The Contribution of Photovoltaics to Commercial Loads

M. Watt[1], R. Passey and M.Snow
[1]School of Photovoltaic and Renewable Energy Engineering
University of New South Wales
Sydney NSW 2052
AUSTRALIA
E-mail: m.watt@unsw.edu.au

Abstract

Whilst photovoltaics (PV) is an increasingly popular technology for residential application, PV ouput is often better matched to commercial load patterns. This has ramifications for both placement of PV and for support policies. Commercial buildings provide the potential for larger scale PV installations which in turn can be valuable in stimulating market growth, developing new financial arrangements and driving price reduction through economies of scale. Market entry by the commercial sector has been instrumental in the rapid market increase experienced in countries such as Germany, while the Japanese PV industry and government, which previously focussed support on residential applications, has now moved to development of this larger scale market.

Through the Australian Government Renewable Energy Commercialisation Program (RECP), a number of commercial scale projects were completed as showcase examples, notably in Sydney (Kogarah Town Square), Melbourne (Melbourne University Research Building) and Brisbane (Hall Chadwick Centre). These projects focused on whole building design outcomes and demonstrating PV integration technologies. This research takes an important step further by investigating the value of PV electricity generation to the commercial sector in the Australian context.

Specifically, this paper examines PV output and load profiles from a number of substations which service areas with a significant portion of commercial load. The cost-effectiveness of PV is then examined for commercial customers, based on current tariffs, depreciation allowances and Renewable Energy Certificates. Possible strategies to stimulate commercial sector uptake of PV are discussed.

1. INTRODUCTION

In Australia, photovoltaic systems have long been a viable alternative to grid extension or diesel generation for power supply in remote areas. Although Australia has some of the cheapest grid electricity in the world, there are now opportunities for photovoltaics to make valuable contributions to daytime energy supply as well as to electricity network support in more central regions of the grid. Australia has some of the most greenhouse gas intensive electricity in the world, so photovoltaics can also play a useful role in greenhouse gas reduction.

Researchers at the University of NSW have been looking at the value of PV-generated electricity for householders and commercial premises, by examining the coincidence of load and PV output. Household load typically peaks in the morning and evening, while commercial load peaks during the day and hence is potentially a good match to PV output. This is illustrated in the case studies cited in this paper, where the impact of PV output on load is shown for a number of substations over peak time periods. Actual PV output from smaller systems operating in the substation area has been scaled in order to make its impact visible in charts.

PV's coincidence to peak loads can be useful to both offset peaking generation and defer network augmentation. Although PV provides value whenever it offsets peaking generation, to defer network augmentation PV must be available in a particular location with a high degree of certainty at particular times in the future. Network operators use both n-1 and n-2 planning criteria, meaning that infrastructure such as substations are designed with parallel paths so that, for example for the n-1 criterion, if one transformer fails, the remainder will be able to meet the expected maximum load. The n-2 criterion is used in places of higher load such as large CBDs. If the remaining transformer(s) rely on PV for firm capacity, the PV must be available at the times when a transformer fails in the future. Thus, it is easier for PV to provide value offsetting peaking generation than deferring network augmentation.

In this paper we examine the coincidence of PV output and load, international experiences of PV in the commercial sector and opportunities presented by PV use in Australian commercial buildings, including electricity displacement under current business tariffs, renewable energy certificates, building structure and appearance and depreciation allowances. We then discuss strategies which could assist PV uptake in this market sector.

2. COINCIDENCE OF PV OUTPUT AND LOAD

2.1. University of NSW, Kensington Campus

A number of studies have been carried out recently to ascertain the usefulness of PV in meeting peak loads, since the latter are driving the need for significant new investment in electricity generation and network infrastructure around Australia. Figures 1 and 2 (from Naughton, 2005) illustrate the potential contribution of north and west facing PV arrays to the load at the Kensington campus of the University of NSW in Sydney. The PV output is scaled from data collected from PV systems on campus.

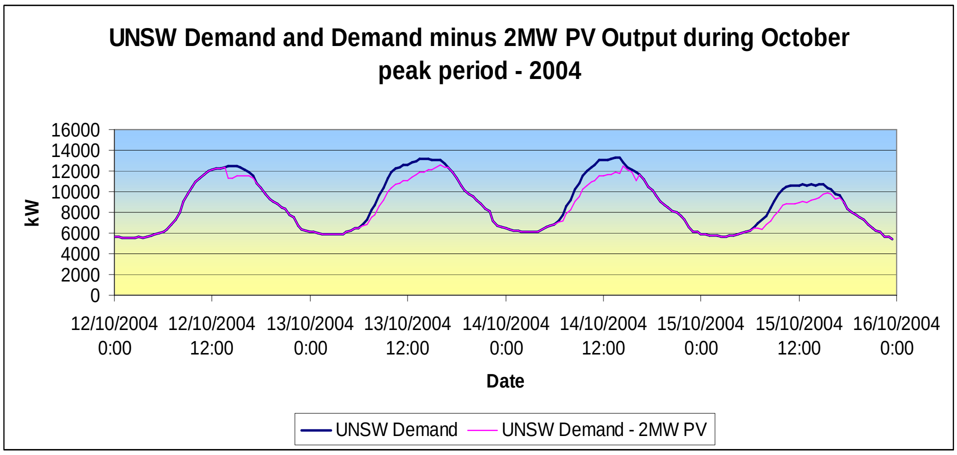

Figure 1: Load at the University of NSW over a peak load period in October 2004, showing the potential impact of a 2MW North facing PV system (Naughton, 2005)

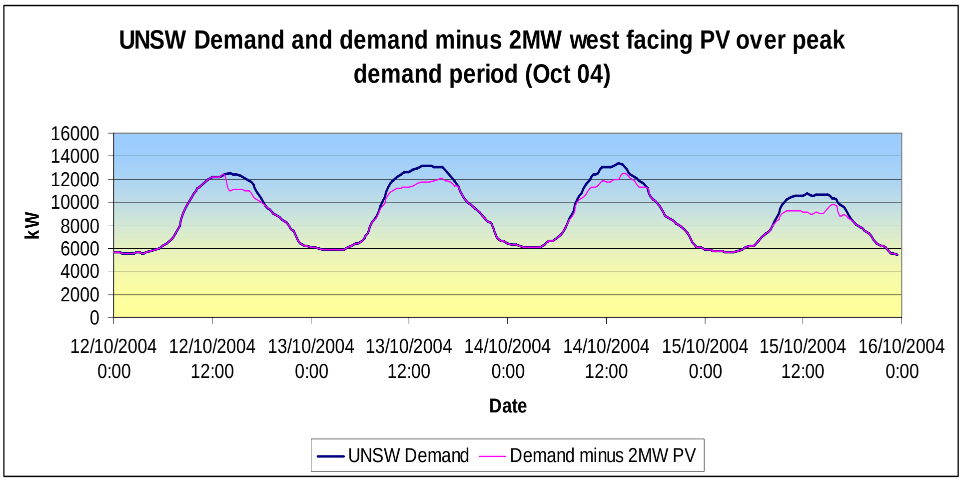

Figure 2: Load at the University of NSW over a peak load period in October 2004, showing the potential impact of a 2MW West facing PV system (Naughton, 2005)

The Naughton analysis found that peak loads on the University campus occur over October to March and both north and west facing arrays directly reduced average peak demand. The UNSW load profile is a fair proxy for the National Electricity Market (NEM) which also has a midday summer peaking profile, and so it is likely PV will be offsetting peaking generation in the NEM. A west facing array was better able to reduce the average peak, however, over the year, it produced about 25% less electricity than a north facing array.

2.2. Distributed PV Systems and Substation Load

While the value of PV for a commercial customer will depend on the output of their own array, their load and their tariff structure, the combined output of a number of PV systems in a given area can also be useful in reducing peak loads for the local substation, as shown for three different substations in Figures 3, 4 and 5. This means that, in areas with commercial loads, PV would be a useful addition to the network and therefore commercial PV uptake should be encouraged.

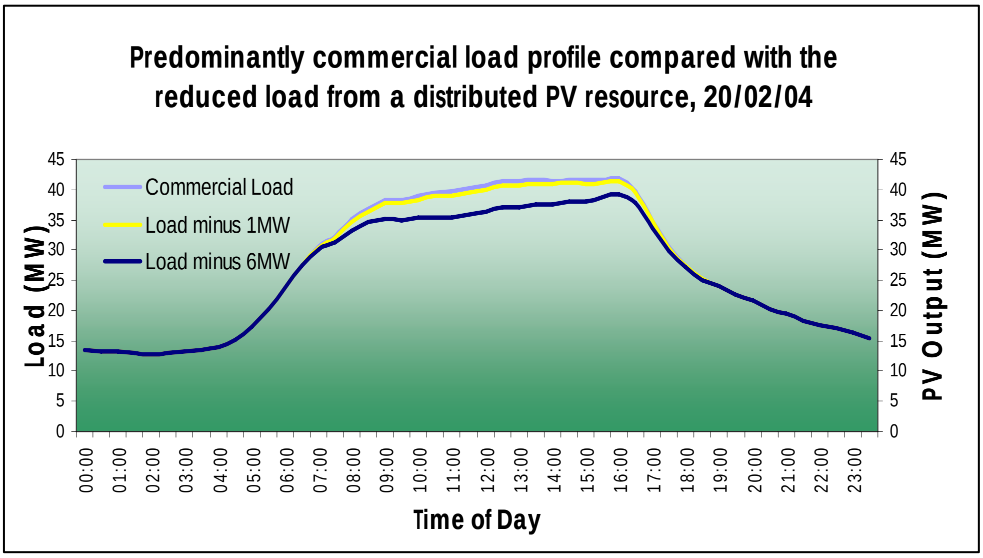

Figure 3: Impact of PV output from a number of systems on a peak load day for a predominantly commercial load substation in Western Sydney (Watt et al, 2005)

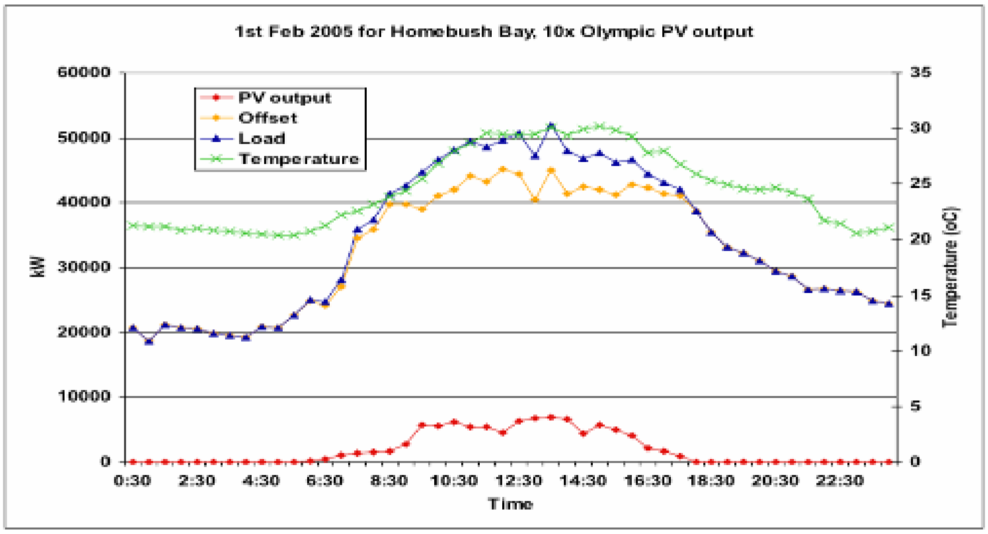

Figure 4: Impact of PV output from 30 PV systems (scaled) and load on the Homebush Bay substation (mixed industrial, commercial and residential) on a peak load day (Watt et al, 2006)

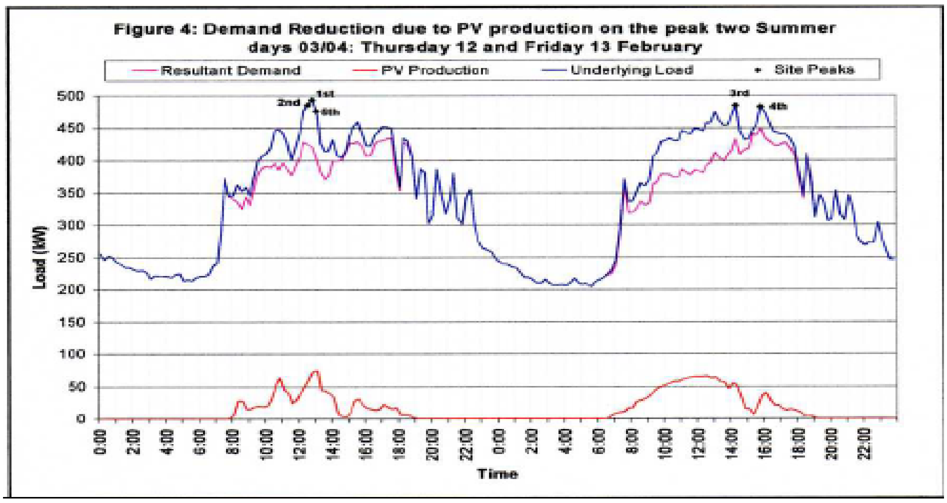

Figure 5: Impact of PV output at the Kogarah Town Square on load at the Carlton zone substation (mixed residential and commercial load) (Energy Australia, 2005).

Note that the degree to which PV can provide firm network capacity needs to be examined on a case by case basis using real time data for both load and PV output. Such analyses should include load duration curves over an extended period of time and assessment of PV against standard reliability of supply criteria. Previous work by the authors has found that at any one time, PV provides between 30% and 75% of its rated capacity during peak periods (Watt et al., 2006; Passey et al., 2007).

3. INTERNATIONAL EXPERIENCES

The use of PV by business dominates the Australian off-grid PV market. Internationally, the grid market also has a strong non-residential sector component, with commercial, industrial and public buildings providing many high profile demonstration systems of building-integrated PV (see for instance IEA-PVPS, 2007) and commercial sector uptake of feed-in tariffs driving large market growth in Europe.

Studies in the US have shown that commercial PV systems can be cost effective in many States and that the breakeven costs can be further improved if consideration is given to environmental, load management, emergency and building component values (Perez, 1999, Herig, 1998)

Incentives for business uptake of PV are provided in many countries. Some examples are discussed below.

3.1. Germany

Germany has a renewable energy target of 12.5 % by 2010 and 20% by 2020 (up from 6.3% in 2000). To meet this target, the Renewable Energy Sources Act provides for PV (and other) feed-in tariffs of different levels depending on application, as well as soft loans. The PV tariffs are higher for systems on roofs and facades than for free standing systems, to encourage building integration, and for 2007 range from 49-57 c€/kWh for 20 years. Prices decrease by 5% per year for new installations. Local government and utility incentives are also available.

The PV market in Germany has grown significantly under this program and Germany now dominates the world PV market with about 750 MW installed per year in 2005 and 2006 and a cumulative installed capacity of around 2.5 GW (iea-pvps.org, 2007). Five thousand companies, employing 50,000 people, are now involved with PV and industry turnover in 2006 was 3.8 billion Euro (A$6 billion) (ibid). Corporate uptake of PV is strong, with PV regarded as a sound investment. Many corporate buildings have PV rooftops or facades, for example, Michelin with 9 MW of PV on its buildings.

3.2. Japan

Japan was the first country to provide market incentives for PV uptake and remains the largest PV manufacturer, supplying around 50% of the world market. As part of its first 30 year PV development plan, grants were provided for residential PV uptake. These grants have now ceased and in its 2nd 30 year PV plan, and its PV2030 PV Roadmap, emphasis moved to larger systems and commercial uptake. The Japanese PV target is 4.8 MW by 2010 (from 1.4 MW in 2005) and PV prices of 14 yen/kWh by 2020 and 7 yen/kWh by 2030. The Japanese PV vision fits under overall renewable energy targets and Kyoto greenhouse gas reduction commitments. PV is a major pillar in its 2006 New National Innovation Plan.

The Field Test Project on PV for Industrial and Other Applications, now extended to New PV Power Generation Technology, provides 50% subsides for private companies and other organisations with large scale innovative PV applications. 70 MW of PV has been installed to date in a range of corporate facilities. All are required to monitor their PV performance. Similar subsidies are provided for systems larger than 10 kW installed by public sector organisations. The Project for Supporting New Energy Operators provides subsidies of 30%, as well as loan guarantees up to 90%, for companies investing in new energy technologies. PV systems must be > 50 kW and have been installed in factories and high rise buildings. A number of other programs support non-residential PV uptake via green building codes, utility programs, government green purchasing regulations and education.

3.3. USA

The Solar America Initiative aims to have PV cost competitive with conventional electricity by 2015, with an installed capacity in the US of 5-10 GW, from around 0.5 GW at present. It involves a combination of technology development partnerships and market transformation and is supported by the US Department of Energy Solar Energy Technologies Program (iea-pvps.org, 2007). Corporate uptake of renewables is supported by a number of measures in the US, at Federal, State, utility and local government level. Federal incentives for PV include a Business Energy Tax Credit of 30% of the system cost in the first year of its operation, as well as a 5 year depreciation schedule under the Modified Accelerated Cost Recovery System (www.dsire.org).

Most States have a mandatory net metering requirement for PV, 33 States have renewable energy portfolio standards and many have grants, loans and other incentives. California has a target of 3000 MW additional PV by 2017, to be achieved via a US$2.50 per Watt subsidy for residential and commercial systems and US$3.25 for the government and non-profit sector (www.cpuc.ca.gov). Utilities like the Sacramento Municipal Utility District offer additional incentives and associated finance packages (7.5% over 10 years), repayable via electricity bills (SMUD, 2007). PV system installers estimate that 70% of commercial PV system costs can be covered by incentives, resulting in a 20% internal rate of return on investment (http://www.mcsolar.com/commercial/ commercial_pv_incentives.htm). The New Jersey renewable energy portfolio standard has a solar component, estimated to be 1500 MW of PV by 2021 (www.njcleanenergy.com). Many States, including Arizona, Massachusetts, Iowa, New York and Texas, provide a variety of corporate tax credits, based on installed cost or electricity production (DSIRE, 2007). Some of these are quite generous and larger systems are increasing: for example, Google recently installed 1.6 MW of PV over buildings and carports at its corporate headquarters and expects to reduce peak time electricity use by 30% (http://google.com/corporate/solarpanels/home). The Fresno Yosemite international airport is installing a 2 MW PV system to displace 40% of its electricity use. Many more such large corporate installations are planned or under construction.

4. COMMERCIAL BUILDING INTEGRATED PV OPTIONS

Commercial buildings typically comprise of large surface areas and, depending on planning conditions, are endowed with significant solar access assets (Snow et. al, 2002). This can present challenges for the external building skin to counteract exposure from intense thermal gain during an Australian summer and require mechanical cooling to make the internal building space a healthy and functional working space. Similarly, encouraging natural sunheat into the building is desirable in winter. Both aspects impact on the seasonal operational energy requirements of commercial buildings.

PV integration, either as a new building design or as a retrofit option, can provide a means of harnessing the solar access assets of buildings and also reducing the thermal gain of facades through clever PV shading devices (Snow, et al, 2005). It also presents added values by improving the building performance rating and reducing the greenhouse gas emission impacts. Corporate re-branding of commercial premises, using innovative PV designs, therefore presents exciting possibilities for new and retrofit buildings.

4.1. Improved Expectations of Building Operation Standards

Rating tools, such as Green Star™ and the Australian Building Greenhouse Rating (ABGR) are becoming increasingly recognised by both government authorities and building operators as important mechanisms for measuring building performance and resultant greenhouse gas emissions. Building occupants are valuing the efficiency characteristics of their building spaces, which links to productivity, operational cost and increasingly the corporate environmental image it conveys. Building integrated PV is a visually striking and ecologically astute product. It can also offset energy required for a significant part of the building operation, such as lifts, lighting and cooling requirements and offers added greenhouse gas emissions savings.

There are numerous ways in which PV designs can be deployed (Prasad & Snow, 2005) to enhance the corporate image of commercial buildings and help increase building operation star ratings. It is clear building-integrated PV presents very convincing PR selling points, but also practical ways of optimising the solar access assets of a building and its contribution to lopping peak electricity loads. Some key Australian design applications are summarised below.

4.2. PV as Part of the Building Structure

Typical commercial high rise buildings comprise large façade areas with often cluttered roof areas of lift overruns, conditioning outlets and communication equipment. Energy yields from PV arrays are typically lower for wall and façade applications. This is due to sub-optimal orientation and shading influences from surrounding buildings. Nevertheless, PV applications on façades can optimise the available surface area and displace conventional façade cladding materials.



Figure 6,7 & 8: Melbourne University PV glass façade (STI, 2002), Kogarah Town Square transluncent PV exhibition space and external PV awnings in Sydney (Kogarah Council, 2005).

Semi-transparent PV modules installed as PV window awnings and louvers provide shielding from direct sunlight while allowing diffuse light to penetrate the interior spaces of the building. This utilises both the wall and window areas of a building's façade. It has been demonstrated that west orientated applications, although sub-optimal for annual PV output, effectively reduce the demand for air-conditioning, particularly on summer afternoons. Various integration strategies can be employed to maximise PV façade applications. Further international examples can be found through the International Energy Agency (IEA) Photovoltaic Power Systems (PVPS) Task 10 Urban Scale PV program at www.pvdatabase.org.

5. AUSTRALIAN COMMERCIAL PV INVESTMENT OPPORTUNITIES

Although commercial PV systems are not eligible for grants under the PV Rebate Program, there are several other avenues available for offsetting expenditure on PV.

5.1. Depreciation Allowances

For commercial PV systems which can be considered a business expense, expenditure can be written off against tax. Hence a 10 kWp PV system costing $100,000 could receive a tax benefit of up to $30,000 over the system life. In the 2007 budget, the Australian Government changed the guidelines for depreciation of business plant and equipment expenditure. The diminishing value rate has increased from 150% to 200% so that expenditure can be written off for tax purposes more rapidly (Aust. Govt., 2007) and in line with the expected life of the equipment.

5.2. Renewable Energy Certificates

PV systems rated under 100 kWp and producing less than 250 MWh per year can use the ORER PV deeming formula and claim Renewable Energy Certificates (RECs) during the first year of installation. PV used for residential or commercial purposes are eligible to register for RECs. For systems installed in 2008, 12 years' of deemed output can be claimed, since the current Mandatory Renewable Energy Target finishes in 2020. For a 10 kWp system in Zone 3 and with the current spot market REC value of $33, this would provide an up front payment of $5,473.

As State-based renewable energy targets begin to extend the MRET target, RECs may be available for further years and prices may increase.

5.3. Research and Development

Most commercial PV systems are likely to use standard, commercially available technology. However, businesses developing new PV technologies and applications may be able to claim research and development allowances for innovative installations. A clearly enunciated R&D program must be developed and tax benefits of 125% of expenditure can be claimed for approved projects. Higher deductions (175%) can be claimed for increased expenditure after 3 years. R&D grants may also be available via the Commercial Ready program, to assist commercialisation of new developments (Aust Govt, DITR, 2007).

6. COST EFFECTIVENESS OF PV FOR COMMERCIAL APPLICATIONS

Table 1 shows the depreciation and energy savings for a 10 kW commercial PV system installed in 2008 and costing $100,000. Using current REC values and tax benefits, and depending on insolation levels and electricity tariffs, the system would recover 32% of its installed cost over a 25 year expected life (1382 kWh/kW/yr). This is equivalent to the system producing electricity with a net cost to the system owner of an additional 20 c/kWh more than the retail price (41% for sites with 1836 kWh/kW/yr, resulting in 13 c/kWh). These values do not include building values such as improved thermal performance or appearance.

While business investments in PV can benefit from tax depreciation, the value of PV-generated electricity is reduced because businesses can claim electricity purchase costs as part of their operating costs every year. For this reason, there may be benefits for businesses to lease PV systems or to purchase PV-generated electricity from a third party, rather than investing in PV plant themselves. At this stage, PV-generated electricity can be purchased from Australian retailers via GreenPower products, but there are opportunities for commercial building owners to install PV and supply power to their tenants as part of their leasing arrangements.

Other developments may also accelerate cost effectiveness. Our calculations have assumed a 2% increase in electricity price per year, although in some jurisdictions, price rises of 5-18% are anticipated over the coming years (NSW IPART, 2007, WA Treasurer, 2007). The introduction of a carbon price in Australia would further increase electricity prices, depending on electricity supply source, while increased demand for renewable energy through State-based targets could see REC prices rise. Such price increases could result in commercial PV systems covering a significant proportion of their installed costs within a 25 year lifetime, even at current PV prices.

Table 1. Value of Commercial PV Systems

Year	25 Yr Depreciation Value	Total discounted value[1]		10 Yr Depreciation Value	Total discounted value	
		1382[2] kWh/kW/yr	1836[3] kWh/kW/yr		1382 kWh/kW/yr	1836 kWh/kW/yr
1	2400	8369	8861	6000	11969	12461
10	1133	1045	1412	4027	2853	3220
25	4055	1327	1553	0	171	396
Total	30000	32548	41099	30000	38550	47101
Increase in Electricity Cost[4] c/kWh		20	13		18	12

Notes:
(1) Net metered tariff 15.47 c/kWh; Discount Rate 8%; Inflation Rate 2.5%; Electricity price increase 2% pa.
(2) MRET Zone 3 deeming value.
(3) Average PV output from simulated systems in WA (Passey et al., 2007).
(4) The resultant increased cost of electricity to the system owner

6.1. Tariff Impacts

Studies in the US (Wiser et al, 2007) have shown that tariff rate and structure can have more impact than solar insolation levels in determining the cost-effectiveness of PV for commercial customers.

The electricity tariff used for the analysis in Table 1 (15.47 c/kWh) is the typical of business tariffs for small to medium usage across most retailers to end June 2007 during PV generating hours (~8am-5pm). We have assumed that all electricity generated is used in-house or is net metered.

Significant changes to both tariff rate and structure have been instigated by many retailers from 1 July, which will change the PV value. Analyses using time of use tariffs, although usually providing higher electricity cost savings during weekdays, have lower weekend savings and hence can provide lower annual cost savings than flat business tariffs, although this depends on the rate structure. For instance, the new Energy Australia “Smart Power” tariff is 8.9 c/kWh from 7am-2pm, 25.1 c/kWh from 2pm-8pm and 5.1 c/kWh at other times and on weekends. The PV value will therefore be maximised by the use of west facing arrays, but the low weekend rate may still result in lower PV value than using a flat daytime tariff. If electricity is generated in excess of requirements and net metering is not available, the PV value will be further reduced, with buyback rates likely to be closer to bulk supply rates (~4-6 c/kWh).

Tariff structures which include a demand component may also be used by commercial enterprises. The PV value in these cases would be strongly related to the load profile of the business, with extra benefit if the demand for peak periods can be reduced.

7. DISCUSSION

At present only residential customers, schools and public buildings have access to the PV Rebate

Program, yet PV on commercial premises may provide greater network benefits and be a good investment for businesses. PV installations on commercial and public buildings can be an important means of driving grid-connected PV market growth both because they typically involve larger PV arrays than residential installations and because they can provide high visibility technology demonstrations. In Australia, early installations were supported by the Renewable Energy Commercialisation Program and most States now support PV in schools, however, this market sector has not become a significant focus for government or industry, as it has done internationally. The various Solar Cities projects are expected to include commercial and public building installations and new commercial building energy codes, and State-based renewable energy targets may also stimulate uptake. However, there is a case for development of specific incentive programs to target growth in this market sector. While system costs are expected to fall over time, other strategies may be used to reduce costs in the meantime. For instance, accelerated depreciation can be used as a means of encouraging investment. For the system examined in Table 1, if PV systems could be depreciated over 10 years, the $30,000 tax benefit would be received earlier and 38% of the system cost would be recovered over the system life, with electricity effectively provided for 18 c/kWh more than the retail price (47% at 1836 kWh/kW/yr; 12 c/kWh). The projected decline in PV costs, together with inclusion of building and public image values could make commercial PV close to being cost competitive with electricity tariffs.

The cost-effectiveness of PV for any business would depend on load profile, location, tariff structure and taxation status and would need to be individually assessed. However, the market for PV in commercial buildings is close to being cost competitive and could be usefully stimulated to maximise PV contributions to load as well as providing volume sales for market growth and price reduction. Strategies to accelerate PV uptake in the commercial sector might include:

- Capital grant programs for the commercial sector
- Net metering or higher feed-in tariffs, especially in grid constrained commercial districts
- Accelerated depreciation for tax purposes
- Exemption of PV components from stamp duty on building sales.

8. ACKNOWLEDGMENTS

The authors would like to acknowledge the Australian PVPS Consortium for providing valuable background material for this work and the SEDO WA for access to PV output data from WA.

9. REFERENCES

Australian Government, 2007, *2006-07 Budget Overview*, www.budget.gov.au/2006-07/overview/html/overview, 19 June 2007.

Australian Government Department of Industry, Tourism and Resources, 2007, *Business Expenditure on Research and Development Fact Sheet*, http://www.industry.gov.au/content/itrinternet/cmscontent.cfm?objectID=D1B8B525-15D4-4033-8C8C99E155319140, 22 May 2007.

DSIRE, 2007, Summary Tables: Financial Incentives for Renewable Energy http://www.dsireusa.org/summarytables/financial.cfm?&CurrentPageID=7&EE=1&RE=1 (accessed July 2007).

Energy Australia, 2005, *Kogarah Town Square Photovoltaic Power System - Demand Management Analysis*, for the NSW Department of Planning.

Herig, C. Perez, R. and Wenger, H., 1998, *Commercial Buildings and PV, a Natural Match*. NREL Brochure DOE/GO-1998 NREL, Golden, CO.

Independent Pricing & Regulatory Tribunal, 2007, *Overview of final report and determination on electricity retail prices in NSW from 1 July 2007 to 30 June 2010*, IPART NSW, 14 June 2007.

International Energy Agency Photovoltaic Power Systems Programme, 2007, *PVPS Annual Report 2006*, available from www.iea-pvps.org.

Kogarah Council (2005) photos sourced from Kogarah Council. Solar Kogarah Town Square website see also www.re-systems.ee.unsw.edu.au/KTS_home.htm

Naughton, D., 2005, *Potential for Photovoltaics to Reduce Peak Demand at the University of NSW*, Taste of Summer Research Report, Centre for PV Engineering UNSW.

Sacremento Municipal Utility District, 2007, *Solar Power for your Business*, http://www.smud.org/green/solar/compv.html, July 2007.

Passey, R., Watt, M., Outhred, H., Spooner, T. and Snow, M., 2007, *Study of Grid-connect Photovoltaic Systems - Benefits, Opportunities, Barriers and Strategies*, for The Office of Energy, Western Australian Government.

Perez, R., Kmiecik, M., Herig, C. and Wenger, H, 1999, *Mapping the Value of Commercial PV Applications in the United States – Accounting for Externalities*, http://www.asrc.cestm.albany.edu/perez/Extern-99/mapping.html.

Prasad D.K. and Snow M. 2005, *Designing with Solar Power - A sourcebook for building integrated photovoltaics (BiPV)*. International Energy Agency (IEA), Images publishing, Melbourne.

Snow M. and Prasad, D.K., 2002, "Architectural and Aesthetic experiences for Photovoltaics (PV) in the Built Environment". In *Proceedings of PLEA 2002*, Toulouse, France, July 2002.

Snow M., Prasad D.K. and Watt, M., 2005, *Best Practice Guidelines for Solar Power Building Projects in Australia*. UNSW, Sydney.

STI, 2002, Photo sourced from Sustainable Technologies International

Watt et al, 2005, *Photovoltaics and Peak Electricity Loads - Summer 2003-04*, Centre for PV Engineering UNSW, for BP Solar, Origin Energy and the Sustaiable Energy Authority ofVictoria.

Watt et al 2006, *Newington Village, An Analysis of Photovoltaic Output, Residential Load and PV's Ability to Reduce Peak Demand*, Centre for Energy & Environmental Markets, for the NSW Department of Planning.

WA Treasurer, 2007, *State Budget 2007-08 – Decisions for our Future - Powering WA*, http://www.mediastatements.wa.gov.au/media/media.nsf/3c64c0ab7409c18f48256dbe0025d27c/3aaf531a9ea18292c82572d7002c1420?OpenDocument, Media Statement,10 May 2007.

Wiser, R., Mills, A., Barbose, G. and Golove, W., 2007, *The Impact of Retail Rate Structures on the Economics of Commercial Photovoltaic Systems in California*, Lawrence Berkely National Laborotory for the National Renewable Energy Laboratories and the U.S. Department of Energy, NBNL – 63019, July 2007.