has educational, environmental, economical and social benefits by (EPA, 2005; EPA, 2006):

- *providing an innovative, hands-on teaching tool about renewable energy technology;*
- *decreasing reliance on coal-fired electricity thereby reducing greenhouse emissions and saving schools money on electricity bills;*
- *raising community awareness of the benefits of renewable energy technology; and*
- *increasing GreenPower subscriptions.*

However, there is a lack of empirical evidence to support these assumptions. There are very few evaluation studies of solar school programs, and even less investigating the impacts of exposure to renewable energy technology on user behaviour (Association for the Conservation of Energy, 2004). This represents a serious gap in knowledge regarding the influence of renewable energy technology on school energy usage. Although the EPA and energy industry sponsors discussed objectives for the *Solar School* program, key outcomes were never identified and very little reportable data has been collected (telephone communication with A. Thomson, 6 December 2005). Very little follow-up has been conducted once systems were installed, and the level of training provided and teaching materials supplied by sponsors has varied from school to school. Once the energy partners took over the technical, training and educational aspects of the program, the aim became the installation of equipment, not quantifying data such as learning outcomes.

The aim of this chapter is to examine the learning outcomes, such as the practice of energy efficiency measures and energy conservation behaviours in solar schools. This is to determine whether the installation of solar PV power systems has been an effective catalyst for changing the way energy is viewed and used within Queensland schools.

SURVEY OF ENERGY EFFICIENCY MEASURES AND ENERGY CONSERVATION BEHAVIOURS

The collection of data for this study, involved the administration of two separate surveys, follow-up correspondence with schools, school visits and observations as well as student focus groups and interviews with teachers. Data collected through a survey sent to fifty-six Queensland schools which had received grid connected solar PV systems through the *Solar Schools* pilot and urban programs, is compared with fifty-four schools without solar PV installations.

The survey contained questions about demographic information, energy costs, energy efficiency measures, energy conservation measures, and for solar schools a section about the solar PV installation. The survey questions were developed using information on energy efficiency and energy saving practices outlined in a guide for school operations published in the United States (United States Department of Energy, 2004). Additionally, the Principal Advisor for QESSI sent two separate email reminders to school principals. Of the 56 surveys mailed out to solar schools, 20 were returned – representing a 36% response rate. Of the 54 surveys mailed out to non-solar schools, 15 were returned – representing a 28% response rate. The following sections examine the survey results.

Part One: Demographic Information

Of the twenty solar school surveys that were returned, 5 surveys were from schools that participated in the *Solar Schools Pilot Program* and 15 surveys were from schools that participated in the *Solar Schools Urban Program*. An equal number of surveys were from urban and rural schools. Fourteen surveys were from primary state schools,

three from state high schools, two from P-12 schools, and one from a P-10 school. Of the fifteen non-solar school surveys that were returned, ten were from urban schools and five from rural schools. Eight surveys were from primary state schools, six from secondary schools, and one from a P-12 school. Four solar schools and one non-solar school had participated in the Energy Efficiency in Schools program.

Part Two: Energy Costs

While the majority of respondents have access to school electricity bills and can therefore see their energy usage patterns, 34% of respondents do not receive information about their power consumption, so are unaware of their energy usage patterns. The data also suggests that energy costs have been continually rising in both solar and non-solar schools for similar reasons: higher tariffs; the installation of air-conditioners; additional computers; new buildings; and, more students. The Queensland Department of Education and the Arts 2005-2006 *Annual Report* admits that school energy usage is increasing due to the installation of air-conditioners through the *Cool Schools* Initiative as well as the use of more computers, increasing student numbers, and new buildings – which has been corroborated by the survey responses. However, 60% of solar schools respondents feel that the installation of the solar PV system is helping to reduce overall electricity costs, even though school-wide energy usage continues to increase.

Although reducing energy usage is cited as a priority area for the Education Department, a comprehensive energy policy for schools has yet to be developed and survey results indicate that only five solar (25%) and two non-solar (13%) schools have implemented an energy policy on their own. Of those five solar schools with an energy policy, three schools participated in the Energy Efficiency in Schools program. Furthermore, only two solar schools (10%) and one non-solar school (7%) have conducted an energy audit in order to ascertain how to improve energy efficiency and decrease electricity consumption. While it is understandable that non-solar schools lack energy policies, one of the requirements of becoming a solar school should have been the development of an energy reduction action plan based on an energy audit (Colello, 2004). Unfortunately, this has not occurred as part of the Queensland *Solar Schools* Initiative. Furthermore, the majority of staff and students from both solar (80%) and non-solar (87%) schools have not received any training to help reduce energy usage and thereby energy costs in the school.

According to the survey data, there are few differences between solar and non-solar school responses to *Part Two: Energy Costs*, indicating that the installation of solar PV systems has not led to the implementation of energy action plans or training in solar schools. This is in marked contrast with schools that have participated in the Energy Efficiency in Schools program.

Part Three: Energy Efficiency Measures

Energy efficiency is defined as a measure that reduces the amount of energy typically required. Energy efficiency measures are usually one-off financial decisions influenced by economic and contextual variables (Black, Stern & Elworth, 1985) as

well as internal variables such as altruism for the environment (Clark, Kotchen & Moore, 2003). Barriers to the uptake of energy efficiency measures include a lack of information or knowledge, financial costs, low energy pricing, and institutional constraints (Sustainable Energy Policy Concepts, n.d.).

Respondents were asked to indicate from a given list, which energy efficiency measures have been implemented in their school. A comparison of the energy efficiency measures practiced by solar and non-solar schools reveals that there is very little difference in the types of measures taken. The most prevalent measures are ones that are convenient, inexpensive, or already being practiced as part of the school's environmental ethos, such as:

- *replacing inefficient light bulbs,*
- *using power-down features on equipment,*
- *automatically setting room temperature, and*
- *regular maintenance of systems.*

The overall number of solar and non-solar schools taking up energy efficiency measures is also similar, which suggests that the installation of a solar PV system under the Queensland *Solar Schools* Initiative has not had a significant influence.

However, the uptake of energy efficiency measures in Queensland schools should improve if barriers are removed (Sustainable Energy Policy Concepts, n.d.). For example, when the Education Department implements an official energy policy for all schools and begins its plan to retrofit and replace inefficient lighting and appliances, both financial and institutional barriers will be removed. Conducting energy audits and providing school staff with information about how to implement energy efficient measures will also significantly improve the degree of actions taken in schools by removing the lack of information and knowledge barrier. The Education Department has also announced that 1000 Queensland schools will subscribe to GreenPower programs, which addresses the barrier of low energy pricing and will make administrators more aware of energy consumption and costs.

Part Four: Energy Conservation Measures

Energy conservation behaviours involve repeated or continual actions that curtail the amount of energy normally used, and are influenced by personal variables such as obligation and self-efficacy (Woods & Skumatz, 2004) as well as values. Energy usage behaviours are typically routine or habitual in nature; thus changing wasteful energy consumption behaviours into energy conservation behaviours "involves the unfreezing of existing behavioural patterns" (Jackson, 2005, p. 115). In a school setting, energy usage behaviours are an evolution of social practices or acceptable social norms; therefore, "unfreezing existing behaviour patterns needs to take place in a group environment," so that preferred energy conservation behaviours are adopted throughout the school (Jackson, 2005, p. 116). That is, it is not merely a matter of individual choices but something that a group must take on and value.

A list of ten energy conservation behaviours related to energy consumption in the classroom was provided. Energy conservation measures are defined as conscious or habitual behaviours that reduce the amount of electricity being used. Since the survey was completed by the school principal or person-in-charge of the solar project, respondents were asked to indicate the energy conservation measures staff and students are being *encouraged* to take rather than what measures are being practiced. Unlike the list of energy efficiency measures that generally require a one-off action, energy conservation behaviours require daily or even hourly diligence on behalf of staff and students. While respondents can indicate the type of behaviours being encouraged as part of the school's energy policy, they cannot definitively say whether all staff and students are actually practicing these behaviours. The list of energy conservation actions that were provided have been ranked below:

Table 1. Energy Conservation Measures Encouraged in Queensland Schools

ENERGY CONSERVATION MEASURES	SOLAR SCHOOLS		NON-SOLAR SCHOOLS	
	Staff	**Students**	**Staff**	**Students**
Turn off AC, fans, heaters in unused rooms	20 (100%)	13 (65%)	14 (93%)	09 (60%)
Turn off computers at the end of the day	18 (90%)	14 (70%)	14 (93%)	13 (87%)
Close doors & windows when AC is on	18 (90%)	11 (55%)	09 (60%)	08 (53%)
Turn off lights in unused rooms	16 (80%)	14 (70%)	13 (87%)	12 (80%)
Turn off computers when not in use	16 (80%)	14 (70%)	10 (67%)	07 (47%)
Use natural daylight wherever possible	15 (75%)	11 (55%)	09 (60%)	08 (53%)
Use water sparingly	14 (70%)	10 (50%)	11 (73%)	09 (60%)
Turn off computer monitors when not in use	13 (65%)	10 (50%)	10 (67%)	07 (47%)
Set air-conditioners at 25°C	12 (60%)	06 (30%)	09 (60%)	06 (40%)
Close blinds or curtains in warm weather	10 (50%)	07 (35%)	07 (47%)	04 (27%)

A comparison of the energy conservation behaviours being encouraged in solar and non-solar schools reveals that the number of schools promoting curtailment behaviours is above 50% for both sample groups; however, there are some differences regarding which actions are viewed as more important. Teachers in both solar and non-solar schools are being encouraged to take energy conservation actions that control classroom environment and ambiance, while students are being encouraged to take energy conservation actions related to the use of equipment. Since energy conservation measures require daily or hourly

repetition, the encouragement of these actions within the school can significantly reduce energy consumption while at the same time fostering habitual behaviours that staff and students may continue in the home.

Respondents were also asked to identify all of the ways in which students and staff are encouraged to reduce energy use at school. While the number of energy conservation actions being practiced in schools appears to be quite high, the ways students and staff are being encouraged to reduce energy use does not fare as well. The list of measures that were provided are ranked below:

Table 2. Ways Students and Staff are Encouraged to Reduce Energy Use

METHODS TO REDUCE ENERGY USE	SOLAR SCHOOLS	NON-SOLAR SCHOOLS
Reminders above light switches	9 (45%)	5 (33%)
School patrols	8 (40%)	5 (33%)
Educational programs offered to students	8 (40%)	4 (27%)
Reminders in computer labs	7 (35%)	7 (47%)
Reminders on school equipment	7 (35%)	3 (20%)
Reminders in school newsletters	5 (25%)	4 (27%)
Special recognition of energy reducers	4 (20%)	1 (7%)
Energy efficiency and energy conservation contests	1 (5%)	1 (7%)
Training courses offered to teachers	Nil	Nil
Training courses offered to school-based staff	Nil	Nil

Behaviour-change theories suggest that modelling and prompts are two effective ways to aid in the diffusion of preferred behaviours (Aronson & O'Leary 1982-83), yet less than half of the schools surveyed use visible reminders or modelling to encourage energy conservation behaviours. So although it appears that staff and students are being encouraged to practice energy conservation behaviours, the data indicates that the use of reminders, modelling, and education as a means to foster reduced energy use is quite low. On the whole, the survey findings indicate that the installation of renewable energy technology alone is not going to significantly increase the uptake of energy efficiency measures and energy conservation behaviours in schools.

CONCLUSION

While exposure to renewable energy technology is a step towards changing the way school staff and students view and use energy by raising the issue of how energy is produced and consumed in Australia, long-term energy conservation behaviours will only occur if barriers to behaviour-change are removed. According to behaviour-change theories, the uptake of preferred behaviours tends to increase if barriers are addressed as part of the intervention, and participants are asked to pledge their commitment to the program (Burns, 1991; McKenzie-Mohr, 2000;

Woods & Skumatz, 2004). Changing the way school staff and students view and use energy requires a combination of approaches that:

- *identify and remove barriers to behaviour-change;*
- *unfreeze existing energy consumption patterns; and,*
- *replace counter-intentional habits with preferred energy conservation behaviours.*

Findings from an ongoing study of the Energy Efficiency in Schools program (Purnell & James, 2006) reveal that the development of energy actions plans by both students and teachers were a significant factor in ensuring success. Monitoring and follow-up conducted by the program organisers provided positive outcomes. Saving money is important and reaping the benefits of savings contributes to the continuation of energy conservation behaviours. Finally, authentic curriculum and assessment experiences for learners that reinforce connectedness to the real world and help students see that they make a difference within the school and their community are crucial. The Energy Efficiency in Schools program provides educational and motivational incentives that support the uptake of effective energy reduction action plans in schools. The Solar Schools program, on the other hand, has become more about the installation of technology rather than a means to encourage the uptake of energy efficiency and energy conservation behaviours. Survey results indicate that although some Queensland schools are encouraging energy efficiency, the installation of solar PV systems does not directly correlate to the uptake of energy reduction behaviours.

The installation of renewable energy technology, without an energy reduction action plan that includes an educational component and appropriate incentives and disincentives, will as the survey data suggests, only have limited influence on the uptake of energy efficiency measures and energy conservation behaviours in schools. It is necessary, therefore, to take a more holistic pedagogical approach to change school energy usage by installing renewable energy technology and providing school-wide energy education, combined with appropriate behaviour-change incentives and disincentives.

This evaluation of the *Solar Schools* Initiative in light of the Energy Efficiency in Schools program has provided evidence to support this position. Fortunately, since the solar PV systems have already been installed and the Education Department has established clear objectives for the development of comprehensive environmental action plans under QESSI, there is an opportunity to re-approach the Queensland *Solar Schools* Initiative and revitalise interest in practicing energy efficiency and energy conservation behaviours at solar schools by making energy a priority.

REFERENCES

AGO. (2007). Photovoltaic Rebate Programme. Australian Green House Office. Retrieved March 3, 2007 from <http://www.greenhouse.gov.au/renewable/ pv/index.html>.

Aronson, E. & O'Leary, M. (1982-83). The relative effectiveness of models and prompts on energy conservation: a field experiment in a shower room. *Journal of Environmental Systems*, 12(3), 219-224.

Association for the Conservation of Energy. (2004). *User behaviour in energy efficient homes: Phase 2 Report*, by J. Pett & P. Guertler, London, England.

Black, J. S., Stern, P. & Elworth, J. (1985). Personal and contextual influences on household energy adaptations. *Journal of Applied Psychology*, 70(1), 3-21.

Burns, S. M. (1991). Social Psychology and the Stipulation of Recycling Behaviors: The Block Leader Approach. *Journal of Applied Social Psychology*, 21(8), 611-629.

Clark, C. F., Kotchen, M. J., & Moore, M. R. (2003). Internal and external influences on proenvironmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, 23 (2003) 237–246.

Clean Energy Future Group. (2004). *A Clean Energy Future for Australia*, by H. Saddler, M. Diesendorf, & R. Denniss, New South Wales, Australia.

Colello, V. (2004). Schools Going Solar: Tips for success in solar schools programs. Interstate Renewable Energy Council, Latham, New York.

Department of Education, Training and the Arts. (2006a). *About the QESSI Alliance*. The State of Queensland. Retrieved February 28, 2007 from http://education.qld.gov.au/schools/environment/outdoor/aboutqessi.html

Department of Education, Training and the Arts. (2006b). *Annual Report 2005-2006*. The State of Queensland. Retrieved February 28, 2007 from <http://education.qld.gov.au/publication/reporting/annual/2006/index.html>.

Department of Energy. (2005). *Electricity in Queensland*. Queensland Government. Retrieved from <http://www.energy.qld.au/electricity_in_ queensland.cfm>.

EPA. (2006). Renewable Energy Solar Schools: fact sheet. Queensland Government Environmental Protection Agency. Retrieved from <http://www.epa.qld.gov.au/publications/p00792aa.pdf/Solar_schools.pdf>.

EPA. (2005). *Renewable Energy Solar Schools for a Smart State: fact sheet.* Queensland Government Environmental Protection Agency. Retrieved from <http://www.epa.qld.gov.au/publications?id=792>.

EPA. (2004). *School Programs*. Queensland Government Environmental Protection Agency. Retrieved from <http://eee.epa.qld.au/environmental_ managment/sustianabiliy>.

GreenPower. (n.d.). *Switching to Green Power*. Australian Government. Retrieved February 26, 2007 from <http://www.greenpower.gov.au/pages/>.

IPCC. (2001). *Third Assessment Report of the International Panel on Climate Change*. UNEP, Geneva, Switzerland.

Jackson, T. (2005). *Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change*. Report to the Sustainable Development Research Network, January 2005. Retrieved February 10, 2006 from <http://www.sd-research.org.uk/documents/MotivatingSCfinal.pdf>.

McKenzie-Mohr, D. (2000). Promoting sustainable behavior: An introduction to community-based social marketing. *Journal of Social Issues*, 56(3), 543. Retrieved May 2, 2005 from <http://80-infotrac.galegroup.com.ezproxy.cqu. edu.au/itw/infomark>.

Mickel, J. (23 June 2004). *Central Queensland schools leading the way in cutting energy use.* Retrieved from the world wide web 5 September 2004 from <http://statements. cabinet.qld.gov.au/cgi-bin/display-statement.pl?id= 1886&db=media>.

Purnell, K. N. (2004). Creating sustainable futures through experiential learning in an energy efficiency in schools program. *Geographical Education, 17,* 40-51.

Purnell, K. N. & James, K. (2006). Report: *Sustainable energy education in Queensland.* Rockhampton: Central Queensland University. 41 pages.

Purnell, K. N., Sinclair, M. & Gralton, A. (2002). *Sustainable schools: making energy efficiency a lifestyle priority.* Rockhampton: Central Queensland University. 22 pages.

Roarty, M. (2000). *Renewable Energy Used for Electricity Generation in Australia.* Science, Technology, Environment and Resources Group. Parliament of Australia. Retrieved September 25, 2005 from <http://www. aph.gov.au/ library/pubs/rp/2000-01/01RP08.htm>.

Sustainable Energy Policy Concepts. (n.d.) Retrieved March 1, 2007 from <http://www.ises.org/sepconew/Pages/EE_Policy_in_Germany/1.html>.

UNESCO. (2005). *UN Decade for Education for Sustainable Development (2005-2014).* Retrieved February 28, 2007 from <http://portal.unesco.org /education/en/ ev.phpURL_ID=23279&URL_DO=DO_TOPIC&URL_SECTION=201.html.

United States Department of Energy. (2004). *School Operations and Maintenance: Best practices for controlling energy costs. A guidebook for K-12 School System Business Officers and Facility Managers.* USA.

Woods R. A. & Skumatz, L. A. (2004). Self-Efficacy in Conservation: Relationship between conservation behavior and beliefs about the ability to make a difference. 2004 ACEEE Summer Study on Energy Efficiency in Buildings. Retrieved February 26, 2007 from <http://www.eceee.org/ conference_proceedings/ACEEE_buildings/2004>.

World Wildlife Fund. (2006). *Living Planet Report.* World Wide Fund for Nature, Gland. Switzerland. Retrieved from <assets.panda.org/downloads/ living_planet_report.pdf>.

World Wildlife Fund Australia. (2003). *Australia's Polluting Power: Coal-fired electricity and its impact on global warming*, by M. Diesendorf, Sydney, NSW, Australia.