Energy Use in Commonwealth Operations

2001-02

Energy & Environment Division

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Cover photographs

Under construction - the new central office building for the Department of Immigration and Multicultural and Indigenous Affairs at Belconnen in the ACT - establishing new standards for energy efficiency and environmental design features.

When fully complete, this two-tower building will have a net lettable area of 28,000 m² and will replace the space currently occupied by the department in the Benjamin office complex. Part of the Green and Yellow buildings of the Benjamin complex can be seen in the background of the larger photograph. These building are to be demolished in stage 2 of the construction program.

For more information on the expected performance of the new building, refer to the case study on page 52.

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Executive summary

Further improvements in the energy efficiency of the Commonwealth's own operations continue to drive reductions in energy consumption, associated greenhouse emissions and cost.

Information provided by 121 budget dependent Commonwealth agencies shows that in 2001/02:

- energy consumption fell by 3.3% to 8,273,042 GJ;
- greenhouse gas emissions fell by 1.7% to 1,585,136 tonnes CO_2 equivalent; and
- energy intensity declined significantly in all major end-use categories.

Since the first Commonwealth energy use report in 1997/98:

- energy consumption has fallen by 14.2%;
- greenhouse gas emissions have fallen by 11.2%;
- energy intensity or consumption has declined in 9 of 12 end-use categories; and
- estimated annual energy costs have fallen by $30 million.

While changes to activities have contributed to the decline in energy consumption, most of the gains are due to efficiency improvements. On a business as usual basis, the consumption has still fallen by nearly 13% since 1997/98.

Performance targets, with a compliance date of the 2002/03 financial year, exist in three of twelve end-use categories. These three end-use categories cover almost 60% of the total Commonwealth energy consumption.

Overall, the Commonwealth is operating below the Office – Central Services energy intensity target of 500 MJ/m². It reduced the Office - Tenant Light and Power intensity by 4% last year and by 23% since 1997/98 to be well on track to meet the 10,000 MJ/m² target during 2002/03.

The Department of Defence reduced energy consumption in its bases by a further 6% in 2001/02, following a reduction of 3% the previous year and its energy efficiency program is

continuing. The department now has a reasonable chance of meeting the 2,500,000 GJ Defence Establishments target.

This report is compiled in accordance with the Commonwealth energy policy detailed in Measures for Improving Energy Efficiency in Commonwealth Operations.

Introduction

This is the fifth annual report on energy use in Commonwealth Government operations.

Objectives

Each report has two main objectives. One is to present a simple picture of overall energy consumption and associated greenhouse gas emissions resulting from the activities of the Commonwealth during the previous financial year. The other is to measure the intensity of that consumption as a means of monitoring progress towards greater energy efficiency in government operations.

Structure

The report starts with an initial discussion on aggregate energy consumption and associated greenhouse emissions by end-use category and by energy source for the Commonwealth as a whole. This is presented for the current reporting year and with trends over the five reporting years. The performance of each end-use category is then examined in detail, focussing on energy intensities where appropriate.

Case studies of energy efficiency initiatives undertaken during the year are next, followed by performance summaries for portfolios and agencies and end-use category league tables. A copy of the policy document *Measures for Improving Energy Efficiency in Commonwealth Operations* concludes the report

Data source

The report is based on end-use category summary data provided by each budget dependent agency. This level of detail is sufficient for the objective of showing consumption, intensity levels and trends, and tracking agency progress toward targets. It is not sufficient, however, for any detailed analysis of processes or technologies associated with agency performance. Agencies are best placed to determine their own responses and solutions to energy efficiency issues affecting their own organisations. The policy sets outcome based goals and uses the reporting system to monitor progress toward those goals.

Administrative structures

Energy performance is reported against agencies as at 30 June 2002. The next report, which will be for the 2002/03 financial year, will be against agencies as they exist at June 30 2003. Where elements move from one agency to another, they carry with them the energy performance for the full financial year. This process of adjusting for administrative changes is more fully explained in section 3.1.9 of the policy document *Measures for Improving Energy Efficiency in Commonwealth Operations*, which is included as Annex D.

During 2001-02, two previously reporting agencies, Auslig and the Office of Asset Sales and Commercial Support, were fully subsumed into Geoscience Australia and the Department of Finance and Administration respectively. In response to this, all previous energy and associated data of the subsumed agencies was transferred to the new parent agencies. For example, the historical data for Geoscience Australia now contains all the information previously reported by Auslig and there is now no separate report on Auslig as there had been in the past.

Responsibility

It is the responsibility of agencies to supply the data for inclusion in this report. Data checking and validation follows before the report is finalised for tabling. While every effort is made to identify data anomalies and to have them addressed by the relevant agency, the final responsibility for the accuracy of the information in this report rests with the individual reporting agencies.

In completing their annual energy reports, agencies quantify their energy consumption levels. Feedback on their initial submissions ensures that they are aware of how their energy intensity compares with other agencies.

In addition to analysis of Commonwealth energy results, detailed summaries of agency performance for all reporting years are provided in Annex B. Agency comments on their own performance are included. To further increase accountability, end-use category data is presented in Annex C as performance league tables in ascending order of energy intensity.

Relative performance

Measuring energy efficiency between organisations as diverse as Commonwealth agencies is not simple. Tracking changes in the overall energy consumption of an agency without accounting for the underlying activity levels of that agency gives no indication of the relative efficiency of energy use. An agency may have increased staff numbers to cope with the introduction of new programs. Accordingly, it may have increased its energy consumption. But the agency is not necessarily less energy efficient.

Energy intensity

For this reason, the concept of normalised energy consumption, or energy intensity, is included in the Commonwealth energy efficiency policy. Simply put, normalised energy consumption provides a measure of how energy consumption is related to activity levels. Normalised energy consumption may be MJ/person, MJ/m^2 or MJ/km. (MJ is an abbreviation for Megajoule, a unit of energy consumption, m^2 represents a square metre of building space and km is the distance travelled by a vehicle)

Relative movement in energy intensity is a much better indicator of relative energy efficiency because it does, to some extent, reflect activity levels. A degree of complexity to the comparison process is introduced, as energy performance is peculiar to the type of activity being assessed. For example, it is reasonable to compare office buildings with each other in terms of energy performance, but it would be inappropriate to compare office buildings with a laboratory.

Energy Intensity

A small agency with a staff of 12 people occupies 330 m^2 of office space. During the year 35,681 kWh of electricity is consumed to light the space and power office equipment.

Using a conversion rate of 3.6 MJ/kWh, total consumption is 128,452 MJ.

The energy intensity of the agency is:

128,452/12 = 10,704 MJ/person the key indicator for Tenant Light and Power
or
128,452/330 = 389 MJ/m^2

End-use categories

To address this, twelve end-use categories are included in the Commonwealth energy efficiency policy. Each end-use category has similar energy performance characteristics and most have a defined intensity as the key indicator of energy efficiency. However, for some categories, there is no intensity that adequately represents efficiency, so total energy consumption is used.

It is reasonable to make comparisons between the year-to-year performance of an agency within a particular category, using its energy intensity. Categories like office buildings and passenger vehicles are reasonably homogeneous and therefore one agency's performance may be compared with another's. In other categories, like public buildings or laboratories, comparisons between agencies should be done with great care and with an understanding of all the factors affecting relative performance.

Performance outcomes

Energy use and greenhouse emissions

Total reported energy consumption of the Commonwealth, excluding Defence Operations, for 2001/2002 was 8,273,042 GJ with associated greenhouse emissions of 1,585,136 tonnes of CO_2 equivalent. To give this some perspective, this energy consumption is about half that of the entire ACT and the greenhouse emissions are less than 0.5% of the total energy-related greenhouse emissions in Australia.

Table 1 Energy consumption and greenhouse gas emissions by end-use category

	Energy use		Greenhouse emissions	
End-use category	**GJ**	**% total**	**Tonnes**	**% total**
Climate Controlled Stores	60,217	0.73	11,593	0.73
Antarctic Bases	76,110	0.92	5,323	0.34
Other Uses	76,256	0.92	12,763	0.81
Law Courts	99,857	1.21	22,405	1.41
Public Buildings	371,131	4.49	66,404	4.19
Office - Central Services	514,154	6.21	95,443	6.02
Other Transport	534,597	6.46	36,613	2.31
Other Buildings	673,633	8.14	152,142	9.60
Passenger Vehicles	695,705	8.41	46,054	2.91
Laboratories	919,440	11.11	180,883	11.41
Office - Tenant Light and Power	1,278,882	15.46	329,238	20.77
Defence Establishments	2,973,059	35.94	626,276	39.51
Total	**8,273,042**		**1,585,136**	
Unreported Central Services	720,000	3.06	133,654	3.49
Defence Operations	14,538,162	61.78	1,013,207	37.09
Grand Total	**23,531,203**		**2,731,997**	

Table 1 provides a summary of energy consumption and associated greenhouse emissions by end-use category.

Greenhouse gas emissions are calculated by applying national average greenhouse coefficients to the total consumption of each fuel type in the category. The coefficients that have been used are included on page 446. National average coefficients introduce a degree of approximation to the calculation of greenhouse emissions and assume that the profile of energy consumption in the Commonwealth government exactly mirrors that of the nation. The extent to which this assumption is correct determines the accuracy of the calculation. The other error factors are the accuracy of the calculation of the coefficients themselves and the accuracy of the energy data. Overall, the accuracy of the greenhouse gas emissions is considered to be within ten per cent in absolute terms, but within a few per cent in year-on-year comparisons.

Defence operations

The energy consumption of Defence Operations is appended to Table 1 to complete the picture of total Commonwealth energy consumption. Despite its significant contribution, defence operational fuel consumption does not fall within the ambit of the Commonwealth energy policy other than as a reporting requirement. Levels of consumption can vary widely depending on operational priorities. Consumption increased significantly during 1999/2000 as a result of activities in East Timor and fell as Australia's military commitment was reduced. This year fell again to below the level of 1997/98. Because it is outside the control mechanisms of the policy, defence operational fuel consumption will be excluded from subsequent analysis in this report, unless it is explicitly stated otherwise.

Government priorities

Total energy consumption varies in response to Government priorities and activity levels. In the past consumption increases were reported as a result of Government responses to the Sydney Olympic Games (increased drug testing, security etc), to East Timor and to the requirements of introducing the new tax system. Last year, the increased state of alert following September 11 increased consumption while the staff reductions that followed the settling in of the new tax system contributed to a reduction in consumption. There are many other such priority changes that affect the levels of consumption and energy intensity in each of the

reporting agencies and these are reflected in the comments provided by the agencies and included in Annex B.

Unreported energy

An important aspect of the Commonwealth energy policy is that departments and agencies are expected to be responsible for, and report on, only that energy consumption over which they have direct control.

While tenants are expected to be responsible for the energy consumption of their own light and power, they are not required to be responsible for the energy consumption of the building central services unless they have agreed to this in their lease agreement.

Tenants in multi storey buildings have virtually no control over the energy consumption of building central services such as air conditioning, lifts, domestic hot water etc that are operated by the building owner and possibly shared by many tenants. The only office building central services energy consumption that is included in this report is for office buildings that the Commonwealth owns, or where the Commonwealth, as a tenant, has agreed to assume responsibility for such consumption.

As Commonwealth office buildings are sold, and the new private sector building owner assumes responsibility, the energy consumption of the building central services are no longer reported.

Nonetheless this consumption can be estimated. Where building central services are reported, the rate of energy consumption is 482 MJ/m^2/annum. If this figure is applied to the nearly 1.5 million square metres of unreported space, then there is an estimated additional 720,000 GJ of energy consumption and 134,000 tonnes of greenhouse emissions that can be added to Commonwealth operations. As with defence operational fuels, this unreported energy consumption is included in Table 1 for information, but is excluded from any further analysis in this report. It should be noted also that the amount of unreported office space has hardly changed over the five years of reporting.

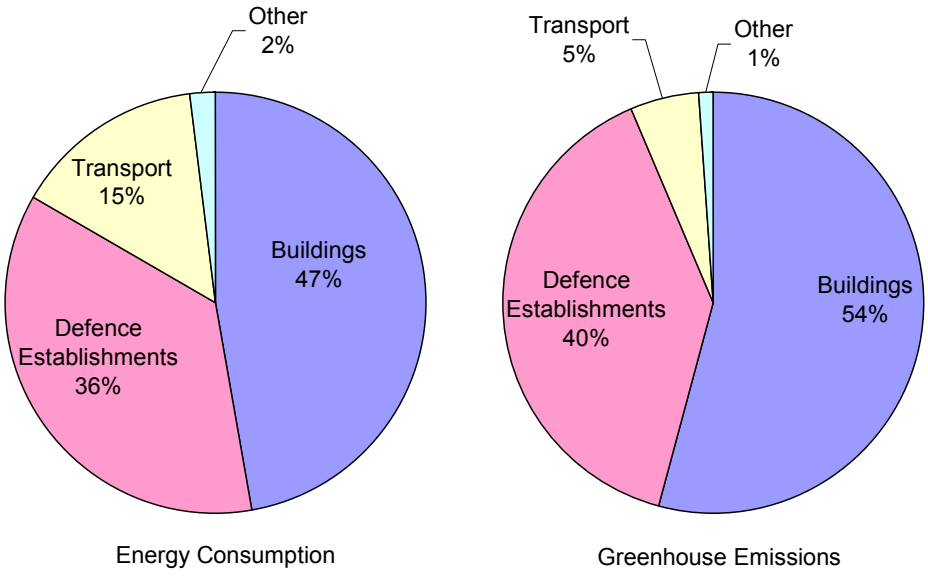
Energy end-use

Transport fuels have much lower greenhouse intensity than electricity, which accounts for more than 75% of non-transport energy use. The high greenhouse intensity of electricity arises because nationally it is mostly generated using coal as a fuel in a

relatively inefficient process. The high greenhouse intensity of coal further compounds this equation and results in electricity having greenhouse intensity around four times higher than the main primary fuels natural gas and petrol.

Figure 1 shows the energy use and greenhouse emissions of four broad end-use groups. This figure clearly shows how important building energy performance is in determining overall greenhouse emissions of the Commonwealth. This becomes even more apparent when it is appreciated that both the Defence Establishments group and the Other group is mostly building related. While transport operations represent 15% of total energy consumption, they are responsible for only 5% of total energy related greenhouse emissions.

Figure 1 Energy use and greenhouse emissions by end-use group



Buildings include Office - Tenant Light and Power, Office - Central Services, Public Buildings, Law Courts, Climate Controlled Stores, Laboratories and Other Buildings.

Transport includes Passenger Vehicles and Other Transport.

Other includes Other Uses and Antarctic Bases.

Defence Establishments includes Defence Establishments only.

Energy use by agency

The goal of the energy policy is to reduce Commonwealth energy consumption and associated greenhouse emissions through improving the efficiency of energy use. As the energy consumption of an agency can vary greatly depending on its underlying activities during the reporting period, its raw energy consumption says very little about its energy efficiency. Therefore, the focus of this report is on energy intensity.

Table 2 Energy use of the 20 highest energy using agencies

	Total Energy Use	
Agency	**GJ**	**% of C'wth**
Department of Defence	3,733,600	54.00
Commonwealth Scientific and Industrial Research Organisation	760,789	10.60
Centrelink	487,827	6.11
Australian Taxation Office	363,795	5.56
Australian Antarctic Division	310,694	4.36
Australian Broadcasting Corporation	240,367	3.32
Australian Customs Service	172,630	2.33
Joint House Department	157,981	2.22
Australian Federal Police	137,552	2.06
Health Insurance Commission	91,767	1.12
Australian Nuclear Science & Technology Organisation	90,045	1.20
National Gallery of Australia	74,988	1.11
Commonwealth Law Courts	69,737	0.90
Australian Sports Commission	63,158	0.84
Director of National Parks	62,947	0.87
Department of Foreign Affairs and Trade	56,710	0.79
Australian War Memorial	52,993	0.67
Australian Quarantine & Inspection Service	50,323	0.68
Department of Health and Ageing	47,387	0.59
Australian Bureau of Statistics	45,367	0.66
Total for top 20 agencies	**7,357,064**	**86.0%**
Total for Commonwealth	**8,273,042**	

The greatest opportunities for achieving significant reductions in the Commonwealth energy consumption tend to be with the largest energy consumers. Table 2 lists the 20 highest energy-using agencies, which together account for 86% of total Commonwealth energy consumption. Full details of the energy performance of all energy reporting agencies are included in the agency data sheets in Annex B.

Metering

Inadequate metering continues to limit the quality of data from many agencies and is one of the greatest impediments to further improvement in the energy performance of the Commonwealth. Some agencies are making progress toward providing adequate metering for both energy management and billing purposes and some enlightened building owners are able to see the value in such investment. One such example is the installation of meters in the Edmund Barton Building by Stockland, the building owner. This system has been installed to provide accurate billing of tenant consumption and a valuable energy management tool for both tenants and building owner. A more detailed account of the installation is included in the case study on page 48.

In contrast to this, there are still many buildings, some owned by the Commonwealth, where tenant energy bills are issued on an estimated basis. Apart from the financial implications, this also deprives the tenants of an incentive to improve energy efficiency. There is no point investing in energy efficiency programs if the outcomes of such programs cannot be measured and any rewards shared with other tenants and the building owner through a formularised energy allocation process.

Each year, the issue of poor data quality arising from inadequate data handling procedures arises. However, things seem to be improving and a number of factors may have contributed to this. The Government Operations Team of the Australian Greenhouse Office has been more active in providing advice to agencies in the past year and both Commonwealth energy managers and their property managers have gained more experience. However, there is still significant work required to improve the rate of ongoing data collection and the error checking of that data.

Energy use by fuel type

This section examines the relative contribution of different energy types to overall Commonwealth energy consumption and greenhouse emissions. Defence operational fuels are included in the overall total of Commonwealth energy use in Table 3 and excluded from subsequent tables and comments.

Table 4 shows the fuel type split for total energy consumption without Defence operational fuels.

Table 3 Energy consumption and greenhouse gas emissions by fuel type
(including Defence Operational Fuels)

	Energy use		Greenhouse emissions	
Fuel type	**GJ**	**% total**	**Tonnes**	**% total**
Heating Oil/Fuel Oil	1,126	0.00	79	0.00
Greenpower	37,707	0.17	-	-
AVGAS	62,331	0.27	4,239	0.16
Special Antarctic Blend	75,669	0.33	5,297	0.20
LPG	115,589	0.51	6,866	0.26
Gas Oil	217,633	0.95	15,234	0.59
Petrol	839,877	3.68	55,432	2.13
Natural Gas	1,337,003	5.86	72,733	2.80
Electricity	5,442,994	23.86	1,415,179	54.46
Automotive Diesel	7,246,059	31.77	505,050	19.44
Aviation Turbine Fuel	7,435,214	32.59	518,234	19.94
Total	**22,811,203**		**2,598,342**	

Table 4 Energy consumption and greenhouse gas emissions by fuel type
(excluding Defence Operational Fuels)

	Energy use		Greenhouse emissions	
Fuel type	**GJ**	**% total**	**Tonnes**	**% total**
Heating Oil/Fuel Oil	1,126	0.01	79	0.00
AVGAS	1,544	0.02	105	0.01
Aviation Turbine Fuel	6,204	0.07	432	0.03
Greenpower	37,707	0.46	-	-
Special Antarctic Blend	75,669	0.91	5,297	0.33
LPG	115,589	1.40	6,866	0.43
Automotive Diesel	197,694	2.39	13,779	0.87
Gas Oil	217,633	2.63	15,234	0.96
Petrol	839,877	10.15	55,432	3.50
Natural Gas	1,337,003	16.16	72,733	4.59
Electricity	5,442,994	65.79	1,415,179	89.28
Total	**8,273,042**		**1,585,136**	

Table 5 shows fuel use for general transport operations that includes the end-use categories of Other Transport and Passenger Vehicles while Table 6 is limited to Passenger Vehicles only.

Table 5 Transport energy consumption and greenhouse gas emissions

	Energy use			Greenhouse emissions	
Fuel type	**GJ**	**Units**	**% total**	**Tonnes**	**% total**
AVGAS	1,544	46,644	0.13	105	0.13
LPG	3,934	153,076	0.32	234	0.28
Aviation Turbine Fuel	6,204	168,600	0.50	432	0.52
Automotive Diesel	161,205	4,176,298	13.10	11,236	13.59
Gas Oil	217,633	4,869	17.69	15,234	18.43
Petrol	839,782	24,555,020	68.26	55,426	67.05
Total	**1,230,302**			**82,667**	

Table 6 Passenger vehicle energy consumption and greenhouse gas emissions

	Energy use			Greenhouse emissions	
Fuel type	**GJ**	**Units**	**% total**	**Tonnes**	**% total**
LPG	3,850	149,789	0.55	229	0.50
Automotive Diesel	43,959	1,138,827	6.32	3,064	6.65
Petrol	647,897	18,944,350	93.13	42,761	92.85
Total	**695,705**			**46,054**	

Automotive diesel is used in many of the light commercial vehicles, four wheel drives and mini buses that are included in the passenger vehicle category.

Trends in energy consumption and greenhouse emissions

Figure 2 illustrates the changes in total energy consumption by end-use category over the full period of reporting to date. These results are presented numerically in Table 7.

Total energy consumption has fallen for the fifth consecutive year. An increased rate of reduction this year is an indication that the work foreshadowed in agency comments last year has delivered the expected savings. There has also been added pressure applied to the agencies by the closeness of the target year.

In the past 12 months total energy consumption fell by 3.3% resulting in a total reduction of 14.2% over the four years since the first report in 1997/1998.

While activity changes may have caused some of this reduction, much can be directly attributed to improvements in energy intensity, thereby indicating that the Commonwealth is becoming more efficient in its energy use.

This can be demonstrated by applying 2001-02 energy intensities to 1997/98 levels of occupancy, floor area and distance travelled (business as usual). This indicates that energy consumption would still have decreased by almost 13% over the same period.

Figure 2 Energy consumption of each end-use category

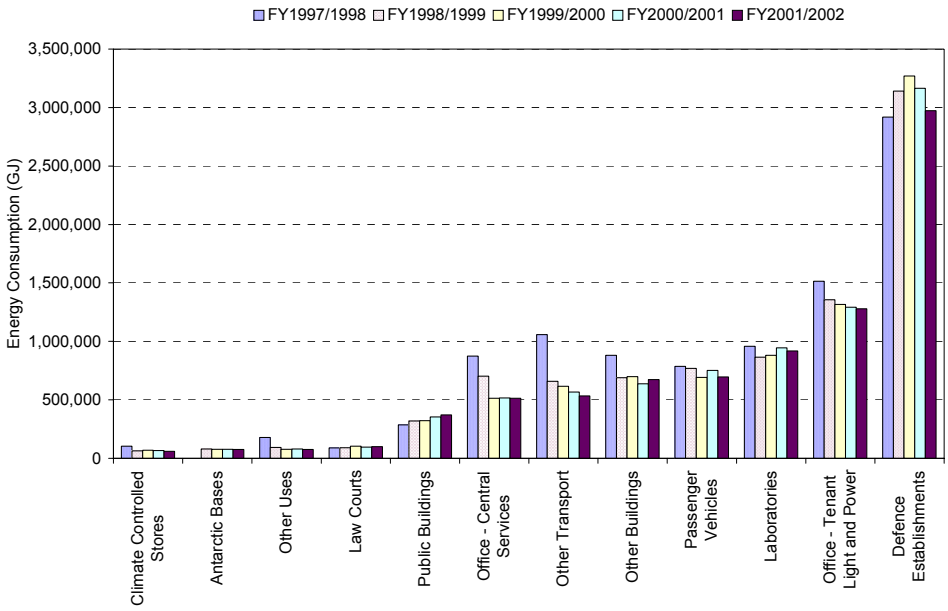


Table 7 End-use category energy consumption by financial year

	Energy use (GJ)				
End-use category	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**
Climate Controlled Stores	104,800	65,054	68,209	66,466	60,217
Antarctic Bases	-	79,644	77,806	78,843	76,110
Other Uses	178,365	94,306	77,065	80,513	76,256
Law Courts	88,829	90,327	104,826	96,013	99,857
Public Buildings	286,059	319,904	322,377	354,569	371,131
Office - Central Services	874,072	702,089	513,346	516,302	514,154
Other Transport	1,057,525	658,713	615,702	567,955	534,597
Other Buildings	880,488	689,563	697,159	637,733	673,633
Passenger Vehicles	786,244	769,949	690,830	752,662	695,705
Laboratories	957,326	863,925	881,470	945,942	919,440
Office - Tenant Light and Power	1,514,954	1,355,781	1,317,335	1,292,324	1,278,882
Defence Establishments	2,917,752	3,139,887	3,268,480	3,164,335	2,973,059
Total	**9,646,413**	**8,829,143**	**8,634,605**	**8,553,655**	**8,273,042**
Year-on-year change	**0.00%**	**-8.47%**	**-2.20%**	**-0.94%**	**-3.28%**
Progressive change	**0.00%**	**-8.47%**	**-10.49%**	**-11.33%**	**-14.24%**

Passenger vehicles

The quality of data in the Passenger Vehicle category is still highly questionable. The agencies rely on their fleet managers and the fleet managers, in turn, rely on drivers, service station attendants and oil companies to provide them with the raw information. In this path, there is significant opportunity for error and very little error checking or error handling.

Department of Defence

The Department of Defence continues to reap the rewards of their Defence Energy Efficiency Program (DEEP). After consecutive years of increase, the energy consumption of Defence Establishments decreased by 3% last year and a further 6% this year. Unofficial advice indicates that even further improvements were accruing as this report was being written. The reduction in this end-use category alone was responsible for more than two thirds of the reported reduction in energy consumption by the Commonwealth this year.

This continuing excellent performance in the face of significant demands on the organisation is further proof of the benefits that a well-directed energy management program can bring.

National Archives of Australia

Some end-use categories show consumption changes greater than 5% up or down and therefore warrant further discussion. Consumption of Climate Controlled Stores dropped by nearly 10%, mostly due to the activities of the National Archives. They reduced the amount of storage but they also significantly reduced the energy intensity of the remaining storage. The National Archives attributes much of this improvement to the efforts of Chris Lowger, Facilities Manager at the Chester Hill Repository in NSW and have provided a case study of his achievements, which can be found on page 50.

Other significant moves

Other Uses consumption fell by 5.3% mainly due to reduced operating hours of the Captain Cook Fountain and improved street lighting, both operated by the National Capital Authority.

The Department of Defence continued to reduce the energy consumption of its Other Transport operations and was responsible for most of the 5.8% reduction in that category.

Centrelink and Australian Hearing both reported in the Other Buildings category for the first time this year, contributing to the 5.6% increase in reported consumption. This consumption had been reported in other categories in previous years and moved to Other Buildings this year as an outcome of a process of ongoing review of the reporting process.

Table 8 End-use category greenhouse emissions by financial year

	Greenhouse emission (tonnes)				
End-use category	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**
Antarctic Bases	-	5,570	5,438	5,514	5,323
Climate Controlled Stores	22,248	12,718	12,777	13,239	11,593
Other Uses	22,569	13,665	13,238	14,177	12,763
Law Courts	21,691	21,879	22,628	21,910	22,405
Other Transport	72,539	44,813	42,024	38,836	36,613
Passenger Vehicles	51,980	51,017	45,747	49,783	46,054
Public Buildings	50,712	56,142	55,839	60,682	66,404
Office - Central Services	156,308	137,979	95,864	95,539	95,443
Other Buildings	213,826	156,329	153,652	142,935	152,142
Laboratories	187,966	164,202	169,341	183,998	180,883
Office - Tenant Light and Power	392,943	349,138	340,338	333,752	329,238
Defence Establishments	600,645	641,473	673,575	651,877	626,276
Total	**1,793,428**	**1,654,924**	**1,630,462**	**1,612,241**	**1,585,136**
Year-on-year change	**0.00%**	**-7.72%**	**-1.48%**	**-1.12%**	**-1.68%**
Progressive change	**0.00%**	**-7.72%**	**-9.09%**	**-10.10%**	**-11.61%**

Greenhouse emissions

Overall, with the reduction in energy consumption, there is a reduction in associated greenhouse gas emissions. There is no direct relationship, as the level of greenhouse emissions also depends on the fuel mix.

While there was an overall reduction in energy use, electricity consumption fell slightly less than the average. As a result, electricity as a proportion of the total energy consumption rose and, with its high greenhouse intensity, limited the reduction in greenhouse emissions to just under 1.7%. The total greenhouse gas reduction since the first year of reporting in 1997/98 is now 11.6%. Table 8 shows the trends in greenhouse emissions.

Table 9 Energy consumption by source for each financial year

	Energy use (GJ)				
Fuel type	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**
Heating Oil/Fuel Oil	91,799	2,615	1,994	824	1,126
AVGAS	6,047	5,694	1,439	1,716	1,544
Aviation Turbine Fuel	10,253	7,986	9,659	6,845	6,204
Greenpower	-	1,714	23,208	34,539	37,707
Special Antarctic Blend	-	79,148	76,974	78,343	75,669
LPG	77,339	123,975	89,073	97,574	115,589
Automotive Diesel	761,174	372,761	157,192	184,476	197,694
Gas Oil	-	73,751	268,454	224,829	217,633
Petrol	1,073,856	996,799	907,908	939,948	839,877
Natural Gas	1,582,511	1,550,879	1,539,205	1,489,828	1,337,003
Electricity	6,043,435	5,613,820	5,559,500	5,494,734	5,442,994
Total	**9,646,413**	**8,829,143**	**8,634,605**	**8,553,655**	**8,273,042**

Energy source

The effect of the fuel mix is illustrated further in Table 9, where energy consumption of the different energy sources is shown. The share of the total consumption taken by each fuel type has been reasonably steady, with understandably greater variation in those fuels with a smaller proportion of the total consumption. The big three fuels of electricity, natural gas and petrol continue to account for more than 90% of total consumption with individual contributions of 66%, 16% and 10% respectively. As an indication of the gradual move towards electricity, the same contributions in 1997/98 were 63%, 16% and 11%. This is without counting the small contribution of Greenpower to the current electricity consumption.

Although the rate of increase in Greenpower consumption slowed this year after a near 50% increase in the 2000/01 financial year its use is expected to increase this year with a contract negotiated in the ACT to supply nearly 200 sites with an average 8% Greenpower. Greenpower still contributes less than half a per cent of total Commonwealth consumption. While the use of Greenpower is effective in reducing greenhouse emissions, it is more costly than other forms of electricity and the additional cost

might yield equally significant reductions if it was invested in cost effective energy efficiency measures.

The Department of Defence reported significant increases in LPG use in Defence Establishments and it appears that the Australian Federal Police has continued to use more LPG fuelled vehicles and is now reporting nearly 5% of its total Passenger Vehicle energy consumption as LPG – up from just over 1% last year.

Around three quarters of all petrol is used in Passenger Vehicles, with most of the rest used in Other Transport and a very small amount used for activities such as lawn mowing reported in the Other Uses category. Overall, reported petrol consumption has dropped and this is partly due to a move away from Commonwealth leased vehicles for the senior executive service towards novated leases. However, there is still a fair degree of doubt hanging over the quality of the Passenger Vehicle data as discussed on page 15.

Once again, the value of the Defence Energy Efficiency Program is shown by a big reduction in natural gas consumption in Defence Establishments. Partly, this was offset by the increased use in LPG, but overall the energy value of all gas used dropped by nearly 15%.

Table 10 Greenhouse emissions by source for each financial year

	Greenhouse emission (tonnes)				
End-use category	**1997/98**	**1998/99**	**1999/00**	**2000/01**	**2001/02**
Greenpower	-	-	-	-	-
Heating Oil/Fuel Oil	6,398	182	139	57	79
AVGAS	411	387	98	117	105
Aviation Turbine Fuel	715	557	673	477	432
Special Antarctic Blend	-	5,540	5,388	5,484	5,297
LPG	4,594	7,364	5,291	5,796	6,866
Automotive Diesel	53,054	25,981	10,956	12,858	13,779
Gas Oil	-	5,163	18,792	15,738	15,234
Petrol	70,874	65,789	59,922	62,037	55,432
Natural Gas	86,089	84,368	83,733	81,047	72,733
Electricity	1,571,293	1,459,593	1,445,470	1,428,631	1,415,179
Total	**1,793,428**	**1,654,924**	**1,630,462**	**1,612,241**	**1,585,136**

Greenhouse emissions

Table 10 shows how greenhouse emissions associated with each fuel type have changed over the last five years. Because the greenhouse intensities of each fuel source have been kept constant in this report, these changes reflect the energy consumption variations over the same period. Greenpower, with its zero greenhouse intensity is the exception to this rule.

Energy end-use intensity

As discussed in the introduction, relative movement in energy intensity is a far better indicator of energy efficiency in operations than movement in energy consumption. Table 11 summarises the aggregate Commonwealth performance for each end-use category and, where appropriate, the range and average of the energy intensity most appropriate to each category.

Table 11 End-use category energy performance indicators

End-use category	Total Energy GJ	%	Target	Lower	Upper	Average	Key Indicator
Office - Tenant Light and Power	1,278,882	15.5	10,000	4,483	27,741	10,381	MJ/person/annum
Office - Central Services	514,154	6.2	500	143	818	482	MJ/m²/annum
Public Buildings	371,131	4.5		229	2,308	1,176	MJ/m²/annum
Law Courts	99,857	1.2		242	921	595	MJ/m²/annum
Climate Controlled Stores	60,217	0.7		344	2,510	679	MJ/m²/annum
Laboratories	919,440	11.1		563	2,184	987	MJ/m²/annum
Other Buildings	673,633	8.1		8	8,973	926	MJ/m²/annum
Passenger Vehicles	695,705	8.4		2.31	5.88	3.90	MJ/km
Other Transport	534,597	6.5					GJ
Defence Establishments	2,973,059	35.9	2,500,000				GJ
Antarctic Bases	76,110	0.9					GJ
Other Uses	76,256	0.9					GJ
Total	**8,273,042**						

The performance of all agencies in each end-use category over the five years of reporting is given in Annex B and league tables of current year agency performance in each end-use category are given in Annex C.

Some end-use categories, such as Other Transport and Other Uses, are so diverse as to make it impossible to define any single indicator of energy performance and so only total energy consumption is included in Table 11. The Defence Establishments category continues to be reported in terms of total energy consumption, although the Department of Defence is considering options for intensity based reporting of a large proportion of this consumption.

Targets

Targets are currently set in three end-use categories as indicated in Table 11. The targets for Office Tenant Light & Power and Office Central Services are set in intensity terms and the Defence Establishments target is an absolute consumption level. These targets are to be met by each agency during or before the 2002/03 financial year.

Progress

Table 12 shows the progress of the Commonwealth towards greater energy efficiency. The size and direction of the intensity changes for each end-use category should be considered alongside the relative contribution that the category makes to overall Commonwealth performance. For example, the improvement in Tenant Light & Power intensity becomes more significant when it is appreciated that this category contributes more than 15% to total energy consumption, and over 20% to greenhouse emissions.

The importance of this relationship is illustrated in Figure 3, where the length of each bar represents the percentage change in end-use category energy intensity from 2000/01 to 2001/02 and the height of the bar represents the relative contribution of the end-use category to total energy consumption. The figure shows that the five end-use categories with increased energy intensity are responsible for only about 30% of total consumption while those with reduced energy intensity were responsible for about 70% of total consumption. The four categories labelled with the suffix (GJ), show only changes in absolute consumption.

Table 12 End-use category energy intensity by financial year

End-use category	Energy Use Intensity 1997/98	1998/99	1999/00	2000/01	2001/02	Performance Indicator
Office - Tenant Light and Power	13,524	12,649	11,758	10,843	10,381	MJ/person/annum
Office - Central Services	534	481	453	459	482	MJ/m²/annum
Public Buildings	1,342	1,309	1,158	1,169	1,176	MJ/m²/annum
Law Courts	550	538	608	570	595	MJ/m²/annum
Climate Controlled Stores	1,174	663	698	686	679	MJ/m²/annum
Laboratories	1,111	996	1,048	1,068	987	MJ/m²/annum
Other Buildings	1,385	1,021	996	896	926	MJ/m²/annum
Passenger Vehicles	3.78	3.66	3.33	3.90	3.90	MJ/km
Other Transport	1,057,525	658,713	615,702	567,955	534,597	GJ
Defence Establishments	2,917,752	3,139,887	3,268,480	3,164,335	2,973,059	GJ
Antarctic Bases	-	79,644	77,806	78,843	76,110	GJ
Other Uses	178,365	94,306	77,065	80,513	76,256	GJ

Figure 3 Changes in energy intensity or consumption last year

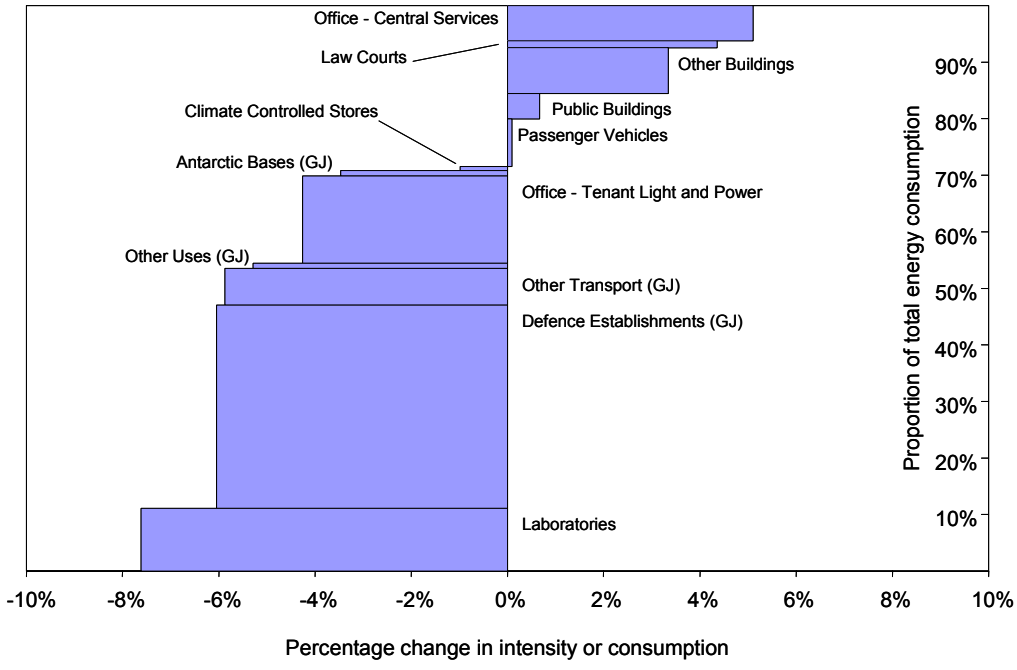
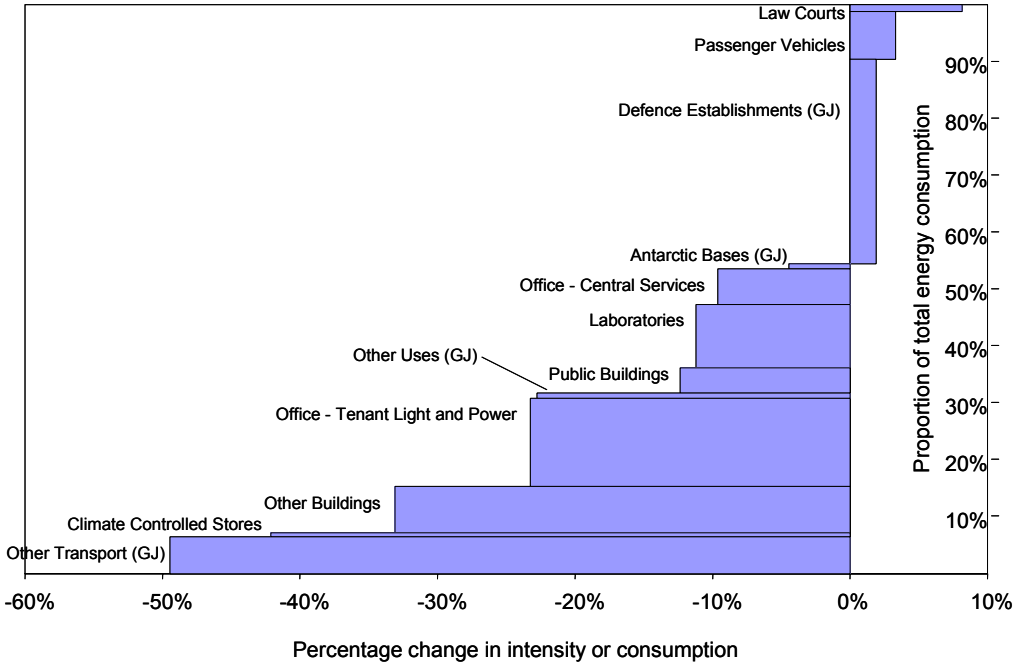


Figure 4 shows how energy intensity and energy consumption has changed since the first report in 1997/98. The only major end-use category showing an increase is Defence Establishments and this is on an improvement trend at the moment. The uncertain nature of the Passenger Vehicle data has been the subject of comment in every report to date and therefore there is a strong degree of uncertainty about the increase that is displayed. The increase in the Law Courts intensity is due to the poor performance of the Commonwealth Law Courts building in Melbourne. This building was constructed and occupied since 1997/98.

Antarctic Bases did not exist as an end-use category in 1997/98 and most of its energy consumption was reported as Other Uses. To give a more realistic picture of moves, Figure 4 uses the 1998/99 Antarctic Bases consumption as the basis for the percentage move in that category. The same consumption figure is deducted from the Other Uses 1997/98 consumption figure as the basis for the percentage move in that category.

Figure 4 Changes in energy intensity or consumption since 1997/98



Performance targets

As stated earlier, energy performance targets to be met by the end of the 2002/03 financial year are set only in the three end-use categories of Office Tenant Light and Power, Office Central Services and Defence Establishments. While the range of targets may be limited, the three end-use categories account for almost 60% of total Commonwealth consumption and more than 65% of energy related greenhouse gas emissions.

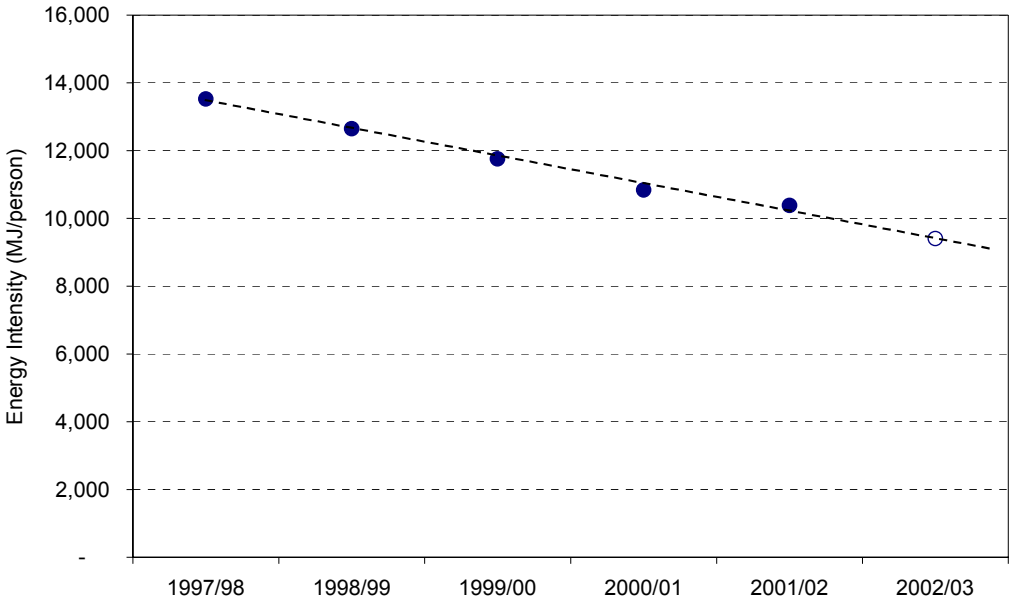
The targets are set at a level that represents a 25% reduction from the equivalent level that prevailed for Commonwealth operations as a whole in 1992/93. For the two office based targets this means a 25% reduction in average energy intensity and for the Defence Establishments target a 25% reduction in energy consumption.

When Tenant Light and Power intensity was first measured in 1997/98, it was found that it had hardly changed from 1992/93 until the introduction of the energy policy. In effect, as illustrated in Figure 5, the Tenant Light and Power target represents a 25% improvement between 1997/98 and 2002/03.

The targets are the same for all agencies that operate in these end-use categories. Some agencies are operating below and others above target but progress of the Commonwealth in aggregate is in the right direction. The Central Services target has been met and the trend towards the Tenant Light and Power target is on track. This year has shown another, and more significant, improvement in the performance of the Defence Establishments category and the Department of Defence has indicated in its comments a strong current and ongoing commitment toward further improvement.

Figure 5 illustrates the continuous improvement in the Tenant Light and Power energy intensity with the five solid points representing the reported performance to date, showing a 23% improvement over 4 years, and the one hollow point the projected performance outcome if the current trend continues. It is apparent that by following this trend, the Commonwealth should reach the Tenant Light and Power target during 2002/03.

Figure 5 Trends in tenant light and power energy intensity



While the Commonwealth as a whole is likely to meet the targets, some agencies have special circumstances that prevent their doing so and many of these agencies have provided comments that explain their performance. These comments are included in Annex B along with the agency's data.

The Australian Greenhouse Office reports that it is addressing the energy policy requirement to set fuel consumption targets through its response to the National Greenhouse Strategy measure 5.10. This measure includes provision for "the development of options for challenging but realistic fuel efficiency targets from 2003, and the use of alternative fuels, for government car fleets...". The AGO has advised that it is investigating options and is in the process of consulting with agencies on this issue and that an approach is yet to be finalised.

In other end-use categories, no targets have been set because the diversity of operations in each of these categories makes a sensible uniform target impossible.

Meanwhile, the requirement for all new and upgraded office buildings to comply with strict energy performance standards and the requirement for agencies to show leadership in their approach

to energy management should ensure that efficiency improvements are realised in these categories. The Australian Greenhouse Office reports that is currently testing several available methodologies to determine their applicability for Commonwealth new and refurbished buildings

Office Buildings - Tenant Light and Power

Description

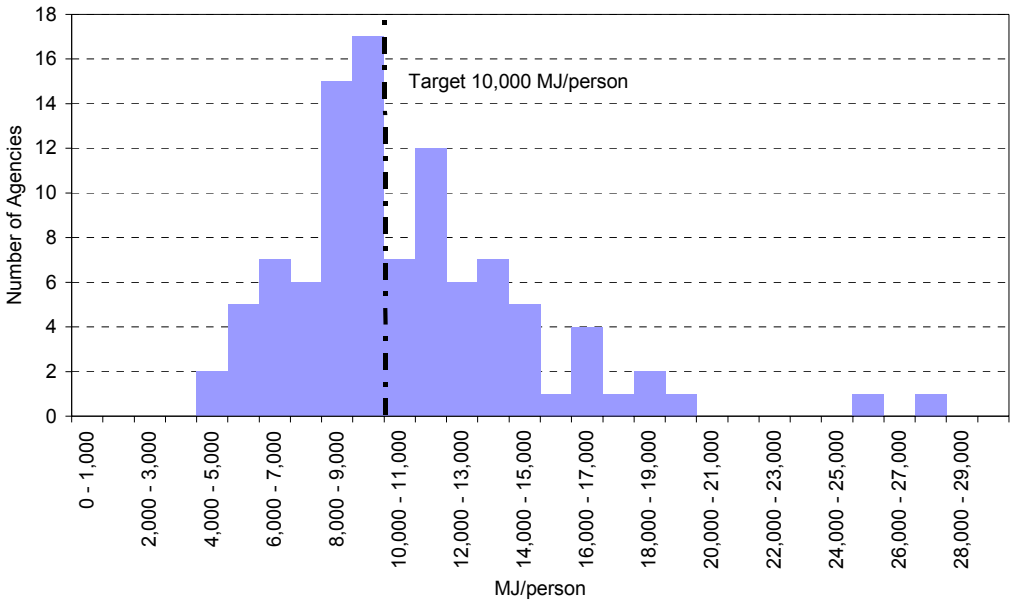
This category covers energy used for tenant operations in buildings whose primary function is office space. It includes tenancy lighting, office equipment, supplementary air conditioners, boiling water units etc. However, additional building factors that contribute to higher energy consumption, such as computer server rooms, or localised areas of extended operating hours, are not separated from office consumption. Agency data is not reported on a building-by-building basis but on the aggregate performance of their entire building estate.

The key indicator in this category is MJ/person/annum, recognising that the overall energy efficiency is a combination of the efficient use of the space with the energy efficiency of the space. A mandatory performance target of 10,000 MJ/person/annum is to be achieved during or before 2002/03.

Performance against target

Average performance in the Office-Tenant Light and Power end-use category was 10,381 MJ/person. Figure 6 shows the distribution of performance about the target of 10,000 MJ/person target. The two reporting at the higher end of the spectrum are the Attorney General's D Branch and the Australian Protective Service. The D Branch reports that increasing hours of operation has contributed to their high intensity levels. It expects that renovation works and the outcome of an energy audit will contribute to a better outcome in the future.

Figure 6 Histogram of tenant light and power performance



The average energy intensity has fallen by more than 4% in the past year and should be lower than the 10,000 MJ/person target in the next report, right on schedule. Again, this is partly due to a further improvement in building productivity, in particular, the average floor area per person, which is now below 21 m^2/person (compared with nearly 28 m^2/person in 1997/98). However, as for the past couple of years, the reduction in Tenant Light & Power intensity is greater than the reduction in average floor space per occupant, indicating that improved efficiency of lighting systems and/or office equipment also has made a significant contribution to this efficiency improvement.

Figure 7 is a box plot of the Tenant Light and Power performance, showing the maximum and minimum intensity each year, the median value and the box shows the 25th and 75th percentile limits.

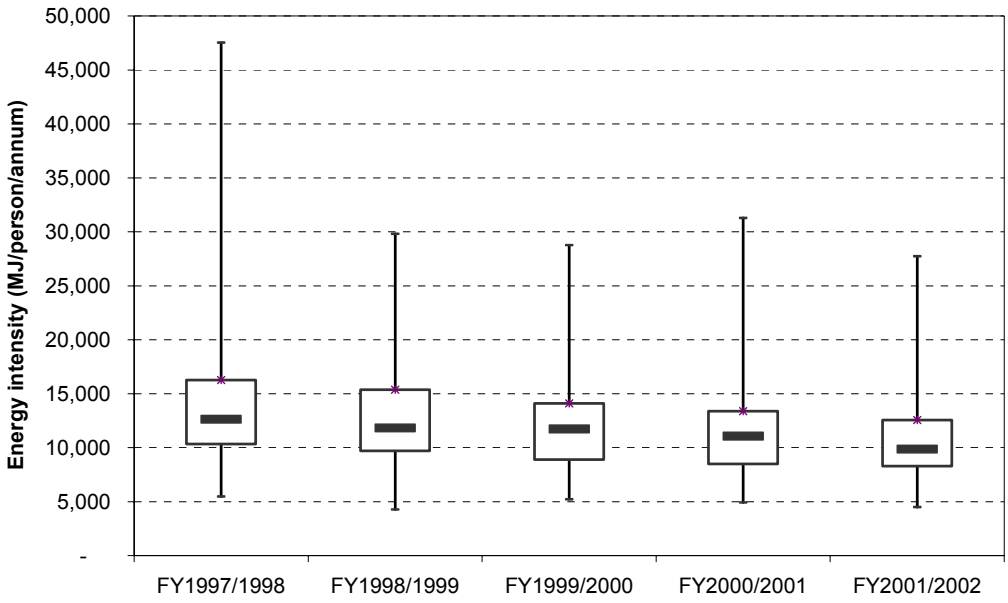
Metering again

There are still many buildings where tenant energy consumption is not measured directly, but is calculated by formula from the total building consumption. This was referred to earlier in the report and has been a cause for concern in each of the previous four reports.

Calculation of energy consumption is most common in buildings currently or formerly owned by the Commonwealth and introduces a significant level of uncertainty into the figures for both Tenant Light & Power and Central Services. Such formulae are usually agreed between the building owner and the tenants and commonly involve the building owner agreeing to accept responsibility for a fixed percentage of consumption, with the balance allocated to each tenant in the same proportion as their occupied floor space.

Calculating energy consumption by formula removes much of the incentive to introduce energy efficiency measures from both tenants and building owners. It is difficult to justify investing in efficiency measures if the energy consumption formula apportions a significant part of your savings to other tenants, or the building owner. Energy contract negotiations, fitouts and upgrades all present opportunities for low cost meter installations that should not be foregone.

Figure 7 Box plot of Tenant Light and Power energy intensity

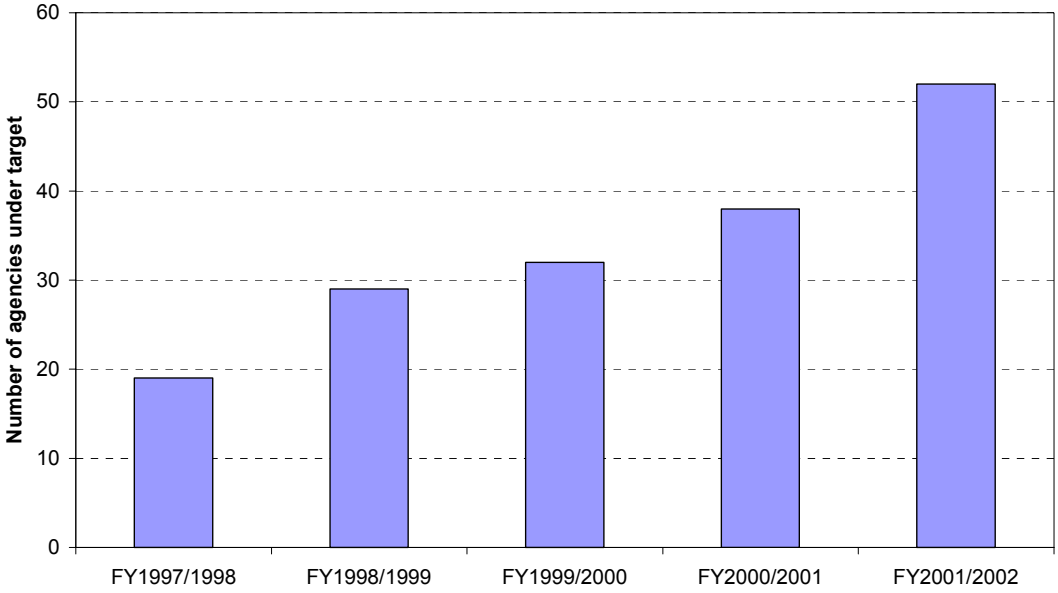


Progress

To further illustrate progress, Figure 8 shows the number of agencies each year operating at or below the target level. This year, 52 of the 100 agencies reporting Tenant Light and Power consumption are below target. In 1997/98, only 19 of 92 agencies were operating below target.

If all agencies currently operating above target were to improve so that they were operating at 10,000 MJ/person, there would be a further reduction of 142,000 GJ, or 11% of current Tenant Light and Power consumption

Figure 8 Numbers of agencies operating under target



Office Buildings - Central Services

Description

This category covers energy used for services in office buildings common to all tenants. It includes building air conditioning, lifts, security and lobby lights, domestic hot water etc.

The Property Group of the Department of Finance and Administration reports the Central Services energy consumption of Commonwealth-owned buildings.

Factors that might contribute to higher Central Services energy use, such as high tenancy loads, localised areas of extended operating hours or climate are not separately identified.

The key indicator in this category is MJ/m^2/annum. This recognises that building central services will typically service an entire building regardless of occupancy. An agency wide performance target of 500 MJ/m^2/annum has been set.

Performance against target

The reported average performance of 482 MJ/m^2/annum is up on last year but still under target, although the same cautionary note about calculated consumption referred to under Tenant Light & Power also applies here.

Figure 9 shows the distribution of performance about the target of 500 MJ/m^2 target.

Some of the agencies reporting at the higher end of the profile have special circumstances such as 24 hour operation that limit their ability to improve in the short term. Some of the extremes are also caused by inadequate metering and reliance on formulae to establish the split between Tenant Light and Power and Central Services. The default formula provided in the energy policy for use where no other information is available is deliberately biased towards higher Tenant Light and Power intensity.

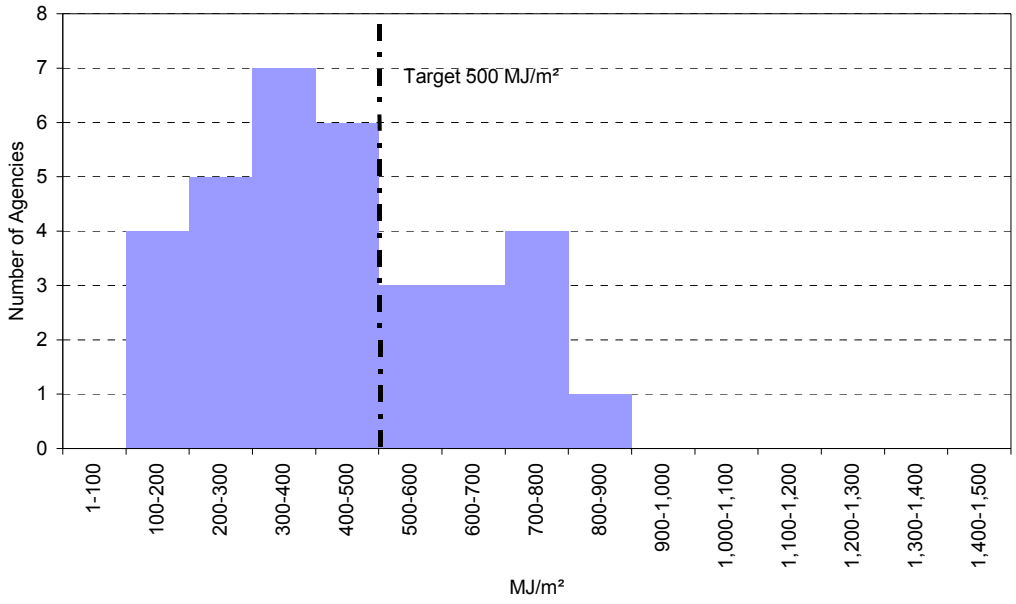
The main reason for the increase in the average Central Services intensity was a substantial increase in the figure supplied by the

Property Group. This agency is responsible for management of Commonwealth owned property and reports on the Central Services component of Commonwealth owned office buildings.

Through uncertainty about the policy intention in the past, the figures for two vacant buildings had been included in the Property Group report. These buildings had virtually no energy consumption but quite substantial floor areas and resulted in a misleadingly low average energy intensity of their building portfolio. With these two buildings removed from the category, the average energy intensity of 531 MJ/m² is a more accurate reflection of the overall building performance and it is not good.

The two largest buildings in the portfolio are the Treasury and John Gorton buildings. The performance of these buildings should be excellent because they were both recently refurbished.

Figure 9 Histogram of central services performance



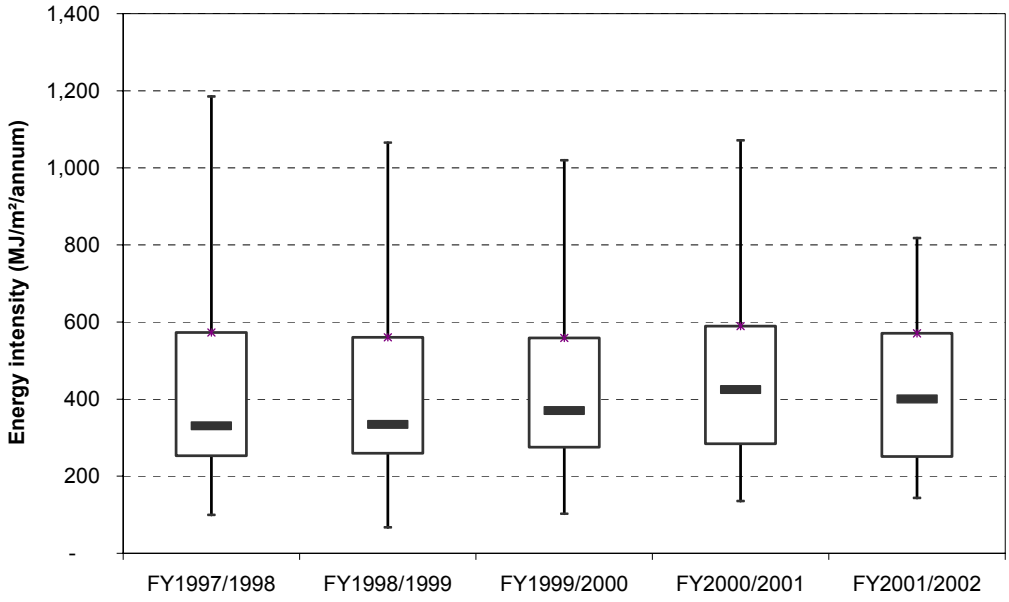
Possibly the poor result could be simply a matter of inadequate metering, but this should have been addressed after five years under the strong recommendations of the energy policy. Mostly, the poor performance has not been recognised and addressed. An option for a performance contract to improve the energy efficiency of the East Block building in Canberra has been under consideration for several years without any action being taken.

Leasing

Note that the Commonwealth energy policy requires that, as far as possible, lease agreements should ensure that all building Central Services energy consumption during normal hours should be the responsibility of the building owner. No costs associated with this consumption should be recoverable from tenants, either directly, or as an outgoing. This will ensure that building owners have an incentive to improve the efficiency of their building systems.

There is evidence to suggest that compliance with this requirement is not comprehensive. There is a marked difference between reported Tenant Light and Power floor area and the Central Services floor area, which has not diminished over the five years of reporting.

Figure 10 Box plot of Central Services energy intensity



Public Buildings

Description

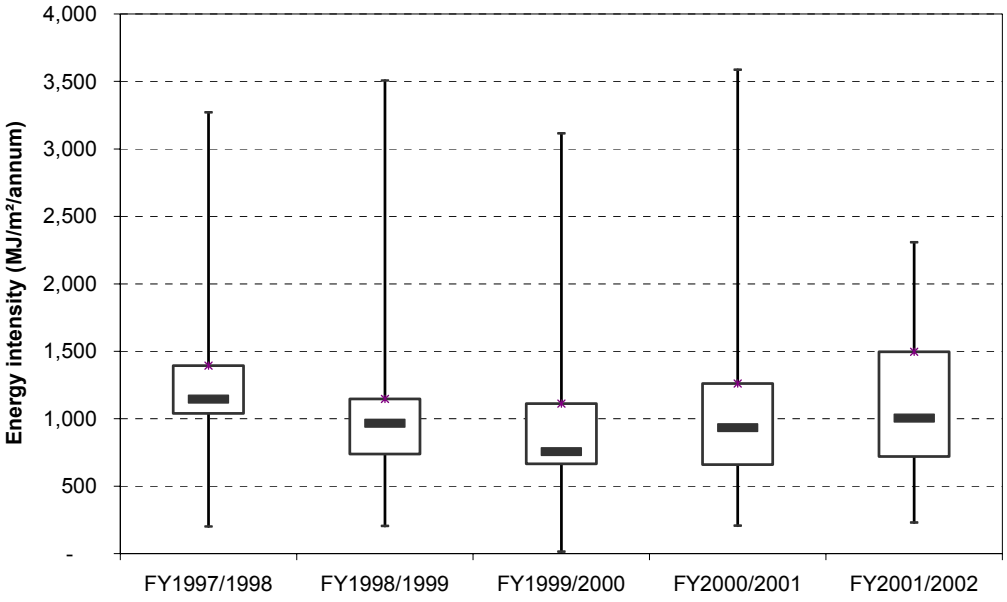
This category includes energy consumed in buildings whose primary function is to be visited by the public in significant numbers. Typical buildings in this category are public libraries, museums or art galleries. Frequently, there is a requirement to maintain close control of internal environmental conditions on a 24-hour basis in these buildings.

The key indicator in this category is MJ/m^2/annum. No target has been set in this category because these buildings tend to be individual in their operational requirements.

Discussion

The calculated energy intensity of 1,176 MJ/m^2 is slightly higher than that reported last year.

Figure 11 Box plot of Public Buildings energy intensity



Law Courts

Description

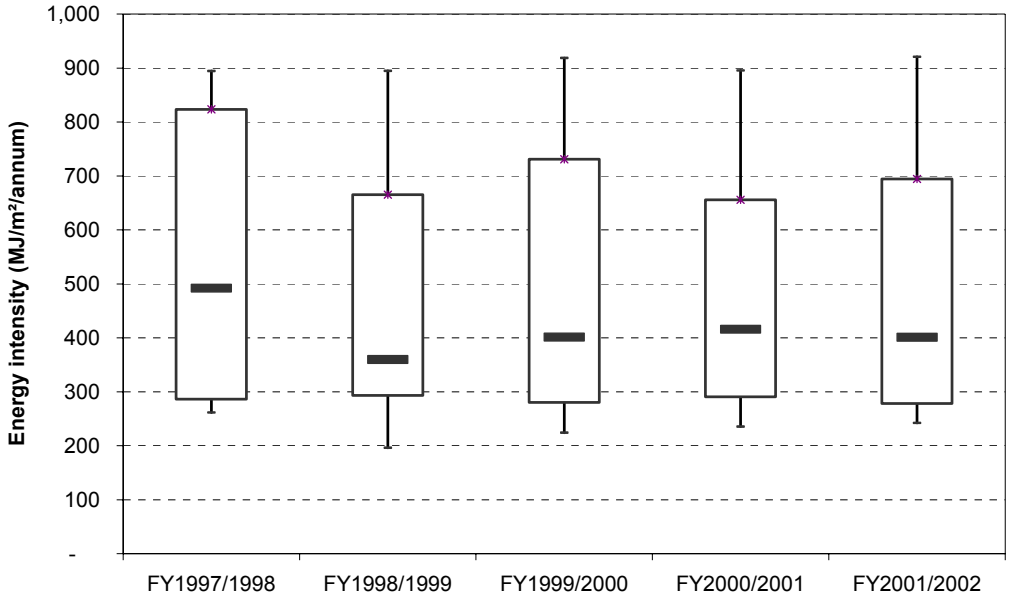
The Law Courts category includes all types of court facilities, whether a relatively small space in a larger building or a specialised building. No performance target applies to this category because of the diverse nature of the facilities

The key indicator in this category is MJ/m²/annum.

Discussion

The average energy intensity is now 595 MJ/m², up 4% on last year (noting that the box plot shows the median and not the average).

Figure 12 Box plot of Law Courts energy intensity



Climate Controlled Stores

Description

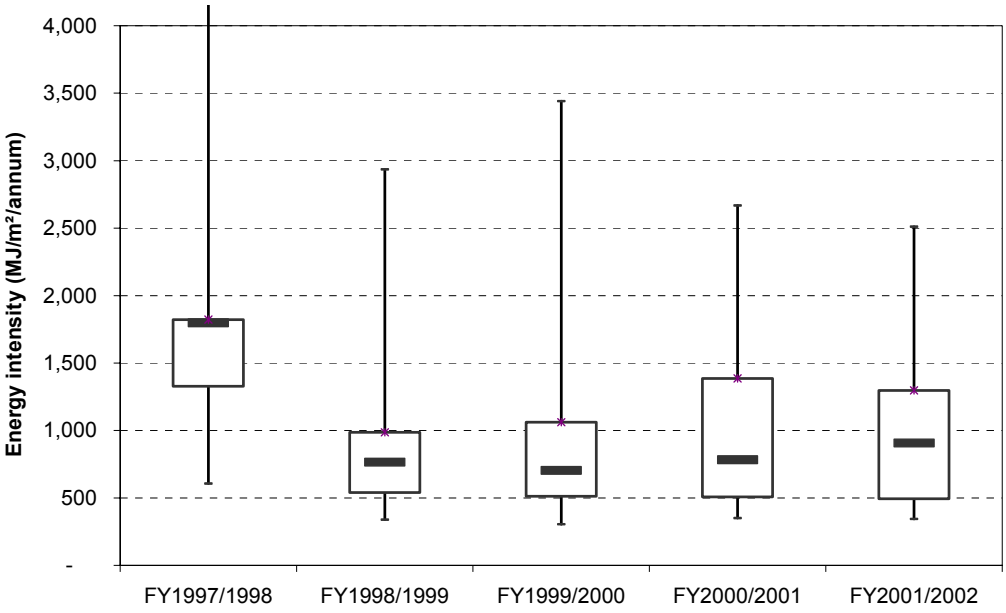
Climate Controlled Stores require close control of internal environmental conditions on a 24-hour basis to maintain the quality of the goods being stored. While cool stores and cold stores fit into this category, these buildings are more typically maintained within a tightly controlled range around 20°C and 50% relative humidity and generally have fairly large areas and low occupancy levels. Buildings in this category could be archives or storage repositories for libraries or art galleries, but not computer suites.

No target has been set in this category and the key indicator is MJ/m^2/annum.

Discussion

Energy consumption in this category has dropped by 9% this year compared with last year while energy intensity has risen slightly to 679 MJ/m^2. Partly this results from a reduction in the reported area of storage space but much has been achieved through improvement in energy efficiency by the biggest operator, the National Archives, which has offset energy intensity increases reported by a number of other operators. The performance of the National Archives was discussed in more detail on page 15 and a case study included on page 50.

Figure 13 Box plot of Climate Controlled Stores energy intensity



Laboratories

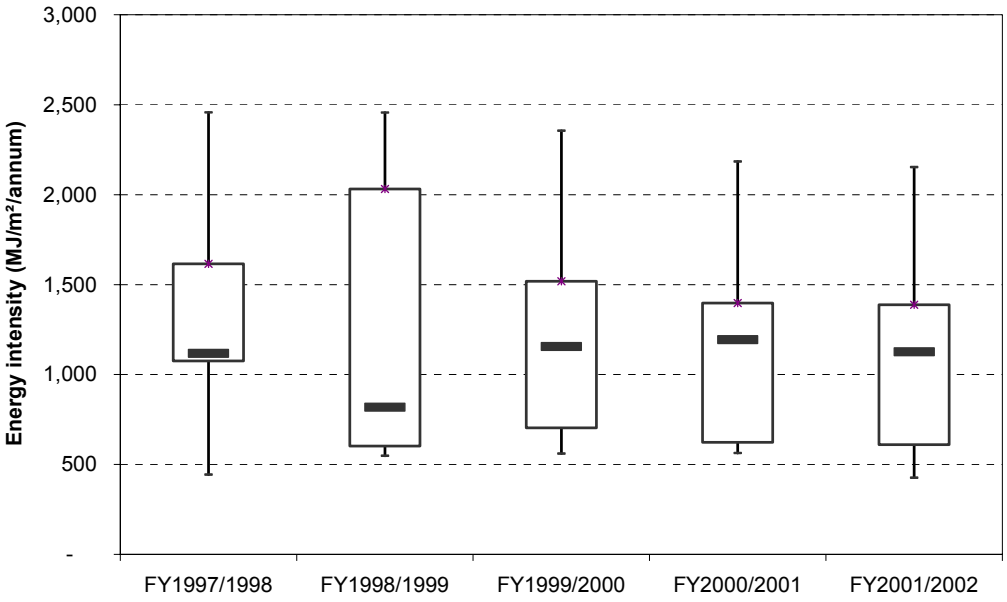
Description

This category covers all energy use in buildings that, as their primary function, are used as laboratories. For this type of facility, the key indicator is MJ/m^2/annum and again, no target has been set for the category.

Discussion

The average intensity of Laboratories was 987 MJ/m^2 in 2001/02, down 8% on the previous year.

Figure 14 Box plot of Laboratories energy intensity



Other Buildings

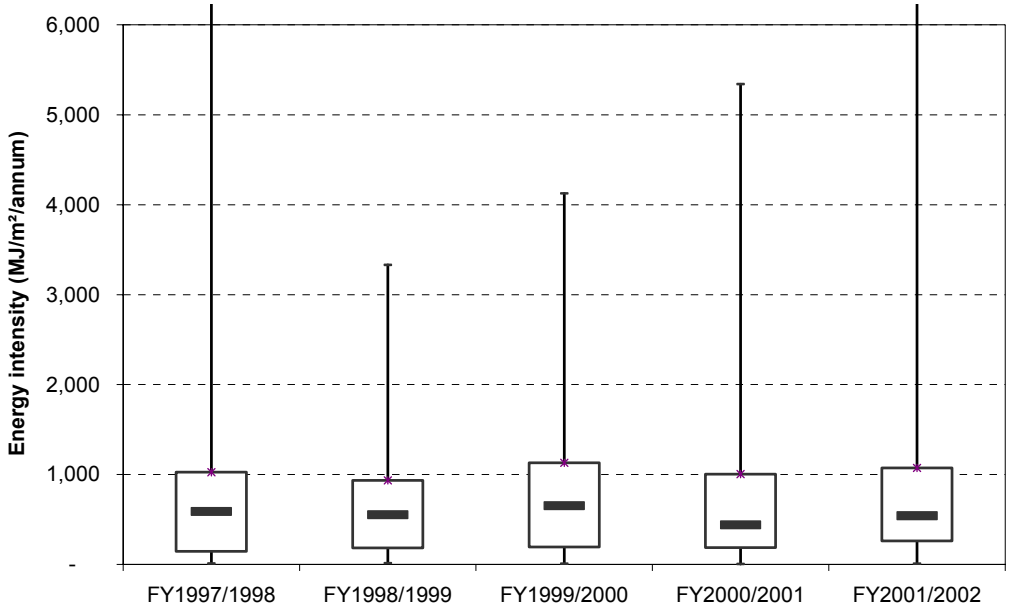
Description

The energy performance of buildings not reported elsewhere is included in the Other Buildings category. These buildings range from simple storage sheds through to radio transmitters. As a result, energy performances in this category cannot be compared in any meaningful way, and the key indicator of MJ/m²/annum is included more for interest than for any practical purpose.

Discussion

The energy intensity of Other Buildings rose by 8% to 926 MJ/m^2 over the past year.

Figure 15 Box plot of Other Buildings energy intensity



Passenger Vehicles

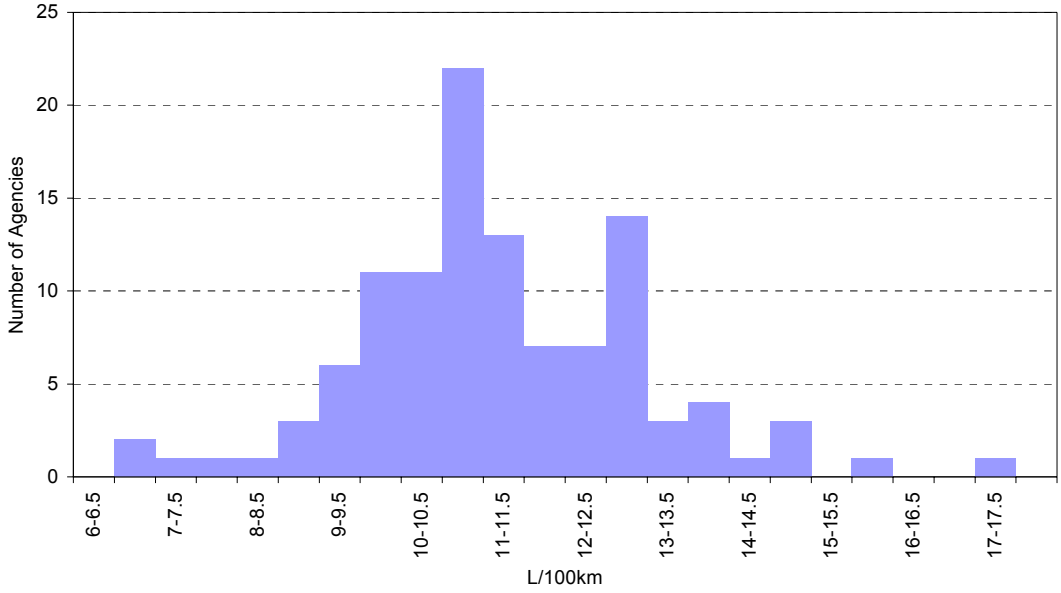
Description

This category includes the energy consumption of passenger cars, light commercial vehicles and mini buses. It includes the energy consumption of Senior Executive Service vehicles, but does not include short term hire cars or cars on novated leases.

The key indicator in this category is MJ/km. This indicator is used rather than the more common L/100km to account for the different fuels (petrol, diesel, LPG, natural gas) that are being aggregated in

the energy consumption data. Where reference is made to L/100km, it is a close approximation derived from the MJ/km by assuming that all fuel used is petrol.

Figure 16 Histogram of passenger vehicle performance

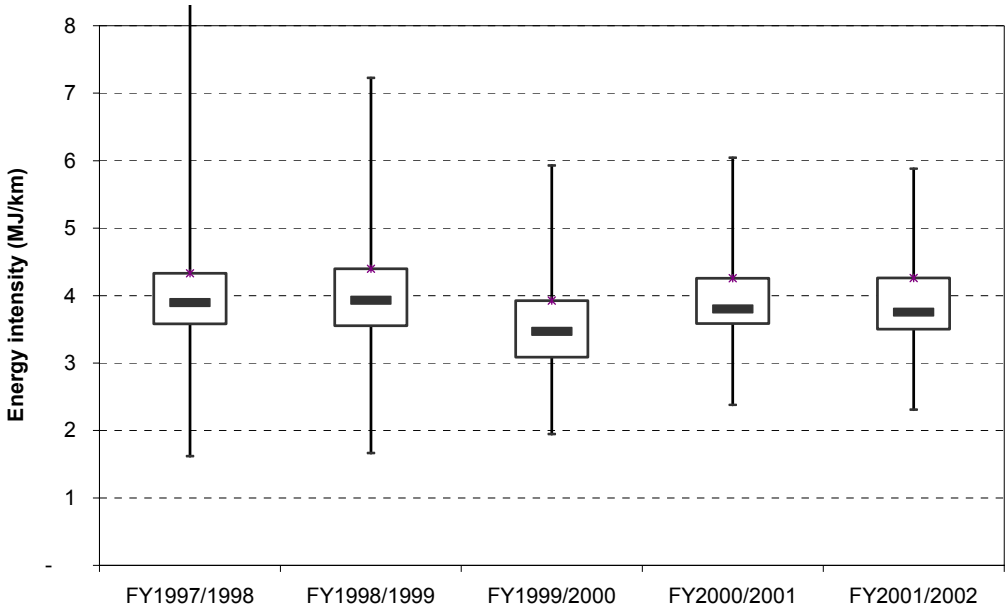


Discussion

The average fuel consumption of 3.9 MJ/km, or around 11.4 L/100km is effectively the same as that reported last year.

The distribution of Passenger Vehicle energy performance shown in Figure 16 indicates that most agencies are operating in the range 10-12 L/100km, or around 3.5-4 MJ/km.

Figure 17 Box plot of Passenger Vehicle energy intensity



Other Transport

Description

The energy consumption of all forms of transport, other than Passenger Vehicles, is reported in this category. Energy used for general public transport such as airlines, trains and buses is not included, but energy consumption of transport systems engaged exclusively for operational purposes is included. For example, energy consumption of aircraft used for surveying, and ships used for customs duty or transport, and similar activities are included.

Like the Other Buildings category, this category is so diverse as to render meaningless any comparison between agencies on an energy intensity basis. Moreover, there is no single normalising factor appropriate to this category, so no key indicator is defined.

Discussion

Other Transport energy consumption fell by nearly 6% to just under 535,000 GJ this year. As noted earlier, this reduction is likely to reflect the change in operational priorities for this year rather than a long-term trend.

Defence Establishments

Description

This category covers energy consumption of all buildings and facilities that are within established Defence bases. It does not include office buildings and stores outside bases that are reported under the appropriate category.

Defence Establishments have a target based on aggregate energy consumption, recognising that Defence bases, which may contain many buildings of varying types, typically have only a single meter at the front gate. The Department of Defence has installed, or is planning to install, metering systems to enable activity based energy reporting and monitoring of this category.

The target is set at 2.5 million GJ.

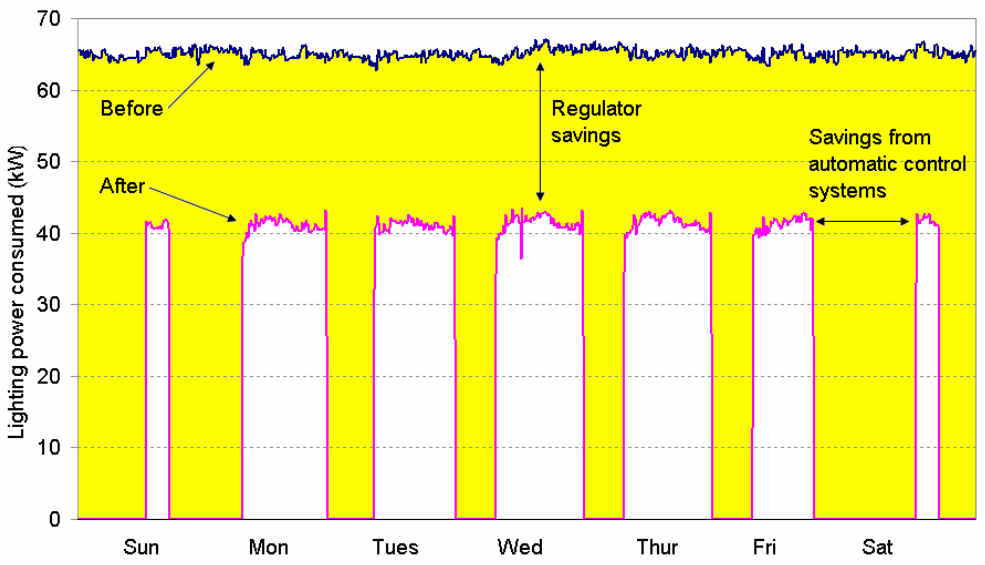
Performance against target

While still well over target, the 2,973,059 GJ reported under Defence Establishments is the second successive reduction in this category after successive increases in the previous reporting years. The reduction this year was 6% after a 3% reduction last year and leaves the Defence department with a fair chance of achieving its target.

Figure 18 shows an example of the level of savings that were gained from one project carried out under the Defence Energy Efficiency Program. The top line is the power consumption profile before remedial work and the lower line, the profile afterwards. The shaded area represents the savings, which are around 60% of

the original consumption. This is not typical of all defence buildings, but it was identified and addressed as part of their energy management program. All effective energy management programs must include techniques for identifying energy saving opportunities such as this.

Figure 18 Energy savings example[1]



Savings were achieved by using voltage regulator controllers to the electricity supply to the fluorescent fittings of the building, reducing the power flow. Power requirements dropped from around 65 kW to 40 kW. An automatic lighting control system was then installed to limit light operating hours to the hours of building occupancy. This reduced the power requirement to zero when the building was unoccupied.

[1] Graphic supplied by Energy Efficient Systems

Defence Operations

Description

This category covers the fuel used in aircraft, tanks, ships, vehicles etc for Defence Operations. Energy use is reported, but there are no targets.

Discussion

Defence Operations accounted for a total consumption of just over 14.5 million GJ.

Other Uses

Description

This category includes the energy consumption of facilities that do not fit into any of the other categories. Typical facilities reported under this category are sporting grounds, swimming pools, fountains, street lighting etc.

Like the Other Transport category, the Other Uses category is so diverse that there is no single appropriate normalising factor and no key indicator is used.

Discussion

The reported energy consumption of Other Uses decreased by 5% to just over 76,000 GJ this year.

Antarctic Bases

Description

This category includes all energy consumed in operating bases in Antarctica. It does not include the fuel used in supply ships, which has been included under Other Transport.

Overall consumption of just under 80,000 GJ is down slightly on last year.

Policy Administration

Government Operations Team – Australian Greenhouse Office

Introduction

The Government Operations Team (GOT) was established under the energy policy to provide advice and assistance to Commonwealth agencies in developing their energy management programs. The team was established first in the former Department of Administrative Services, moved to the Department of Finance and Administration and is currently located in the Australian Greenhouse Office. The roles and responsibilities of the team are described in clause 5.1 of the policy document Measures for Improving Energy Efficiency in Commonwealth Operations, a copy of which is included as Annex D to this report.

The following information was provided by the Government Operations Team as a summary of their activities during 2001-02 and their plans for the future.

Electricity procurement activities

GOT undertook a major electricity procurement exercise during the year. The final contract involved 53 Commonwealth agencies, 176 sites and 220 meters.

This open market procurement process demonstrated Commonwealth Government leadership by:

- full market testing involving all eligible retailers in the ACT for a significant load (approximately 176 GWh per annum);
- encouraging retailers to develop itemised and transparent bids separating out administrative and metering costs from the actual electricity price; and

- using a novel selection method to demonstrate market competition, i.e. an on-line negative price auction.

The result of the auction was:

- Savings of approximately $2 million per year compared with the previous contract;
- An increase in the amount of green energy procured to an average of 8%;
- A 100% upgrade of all electricity meters to NEM compliancy for approximately 50% of the price paid previously;
- An electricity contract that significantly reduces risk to the Commonwealth; and
- A significantly better service being provided in regard to energy use data and transparency of the costs of electricity.

It is estimated that the contract will result in saving almost 42,000 tonnes of greenhouse emissions over the 3 year contract. This equates to almost 14,000 tonnes of CO_2 emissions per annum or the equivalent of removing 1200 cars every year from Australia's roads.

GOT has also provided advice to the CSIRO, the High Court and Centrelink in regard to their electricity procurement projects. It is expected that GOT advice will result in greater levels of 'green energy' being procured.

Advisory Service

GOT undertook an intensive program of agency consultation in 2002 in an attempt to significantly reduce the number of agencies not achieving the tenant light and power energy intensity target (60% of reporting agencies in 2000-01). The 2001-02 report result shows a 12% improvement.

Since January 2002 GOT has visited and provided with written assessments, advice and follow-up to 56 agencies; 52 agencies have been contacted on a regular basis for the purposes of ascertaining electricity requirements, meter replacement, negotiating an electricity contract on their behalf and general contract management; and had over 100 agency representatives have attended the two highly successful Commonwealth Energy Manager's forums in 2002. This ground work is expected to further

reduce the percentage of agencies not achieving the tenant light and power target.

Commonwealth Energy Policy Products

GOT is in the process of assembling, revising and promoting afresh the following products:

1. Working Energy;
2. Post occupancy energy evaluation tool;
3. Residential building energy rating tool;
4. Energy performance contracting base documents;
5. Energy Audit documentation;
6. EPC better practice guide (a Department of Industry, Tourism and Resources (ITR) product);
7. Better Practice Guide: Energy Requirements in Commonwealth Leases (an ITR product);
8. Better Practice Guide: Electricity Procurement;
9. Green procurement guide (a joint AGO and EA product);
10. Best Practice Guide: Commonwealth Energy Policy (a joint ANAO, ITR and AGO product); and
11. Appliance Star rating.

Plans are also being developed for the following:

12. Commonwealth base lease better practice guide;
13. Commonwealth base building better practice guide;
14. ESD Building better practice guide;
15. EMS (ISO14001) better practice guide re. the energy component; and
16. A guide for the energy component of the Environmental Protection and Biodiversity Conservation Act 1999, section 516A, reporting requirements.

EDGAR

Description

Data for this report has been collected using the Energy Data Gathering And Reporting System, EDGAR, developed over the past year or so by the Department of Industry, Tourism and Resources in conjunction with software development firm One Planet Solutions.

EDGAR has evolved from the data gathering system that relied on a distributed electronic template that was filled in by reporting entities and returned by e-mail, or on disk. The data was imported into a central database for analysis and presentation. This was time consuming and introduced considerable scope for error. Considerable administrative effort was needed whenever the template was updated.

EDGAR follows the same general data structure principles as its predecessors, but is an on-line database application. It has a central web-hosted database that is accessed by the reporting entities through the web browsers on their computers. This means that there is no special software to distribute and any updates need only be done on the single database application.

Funding

A large portion of the development cost for EDGAR was provided through the National Greenhouse Strategy $10 million funding envelope provided in the Prime Minister's 1997 *Safeguarding the Future* statement. A key requirement of this funding provision was for the system to be made available to the states and territories for their use in developing a similar overview report of energy consumption in their own operations. The ultimate goal is a single structured overview of the energy performance of all Australian governments. New South Wales, Victoria, South Australia and Western Australia are already active users of the system, indicating that it is well on its way towards meeting that goal.

Environmental data

EDGAR is not limited to energy data. The development was conscious of a growing need for environmental as well as energy reporting and consequently the system includes capability for gathering data on water consumption, waste to landfill and just about every combination for reporting greenhouse emissions.

Case Studies

Introduction

Each year, a number of agencies are invited to submit case studies of successful energy management outcomes. Some of the more successful agencies could provide one or more such stories every year, but every attempt is made to acknowledge the performance of different agencies. This year, some agencies were invited to submit case studies but declined for a number if reasons including wanting to wait for more detailed information. As a result, the number of case studies this year is few but this does not in any way reflect the success rate of energy management initiatives.

One of the case studies is provided by Stockland, a private sector building owner, with a significant portfolio of buildings occupied by Commonwealth tenants. Their story is an important illustration of the need for building owners and tenants to work together to achieve the best possible energy management outcomes for all stakeholders.

These case studies are included, as provided by the relevant agency, with only a light edit to maintain consistency of style with the rest of the report.

Smart metering installation in Edmund Barton Building

The Edmund Barton Building on Kings Avenue, Barton ACT is owned by Stockland. The net lettable area of the building is 46,000 square metres with the principal tenant being the Department of Agriculture, Fisheries and Forestry - Australia. Other tenants include the Australian Public Service Commission, the Department of Health and Ageing and the Australian Greenhouse Office.

The building was constructed by the Commonwealth in the mid 1970's with total electricity usage measured by a set of kWh meters monitoring the building electricity supply from 3 supply sub-stations and encompassing 11 incoming supplies. The building was

sold by the Commonwealth in 1999 with a lease condition requiring the Lessor to install separate metering.

Initial investigations into the provision of traditional metering were discouraging. The architectural core/wing configuration of the building over six levels is unique and required that 72 electrical distribution boards be metered to adequately separate tenant and house power consumption. In addition, a further 40 meters were required to monitor specific basement activities, common area light and power, mechanical services and lift power consumption bringing the total requirement to 110 meters.

Stockland went to the marketplace to source a suitable system which fulfilled its lease obligations, and provided the tenants with accurate billing detail, as well as providing value-added initiatives such as energy monitoring, management and reporting functions. A further requirement was that the installation of the system was to cause minimum interruption to the operation of the building and to the business of the tenants.

The system selected to meet all of these requirements was the SM 3000 Smart Metering System, supplied and commissioned by EP&T Energy. The system basically consists of contestability rated measuring devices connected to an electronic meter that provides data to a memory module. The memory module is connected to a head-end computer. The computer manages the data to provide reports on energy management, engineering, Greenhouse Emissions and billing.

Installation of the system over a 3 month period has been managed by Asset Services who are the building's Facility Manager. The system has now been commissioned and is expected to commence live operation from 1st December, 2002.

Both Stockland and its tenants are looking forward to utilising the System to provide:

- immediate and accurate information on energy usage and cost;
- identification of tenant energy use patterns and areas of potential energy reductions and savings to enable preparation of strategies for energy reduction;
- identification of energy use patterns in base building operations to enable strategies for energy use reduction.

To maximise the System's functionality, Stockland has commissioned Asset Services to carry out a detailed audit of the

base building's energy usage to enable preparation of an energy management strategy.

Stockland acknowledges the valuable contributions of the department of Agriculture, Fisheries and Forestry-Australia, the Australian Public Service Commission, EP&T Energy and Asset Services and the cooperative approach by all parties in ensuring the successful implementation of the system and looks forward to continuing the team approach. We are looking at achieving an overall reduction in energy consumption of 10% as a first stage target, with further reductions following as audits based on acquired information identify new opportunities. Stockland is also introducing Smart Metering into other buildings occupied by government tenants within its Canberra portfolio.

National Archives of Australia - holding on to our history

Holding on to our history – that's what the National Archives of Australia does. We care for valuable Commonwealth government records and make them available for present and future generations to use. The longevity of these records depends upon storage under proper and stable environmental conditions.

What are the options for a National Archives' property manager to balance the imperatives of maintaining optimum conditions for climate controlled storage on a 24 hours per day/7 days per week basis and still be able to produce energy savings and reduction in greenhouse gas emissions at the same time? Chris Lowger, and his facilities management team at the largest of the National Archives' repositories at Chester Hill, NSW have shown that it can be done. They have produced savings of over $1m on gas and electricity costs over a ten-year period and 46% reduction in greenhouse gas emissions - well in excess of government targets, over the same period (Whole of Government Energy Report, 2001-02). Their efforts have been instrumental in ensuring that our priceless heritage will survive for future generations.

Chester Hill Repository currently holds about 150 shelf kilometres of valuable Commonwealth records. This equates to approximately 23.7 million items which include lots of those easily recognised public service files, but also significant holdings of photographs,

posters, maps, architectural drawings, films, playscripts, musical scores and sound recordings. All of these records are vulnerable to disintegration and destruction unless stored and housed in the optimum environmental conditions as set out in international standards. A specialised facility of this nature also has many unique fire safety, OH&S and security aspects.

Chris Lowger has been employed by National Archives since March 1973 and in the early 1990's became responsible for the facilities management at Chester Hill Repository. At this time Chris took it on himself to analyse our energy usage patterns and realised that flattening energy consumption and minimising 'spikes' in usage, could reduce electricity costs substantially. Using innovative solutions to radically change the way the Chester Hill air conditioning system was originally designed to function, Chris undertook a painstaking process of re-engineering the existing plant. Computerised building management systems with tailored software programs were blended with various mechanical components of the system to make them perform to Archives' requirements. This integrated approach was extended to the extensive modification of the Low Temperature Film Vault to provide an extremely stable environment that can be run for reasonable cost.

Some examples of other specifically designed strategies developed by Chris and the facilities management team are:

- A demand ventilation air conditioning system, which involves the supply of outside air on a needs basis (when staff are present), for maintaining high quality indoor air.
- The development of an electronic expansion valve to produce the low temperatures required for the storage of film in the film vault at Chester Hill. This type of valve was not commercially available at the time.
- Computerised Building Management Systems installed at all National Archives repositories and then networked nationally.
- Lighting control systems designed and installed at Chester Hill and other NAA repositories to produce energy savings and operating efficiencies.
- Reconfiguration of storage space to compartmentalise repository areas combined with exhaust ventilation and alarms to contain and minimise fire risk and possible damage to records.

- Reduction in the stress placed on air conditioning plant by levelling out the load through improved techniques and minor modifications not previously considered by 'technical experts' at the time of installation. This has also reduced maintenance costs dramatically.

Through a high standard of commitment and dedication to the management of archival facilities, Chris has earned an enviable reputation resulting in a steady increase in agencies outside National Archives seeking his professional guidance. He has assisted the National Library in the "Cellulose Acetate Project" to best manage their deteriorating film collection. Chris has also assisted Ryde City Council, The Reserve Bank of Australia, TVNZ and the ABC with their vault storage of film, tape & documents.

The significance and value of Chris Lowger's contribution is well recognised throughout the National Archives and the archival profession. His firm commitment to best practice in all aspects of facility management has resulted in significant benefits to the long term preservation of the National Archives' valuable collection on behalf of all Australians.

Department of Immigration and Multicultural and Indigenous Affairs – new building project

The Department of Immigration and Multicultural and Indigenous Affairs entered into a 15 year pre-commitment lease in December 2001 for a new head office building in Belconnen. The new building replaces the existing rental space DIMIA occupies in the Benjamin Offices complex.

As the sole tenant of this "purpose constructed building" DIMIA sought and gained significant influence in its design. Bovis Lend Lease (BLL) was engaged by DIMIA for an integrated fit-out to run concurrent with the building's construction.

From the outset, energy efficiency was one of the key requirements DIMIA demanded in the building's design. The Department was conscious of the environmental and cost benefits that will arise from the energy efficient operation of this building and applied the stringent performance standards of the Commonwealth Energy Policy to the development contract.

BLL put the various design options through a building performance thermal modelling program to ensure that the building would be capable of meeting the energy standards. Early modelling runs pointed to weaknesses in the design with respect to the proposed lighting system and also highlighted the impact of tenant power on overall building performance.

A substantial upgrade to the lighting system was adopted to address the first issue. The final system was based on single lamp light fittings using high performance T8 tri-phosphor lamps and electronic ballasts. The installed power density of office lighting will be around 8 W/m² instead of the 14 W/m² originally proposed and will save the department around $75,000 per year in running costs for the lighting.

To further consolidate these savings, the department chose to install a lighting control system. Based on the Clipsal C-bus system, the lighting control system will ensure that lights are used only where and when they are required. The control system is designed to avoid the disruptive on/off operation often associated with lighting control systems, thereby maximising staff productivity.

To reduce tenant power, and its adverse impact on other building systems, the department decided to switch from conventional cathode ray tube computer monitors to flat panel liquid crystal display monitors. These LCD monitors typically use only 30 percent of the power consumption of the CRT monitors that they replace and bring many other benefits. They provide a sharper image, are far less susceptible to glare and they occupy significantly less desk space than the CRT monitors.

As a guarantee that the expected energy performance is delivered, the department will install an energy metering system that will measure the tenant light and power consumption on each floor and in the main computer suite. By monitoring energy consumption profiles and trends, the department will be able to react quickly to any adverse performance before it accrues into a major consumption and cost increase.

The department has examined all of its energy efficiency options in this development and adopted all those that are cost effective and will benefit from annual energy cost savings of over $200,000 on tenant light and power alone. This does not count the added benefits of better working conditions, higher staff productivity and lower maintenance costs.

Combined with the work being done by the building owner to ensure that the building services meet required performance standards and with the design targeting energy efficiency in its comprehensive environmental brief, it is expected that potential greenhouse emissions will fall by 60% compared with the space it currently occupies.

Attention to detail from the insulation of exterior walls to the thermal quality and efficiency of the double glazed windows, and positioning of the building, have all contributed to the outstanding results achieved.

The Department's new building team, along with BLL, has worked assiduously to achieve this outcome, ably assisted by DITR on a regular basis in a combined effort to meet the very high goals set for the building.

The new building sets an example for how to achieve good environmental outcomes that also bring financial benefits.