

Energy Use in the Australian Government's Operations

2003-2004

Industry, Communities & Energy Division

Australian Greenhouse Office

Department of Environment and Heritage

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Front:

Energy efficient plasma lights to illuminate the memorials along Anzac Parade in Canberra were installed in 2003, and were the first application of electromagnetically induced plasma lamps in a major street lighting installation. These lamps use 60 per cent less energy than the old carriageway floodlights.

Back (left to right):

1. Chillers at the Australian War Memorial are fitted with electronic expansion valves which improve running efficiency and thereby reduce energy usage.
2. Light wells in the John Gorton Building in Parkes, ACT provide natural light for workers, enhancing the working environment and reducing artificial lighting needs.
3. Variable speed drives, used with most electric motors at the Australian War Memorial, save energy, improve the power factor, and can prolong a motor's life. Significant savings are achieved as the Memorial's air conditioning plant operates continuously.
4. The Australian War Memorial monitors the power factor to reduce demand charges.

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Executive summary

The Australian Government's energy consumption and greenhouse gas emissions have declined significantly since the first year of reporting in 1997/98:

- energy consumption has fallen by 15%;
- greenhouse gas emissions have fallen by 11.5%;
- energy intensity or consumption has declined in nine of twelve end-use categories; and
- estimated annual energy costs have fallen by almost \$30 million.

Most of the reported improvement since 1997/98 is due to energy efficiency management initiatives.

In aggregate, the Australian Government continues to improve performance in its office accommodation. The Office-Tenant Light and Power performance target of 10,000 MJ/person, and an Office-Central Services performance target of 500 MJ/m² were set in 1997 to be met by 2002/03. These targets were exceeded in that year and have been further exceeded in 2003/04. Overall energy intensity declined in four of the eight end-use categories where intensities are defined as the key indicator of energy efficiency.

Government Operations energy performance for 2003/04 increased slightly by 0.45% in energy consumption and 1.4% in greenhouse gas emissions. This increase is mostly due to slight increases in energy consumption by a small number of government agencies such as Defence, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Customs Service that consume a high proportion of the energy used in Australian government operations.

The Department of Defence is the largest energy consumer with almost 45% of the total energy used in Australian Government's operations. In 2003/04, a small change in energy consumption at

Defence establishments¹ had a significant impact on the total energy consumption of government operations. Factors such as construction and operation of new buildings, installation of additional high energy using equipment, significant infrastructure upgrades, and an increase of almost 3% in its workforce have contributed to the increase.

Defence did, however, improve its overall energy performance, including Defence Operations², for the fourth consecutive year. In 2003/04, Defence has improved its energy performance for Office Tenant Light and Power and Office Central Services.

This report is compiled in accordance with the policy detailed in *Measures for Improving Energy Efficiency in Commonwealth Operations* announced by the Prime Minister in 1997. This policy is currently being reviewed to align with the Government's recent Energy White Paper, *Securing Australia's Energy Future*. The outcomes of the review will inform the Australian Greenhouse Office's development of a new energy policy for Government Operations.

¹ Defence Establishments: Energy used in all buildings and facilities that are within established Defence bases. It does not include office buildings and stores outside bases that are to be reported under the appropriate category.

² Defence Operations: Energy used in the operation of aircraft, tanks, ships, submarines, vehicles etc.

Introduction

This seventh annual report on energy use in the Australian Government's own operations is compiled in accordance with the policy detailed in *Measures for Improving Energy Efficiency in Commonwealth Operations* announced by the Prime Minister in November 1997. This policy is currently being reviewed to align with the Government's recent Energy White Paper, *Securing Australia's Energy Future*. The outcomes of the review will inform the Australian Greenhouse Office's development of a new energy policy for Government Operations.

Objectives

This report has two main objectives. The first is to present a simple picture of overall energy consumption and associated greenhouse gas emissions resulting from the activities of the Australian Government during the 2003/04 financial year. The second 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 Australian Government as a whole. This is presented for the current reporting year and with trends over the seven 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 such as the installation of energy efficient lighting, Energy Performance Contracting, Environmental Management System and Triple Bottom Line Reporting, undertaken during the year are then presented, followed by performance summaries for portfolios and agencies and then 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 to show 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, which set outcome based goals to be met by the end of the 2002/03 financial year, uses the reporting system to monitor progress toward those goals.

Administrative structures

Energy performance is reported for agencies as they were constituted at 30 June 2004. Where elements move from one agency to another, they carry with them the energy performance for the full financial year.

The process of adjusting for administrative changes is 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.

Responsibility

It is the responsibility of agencies to supply the data for inclusion in this report. Data checking and validation by both the Australian Greenhouse Office and the individual agencies follows before the report is finalised for tabling. While the Australian Greenhouse Office makes every effort 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.

Agencies are required to enter and submit data by October 31 each year to the online Energy Data Gathering and Reporting (EDGAR) system, which is administered by the Australian Greenhouse Office. The reporting system provides initial validation and raises anomalies if data varies significantly from the previous year, or if energy intensities are outside the expected ranges of each end-use category. For example, any number entered, which is fifteen per cent higher or lower than the same data point in the previous reporting period will trigger an anomaly. Also, expected intensity ranges are set for all end-use categories where meaningful intensities can be calculated. For example, in the Tenant Light and Power category where

there is a 10,000MJ/person performance target, it is expected that all agencies will report in the range of 4,000 to 20,000MJ/person.

Large data changes do not necessarily mean that the data is wrong. The functions of the agency may have changed due to changing government priorities. This may have caused increases or decreases in staff, or acquisition or disposal of buildings. There may be many valid reasons why reported intensities are not in line with expectations. These might include a higher than average requirement for public space or a concentration of energy intensive computer equipment.

Before they can submit data, agencies must acknowledge all anomalies raised by the reporting system. In doing this, they confirm that data anomalies are for valid reasons and not due to data error.

Submitted data is then reviewed by the Australian Greenhouse Office and a note sent back to each agency drawing attention to any obvious errors and omissions. In this note, agencies are encouraged to provide reasons in their comments for any remaining data anomalies and are invited to undertake a final review of their data before confirming it as a full and accurate statement of their energy performance for the year.

Annex B provides a detailed summary of agency performance since the first reporting period in 1997/98. Each agency's comments on its own performance during the current reporting period are included in this annex. 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 and energy efficiency

Measuring energy efficiency between organisations as diverse as Australian Government agencies is not simple. Tracking changes in the overall energy consumption of an agency without accounting for the underlying activity levels of that agency would give no indication of its 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 without necessarily being less energy efficient.

Energy intensity

The concept of normalised energy consumption, or energy intensity, is included in *Measures for Improving Energy Efficiency in Commonwealth Operation*³. 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/m² or MJ/km. (MJ is an abbreviation for Megajoule, a unit of energy consumption, person is an occupant of the space, m² represents a square metre of building space and km is the distance travelled by a vehicle in kilometres).

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 results from this approach, 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 m² 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/m²

End-use categories

To address the complexity involved in comparing energy efficiency of different activities twelve end-use categories are included in *Measures for Improving Energy Efficiency in Commonwealth Operations*. 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.

³ Refer to *3.1.6 Energy Intensity*, Annex D – Measures for Improving Energy Efficiency in Commonwealth Operation.

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 allow ready comparisons between agencies' performance. In other less homogeneous 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.

Definitions of each end-use category and discussion of their performance in 2003/04 commences on page 29 of this report.

Public reporting benefits

Monitoring and reporting is a basic requirement under any energy efficiency or greenhouse abatement program. It demonstrates, at a minimum, that organisations keep records of their energy consumption and property holdings, and ideally that they have an energy management plan in place. Those that are able to measure and monitor their energy use are better able to manage their consumption and integrate commitment to improved energy efficiency into their day-to-day operations. If approached in this way, a reporting requirement is straightforward and does not impose an additional burden.

Regular public reporting of performance provides a number of benefits:

Increased awareness of energy and greenhouse issues

Energy efficiency and greenhouse issues are often distant from core business for most organisations and are generally given relatively less attention. Regular reporting focuses some attention in this area. One comment from an Australian Government agency was that reporting "focuses the mind" and savings opportunities are often identified and realised as a result.

Measures relative performance

A consistent reporting basis that covers energy or greenhouse intensities (such as MJ/m² or tonnes/unit production) allows an organisation to compare its performance with others operating

similar facilities. Such comparisons give indications of possible energy or greenhouse saving opportunities and provide the impetus for energy manager networking and cross fertilisation of ideas.

Provides a benchmarking tool

With sufficient normalised data over a period of time, benchmarks of good energy and greenhouse performance will become apparent. These will provide a ready performance indicator for comparison and a goal for energy and greenhouse management programs.

Tracks changes over time

Regular reporting will track changes in intensity over time and will provide a good indication of the effectiveness of existing management programs. The shorter the period between reports, the more quickly management programs can be adjusted to maximise the performance. Annual reporting is probably sufficient for external performance monitoring but at least monthly internal monitoring and reporting is preferred for an effective energy management program.

Identifies high intensity areas

Policy and management response can be better directed towards those activities that have the highest energy consumption or greenhouse emissions. A reporting system can provide the basis for making informed decisions, and effectively deploying resources.

Transparency encourages improvement

The knowledge that outcomes of energy and environmental management practices will be made available to public scrutiny encourages greater focus. Such transparency encourages both improved performance and improved reporting of that performance.

Public performance reporting also identifies opportunities for energy services companies by allowing them to focus on poorer performing organisations.

Performance outcomes

Energy use and greenhouse emissions

Total reported energy consumption of the Australian Government, excluding Defence Operations, for 2003/2004 was 8,198,291 GJ with associated greenhouse emissions of 1,587,867 tonnes of CO₂ equivalent. To give this some perspective, these greenhouse emissions are just less than half that of the entire ACT energy-related greenhouse emissions and are just under 0.5% of the total energy-related greenhouse emissions in Australia. Table 1 provides a summary of energy consumption and associated greenhouse emissions by end-use category.

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

End-use category	Energy use		Greenhouse emissions		
	GJ	% total	Tonnes	% total	kg/GJ
Climate Controlled Stores	50,010	0.61	9298	0.59	186
Antarctic Bases	67,134	0.82	4,696	0.30	70
Other Uses	84,797	1.03	13,429	0.85	158
Law Courts	100,033	1.22	23,049	1.45	230
Public Buildings	355,700	4.34	64,157	4.04	180
Other Transport	414,508	5.06	28,898	1.82	70
Office – Central Services	527,676	6.44	102,303	6.44	194
Other Buildings	665,652	8.12	154,275	9.72	232
Passenger Vehicles	777,505	9.48	51,370	3.21	66
Laboratories	957,218	11.68	179,681	11.32	188
Office – Tenant Light and Power	1,136,167	13.86	288,732	18.18	254
Defence Establishments	3,061,891	37.35	667,979	42.07	218
Total	8,198,291		1,587,867		194
Unreported Central Services	680,000	3.13	131,835	3.89	194
Defence Operations	12,822,450	58.94	893,248	34.00	70
Grand Total	21,700,741		2,612,950		120

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 480. National average coefficients introduce a degree of approximation to the calculation of greenhouse emissions and the assessment in this report is based on the assumption that the profile of energy consumption in the Australian 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 Operations⁴ is appended to Table 1 to complete the picture of total Australian Government energy consumption. Despite its significant contribution, defence operational fuel consumption does not fall within the ambit of the Australian Government 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. Consumption has continued to decline since then despite involvement in the Pacific and Iraq. 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. Consumption increased due to continuing state of alert following September 11 and the Bali bombing. Responses to Government priorities in 2003/04 resulting in increased energy consumption

⁴ Defence Operations: Energy used in the operation of aircraft, tanks, ships, submarines, vehicles etc.

included the Department of Defence's construction and operation of new buildings, installation of additional high energy using equipment, significant infrastructure upgrades, and increasing its workforce by almost 3%.

Another significant increase occurred because Customs container examination facilities in Sydney, Melbourne, Brisbane and Fremantle became fully operational. These facilities are part of a more comprehensive and integrated approach to sea cargo examination in Australia's major ports.

The CSIRO recorded increased electricity consumption with the construction of new sites at Newcastle and St Lucia and other building programs. These included new air-conditioned floor area, research plant and equipment.

There are many 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 Australian Government 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, therefore, is for office buildings that the Australian Government owns, or where the Australian Government, as a tenant, has agreed to assume responsibility for such consumption.

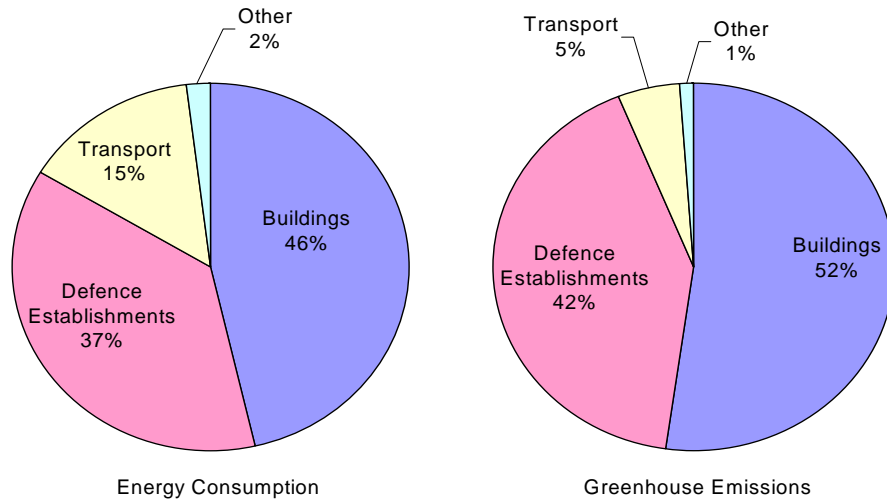
Nonetheless the policy requires that this consumption be estimated. Where building central services are reported, the rate of energy consumption is 446 MJ/m²/annum. If this figure is applied to the slightly more than 1.6 million square metres of unreported

space, then there is an estimated additional 680,000 GJ of energy consumption and 132,000 tonnes of greenhouse emissions that can be added to Australian Government 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.

Energy end-use

Transport fuels have much lower greenhouse intensity than electricity, which accounts for nearly 80% of non-transport energy use. In Australia most electricity is generated from coal which has a relatively high greenhouse intensity. This results in electricity having a greenhouse intensity around four times higher than the main primary fuels of natural gas and petrol.

Figure 1 shows the energy use and greenhouse emissions of four broad end-use groups. This figure shows how important building energy performance is in determining overall greenhouse emissions of the Australian Government. The energy consumption of both the Defence Establishments and the Other groups are also mostly building related, giving a strong indication of the need to apply policy focus on buildings, rather than transport operations. 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 all buildings and facilities that are within established Defence bases. It does not include office buildings and stores outside bases.

Energy use by agency

The goal of the energy policy is to reduce Australian Government 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 main focus of this report is on energy intensity.

Table 2 Energy use of the 20 highest energy using agencies

Agency	Total Energy Use	
	GJ	% of Total
Department of Defence	3,683,722	44.93
Commonwealth Scientific and Industrial Research Organisation	769,940	9.39
Centrelink	449,116	5.48
Australian Taxation Office	329,843	4.02
Australian Antarctic Division	299,573	3.65
Australian Broadcasting Corporation	235,011	2.87
Australian Customs Service	234,206	2.86
Australian Federal Police	176,842	2.16
Department of Parliamentary Services	157,232	1.92
Australian Nuclear Science & Technology Organisation	105,776	1.29
Health Insurance Commission	96,190	1.17
Commonwealth Law Courts	73,162	0.89
Australian Sports Commission	68,309	0.83
Department of Foreign Affairs and Trade	58,439	0.71
National Gallery of Australia	57,654	0.70
Australian Quarantine & Inspection Service	51,660	0.63
Property Group	51,488	0.63
Australian War Memorial	47,945	0.58
Australian Institute of Marine Science	46,102	0.56
Director of National Parks	44,595	0.54
Total for top 20 agencies	7,036,804	85.8%
Total for the Australian Government	8,198,291	

While the focus on energy intensity is important, the greatest opportunities for achieving significant reductions in energy consumption tend to be with the largest energy consumers. Table 2 lists the 20 highest energy-using agencies, which together account for 85.8% of total Australian Government energy consumption. Full details of the energy performance of all energy reporting agencies are included in the agency data sheets in Annex B.

The Department of Defence remains the biggest energy consumer with almost 45% of the total energy used in the Australian Government's operations. Consequently a small change in its energy consumption has a significant effect on the total consumption. The Department reported an increase of 1.7% in 2003/04 (excluding Defence Operations) which increased the Australian Government's total consumption by 0.76%. Factors such as construction and operation of new buildings, installation of additional high energy using equipment, significant infrastructure upgrades, and an increase of almost 3% in its workforce have contributed to the increase (see also the Department's comments in Annex B – Agency performance data). The second biggest energy consumer is the CSIRO, which used 9.4% of the total energy used in the Australian Government's operations. The CSIRO reported an increase of almost 4% during 2003/04 which accounted for 0.36% of the Australian Government's total consumption.

The contribution of smaller agencies also should not be underestimated. In 2002/03 the Superannuation Complaints Tribunal had just over thirty staff but reported a 7% reduction in its energy consumption, by making energy efficiency a management priority. In 2003/04 a continuing commitment by the Tribunal to more efficient use of energy has resulted in a further reduction in consumption.

Energy use by fuel type

This section examines the relative contribution of different energy types to overall Australian Government energy consumption and greenhouse emissions. Defence operational fuels are included in the overall total of Australian Government 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)

Fuel type	Energy use		Greenhouse emissions	
	GJ	% total	Tonnes	% total
Heating Oil/Fuel Oil	529	0.00	37	0.00
Special Antarctic Blend	66,843	0.32	4,679	0.19
AVGAS	77,703	0.37	5,284	0.21
Greenpower	85,449	0.41	-	-
LPG	95,968	0.46	5,700	0.23
Gas Oil	204,402	0.97	14,308	0.58
Petrol	880,821	4.19	58,134	2.34
Natural Gas	1,249,770	5.95	67,987	2.74
Automotive Diesel	5,360,627	25.50	373,636	15.06
Electricity	5,493,142	26.13	1,428,217	57.56
Aviation Turbine Fuel	7,505,487	35.71	523,132	21.08
Total	21,020,741		2,481,115	

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

Fuel type	Energy use		Greenhouse emissions	
	GJ	% total	Tonnes	% total
Heating Oil/Fuel Oil	529	0.01	37	0.00
AVGAS	1,013	0.01	69	0.00
Aviation Turbine Fuel	18,916	0.23	1,318	0.08
Special Antarctic Blend	66,843	0.82	4,679	0.29
Greenpower	85,449	1.04	-	-
LPG	95,968	1.17	5,700	0.36
Gas Oil	204,402	2.49	14,308	0.90
Automotive Diesel	219,088	2.67	15,270	0.96
Petrol	763,629	9.31	50,400	3.17
Natural Gas	1,249,770	15.24	67,987	4.28
Electricity	5,492,685	67.00	1,428,098	89.94
Total	8,198,291		1,587,867	

Table 5 shows fuel use for the general transport operations 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

Fuel type	Energy use			Greenhouse emissions	
	GJ	Units	% total	Tonnes	% total
AVGAS	1,013	30,615	0.09	69	0.09
LPG	4,843	183,848	0.41	288	0.36
Aviation Turbine Fuel	18,915	514,000	1.59	1,318	1.64
Automotive Diesel	199,320	5,163,733	16.72	13,893	17.31
Gas Oil	204,402	4,573	17.15	14,308	17.83
Petrol	763,519	22,325,119	64.05	50,392	62.78
Total	1,192,013			80,268	

Table 6 Passenger vehicle energy consumption and greenhouse gas emissions

Fuel type	Energy use			Greenhouse emissions	
	GJ	Units	% total	Tonnes	% total
LPG	4,600	178,970	0.59	273	0.53
Automotive Diesel	22,898	593,216	2.95	1,596	3.11
Petrol	750,008	21,930,046	96.46	49,501	96.36
Total	777,505			51,370	

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

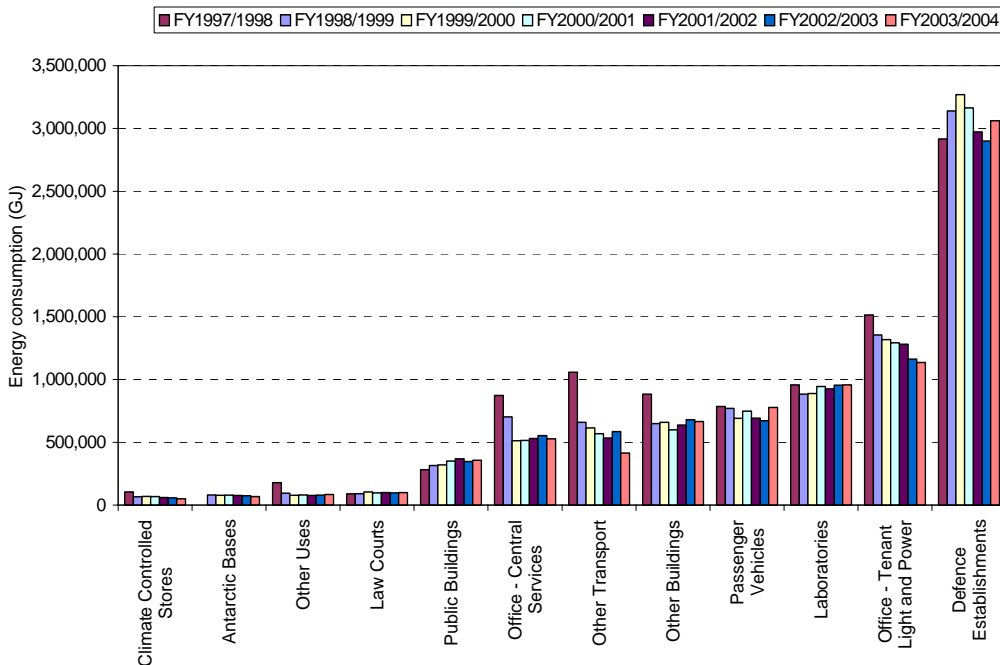
Figure 2 illustrates the changes in total energy consumption by end-use category over the full period of reporting to date. These results are presented numerically in Table 7.

In the past 12 months total energy consumption increased by 0.45%. A contributing factor to this increase was the increase in the Defence Establishments end-use category of 162,686 GJ, or 1.98% of the total energy consumption reported.

There has been a total reduction of 15% over the six years since the first report of 1997/98. While activity changes may have caused some of this total reduction, much can be directly attributed to improvements in energy intensity, indicating that the Australian Government is becoming more efficient in its energy use.

In the eight energy end-use categories where meaningful energy intensities can be calculated, total consumption declined by over 16% since 1997/98.

Figure 2 Energy consumption of each end-use category



In the end-use categories of Other Transport, Defence Establishments, Antarctic Bases and Other Uses, those categories for which no meaningful energy intensity can be calculated, consumption declined by just over 12% over the same period.

A lot of this reduction came from activity changes in the Other Transport category. Activities, such as land and sea geological surveys are less of a priority now than in the earlier years and associated energy consumption has declined accordingly. Overall, the reported reductions in energy consumption have come almost entirely from energy efficiency improvements.

The implementation of environmental management systems and membership of the Greenhouse Challenge program have been drivers towards this greater energy efficiency. Implementation of computer power management systems, improving efficiency of lighting systems and the introduction of lighting control systems, moving to more energy efficient premises and better monitoring and targeting systems are some of the vehicles by which agencies have achieved this improvement.

Table 7 End-use category energy consumption by financial year

End-use category	Energy use (GJ)						
	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Climate Controlled Stores	104,800	65,054	68,209	66,466	59,798	56,930	50,010
Antarctic Bases	-	79,644	77,806	78,843	76,110	74,599	67,134
Other Uses	178,365	94,306	77,065	80,513	76,256	78,967	84,797
Law Courts	88,829	90,327	104,826	96,013	99,857	96,297	100,033
Public Buildings	282,285	316,145	319,187	350,926	368,009	346,861	355,700
Office - Central Services	874,072	702,089	513,346	516,302	530,352	553,081	527,676
Other Transport	1,057,525	658,713	615,702	567,955	534,597	585,758	414,508
Other Buildings	884,262	648,327	658,956	599,286	637,431	679,570	665,652
Passenger Vehicles	786,244	769,949	690,830	748,216	693,068	672,648	777,505
Laboratories	957,326	883,866	887,974	945,761	926,387	955,485	957,218
Office – Tenant Light and Power	1,514,954	1,355,781	1,317,335	1,292,324	1,281,307	1,162,166	1,136,167
Defence Establishments	2,917,752	3,139,887	3,268,480	3,164,335	2,973,059	2,899,206	3,061,891
Total	9,646,413	8,804,088	8,599,715	8,506,940	8,256,230	8,161,567	8,198,291
Year-on-year change	0.00%	-8.73%	-2.32%	-1.08%	-2.95%	-1.15%	0.45%
Progressive change	0.00%	-8.73%	-10.85%	-11.81%	-14.41%	-15.39%	-15.01%

Passenger vehicles

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 data for reporting under this category. This creates significant margin for error. Very few agencies have adopted alternative approaches to data collection. A number of Agencies have reported vehicle data provided by LeasePlan which was based on the Fringe Benefits Tax year which runs from April to March. This is included in this report as if it was for the financial year.

In early 2004, a target that rates the fleet mix rather than the fleet performance was introduced. This target was based on a draft green vehicle guide that rates the environmental performance of individual vehicles. Details of this green vehicle guide target can be found on page 27.

Significant moves

Energy use in the Other Transport category fell by 29.2% this year after increasing by 9.6% last year. Consumption in this category is dominated by the operation of ocean going vessels by agencies like the Australian Customs Service, the Australian Institute of Marine Science and the Australian Antarctic Division. A single voyage more or less in any reporting period can result in significant changes, so overall consumption levels in this category tend to be quite volatile. However most of the decline this year was caused by the Department of Defence reallocating 185,290 GJ of petrol consumption from Other Transport to the Passenger Vehicles and Defence Operations categories. The Department confirms that the reallocation was undertaken to reflect more accurate usage of their petrol vehicles.

Consumption in the Tenant Light and Power category fell by 2.4% overall, driven mostly by further improvements in the energy intensity of operations. Better metering and more accurate recording of data also contributed.

There was a significant improvement in the efficiency of Office – Central Services this year and this resulted in a 4.6% reduction in energy consumption for the category.

Greenhouse emissions by end-use category

Overall, a small increase in energy consumption results in an increase in greenhouse gas emissions. The relationship is not linear, however, as the level of greenhouse emissions also depends on the fuel mix.

Table 8 End-use category greenhouse emissions by financial year

End-use category	Greenhouse emission (tonnes)						
	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Antarctic Bases	-	5,570	5,438	5,514	5,323	5,216	4,696
Climate Controlled Stores	22,248	12,718	12,777	13,239	11,484	10,411	9,298
Other Uses	22,569	13,665	13,238	14,177	12,763	12,072	13,429
Law Courts	21,691	21,879	22,628	21,910	22,405	21,877	23,049
Other Transport	72,539	44,813	42,024	38,836	36,613	40,155	28,898
Passenger Vehicles	51,980	51,017	45,747	49,490	45,880	44,487	51,370
Public Buildings	49,731	55,164	55,009	59,735	65,592	62,443	64,157
Office - Central Services	156,308	137,979	95,864	95,539	96,306	108,208	102,303
Other Buildings	214,807	145,607	143,719	133,464	143,437	155,878	154,275
Laboratories	187,966	169,387	171,032	183,951	181,715	184,839	179,681
Office - Tenant Light and Power	392,943	349,138	340,338	333,752	329,868	294,070	288,732
Defence Establishments	600,645	641,473	673,575	651,877	626,276	625,941	667,979
Total	1,793,428	1,648,410	1,621,390	1,601,483	1,577,662	1,565,596	1,587,867
Year-on-year change	0.00%	-8.09%	-1.64%	-1.23%	-1.49%	-0.76%	1.42%
Progressive change	0.00%	-8.09%	-9.59%	-10.70%	-12.03%	-12.70%	-11.46%

There was an overall increase in energy use of 0.45% and electricity consumption increased by 1.8%. Electricity as a proportion of the total energy consumption rose, and since electricity is responsible for higher greenhouse emissions than other fuels, total greenhouse emissions increased by 1.4%. However, the total greenhouse gas reduction since the first year of reporting in 1997/98 is now 11.5%. Table 8 shows the trends in greenhouse emissions.

Table 9 Energy consumption by source for each financial year

Fuel type	Energy use (GJ)						
	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Heating Oil/Fuel Oil	91,799	2,615	1,994	824	1,126	424	529
AVGAS	6,047	5,694	1,439	1,716	1,544	639	1,013
Aviation Turbine Fuel	10,253	7,986	9,659	6,845	6,204	19,337	18,916
Greenpower	-	1,714	23,208	34,539	37,707	105,928	85,449
Special Antarctic Blend	-	79,148	76,974	78,343	75,669	74,060	66,843
LPG	77,339	123,975	89,073	97,574	115,589	81,774	95,968
Automotive Diesel	761,174	372,761	157,192	181,713	193,976	205,099	219,088
Gas Oil	-	73,751	268,454	224,829	217,633	225,455	204,402
Petrol	1,073,856	996,799	907,908	935,502	837,241	836,237	881,672
Natural Gas	1,582,511	1,550,879	1,539,205	1,489,828	1,358,024	1,217,973	1,249,770
Electricity	6,043,435	5,588,765	5,524,610	5,455,228	5,411,515	5,394,642	5,492,685
Total	9,646,413	8,804,088	8,599,715	8,506,940	8,256,230	8,161,567	8,198,291

Energy source

The effect of the fuel mix on greenhouse gas emissions 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 91% of total consumption (67% electricity, 15% natural gas and 9% petrol).

There was a decrease of 9.7% in the use of Special Antarctic Blend this year due to ongoing energy management programs at the Antarctic stations, as well as wind turbines being commissioned at Mawson. An increase of 10% in Automotive Diesel consumption can be attributed mainly to the increase in surveillance activities by Australian Customs Service vessels.

While the use of Greenpower is effective in reducing greenhouse emissions, it is more costly than other forms of electricity. The decline in Greenpower consumption of 19% since 2002/03 is mostly attributable to reduced purchase by the Department of Defence because of budgetary constraints.

Natural Gas consumption levels increased by 2.6% because of a range of factors including the modification and extensive testing by the Department of Defence of a 2.3 MW gas fired, co-generation power supply at Edinburgh Salisbury Research Laboratory. However, it is expected that when the co-generation plant is fully operational it will help reduce overall conventional electricity consumption and associated greenhouse emissions from the site.

LPG consumption increased by 17.4%. A major proportion of this increase was in Defence Establishments which had infrastructure developments and redevelopments in a number of regions together with increased usage of facilities.

Table 10 Greenhouse emissions by source for each financial year

End-use category	Greenhouse emission (tonnes)						
	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Greenpower	-	-	-	-	-	-	-
Heating Oil/Fuel Oil	6,398	182	139	57	79	30	37
AVGAS	411	387	98	117	105	43	69
Aviation Turbine Fuel	715	557	673	477	432	1,348	1,318
Special Antarctic Blend	-	5,540	5,388	5,484	5,297	5,184	4,679
LPG	4,594	7,364	5,291	5,796	6,866	4,857	5,700
Automotive Diesel	53,054	25,981	10,956	12,665	13,520	14,295	15,270
Gas Oil	-	5,163	18,792	15,738	15,234	15,782	14,308
Petrol	70,874	65,789	59,922	61,743	55,258	55,192	50,400
Natural Gas	86,089	84,368	83,733	81,047	73,877	66,258	67,987
Electricity	1,571,293	1,453,079	1,436,399	1,418,359	1,406,994	1,402,607	1,428,098
Total	1,793,428	1,648,410	1,621,390	1,601,483	1,577,662	1,565,596	1,587,867

Greenhouse emissions by source

Table 10 shows how greenhouse emissions associated with each fuel type have changed over the last seven 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 Australian Government 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	Total GJ	Target	Lower	Upper	Average	Key Indicator
	GJ	%					
Office - Tenant Light and Power	1,136,167	13.8	10,000	5237	29,550	8,643	MJ/person/annum
Office - Central Services	527,676	6.4	500	134	778	446	MJ/m ² /annum
Public Buildings	355,700	4.3		227	1,911	1,124	MJ/m ² /annum
Law Courts	100,033	1.2		242	750	596	MJ/m ² /annum
Climate Controlled Stores	50,010	0.6		398	2,482	742	MJ/m ² /annum
Laboratories	957,218	11.6		563	2,184	1,146	MJ/m ² /annum
Other Buildings	665,652	8.1		12	6,544	831	MJ/m ² /annum
Passenger Vehicles	777,505	9.4		1.91	5.88	3.42	MJ/km
Other Transport	414,508	5.0					GJ
Defence Establishments	3,061,891	37.1	2,500,000				GJ
Antarctic Bases	67,134	0.8					GJ
Other Uses	84,797	1.0					GJ
Total	8,198,291						

The performance of all agencies in each end-use category over the seven 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

In 1997 targets to be met by 2002/03 were set in three end-use categories as indicated in Table 11. The targets for Office-Tenant Light and Power and Office-Central Services were set in intensity terms and the Defence Establishments target was an absolute consumption level. While the due date for these targets has passed, they still act as a useful benchmark against which performance can be measured.

How each agency performed against these benchmarks can be seen by examining the league tables of performance in Annex C. Of course, each agency's comments should be considered before drawing any conclusions on their performance. Smaller agencies have less scope to address poorly performing space by using other space which performs at high levels. These agencies are usually only able to make improvements in the longer term when moving to alternative accommodation becomes viable.

Progress

Table 12 shows the progress of the Australian Government 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 Australian Government performance. For example, the improvement in Tenant Light and Power intensity becomes more significant when it is appreciated that this category contributes nearly 14% to total energy consumption, and just over 18% to greenhouse emissions.

Table 12 End-use category energy intensity by financial year

End-use Category	Energy Use Intensity							Performance
	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	Indicator
Office - Tenant Light and Power	13,524	12,649	11,758	10,848	10,415	8,980	8,643	MJ/person/annum
Office - Central Services	534	481	453	459	497	480	446	MJ/m ² /annum
Public Buildings	1,347	1,313	1,161	1,171	1,181	1,109	1,124	MJ/m ² /annum
Law Courts	550	538	608	570	595	574	596	MJ/m ² /annum
Climate Controlled Stores	1,174	663	698	686	675	655	742	MJ/m ² /annum
Laboratories	1,111	1,026	1,056	1,068	994	1,029	1,146	MJ/m ² /annum
Other Buildings	1,383	955	937	838	862	846	831	MJ/m ² /annum
Passenger Vehicles	3.78	3.66	3.33	3.87	3.90	3.54	3.42	MJ/km
Other Transport	1,058	659	616	568	535	586	415	'000 GJ
Defence Establishments	2,918	3,140	3,268	3,164	2,973	2,899	3,062	'000 GJ
Antarctic Bases	-	79,644	77,806	78,843	76,110	74,599	67,134	GJ
Other Uses	178,365	94,306	77,065	80,513	76,256	78,967	84,797	GJ

Performance targets

As stated on page 24, in 1997 energy performance targets to be met by the end of the 2002/03 financial year were set at a level that represented a 25% reduction from the equivalent level that prevailed for Australian Government operations as a whole in 1992/93. The targets applied only in the three end-use categories of Office - Tenant Light and Power (10,000MJ/person/annum), Office - Central Services (500MJ/m²/annum) and Defence Establishments (2.5 million GJ). While the range of targets was limited, the three end-use categories account for almost 60% of total Australian Government consumption and more than 65% of energy related

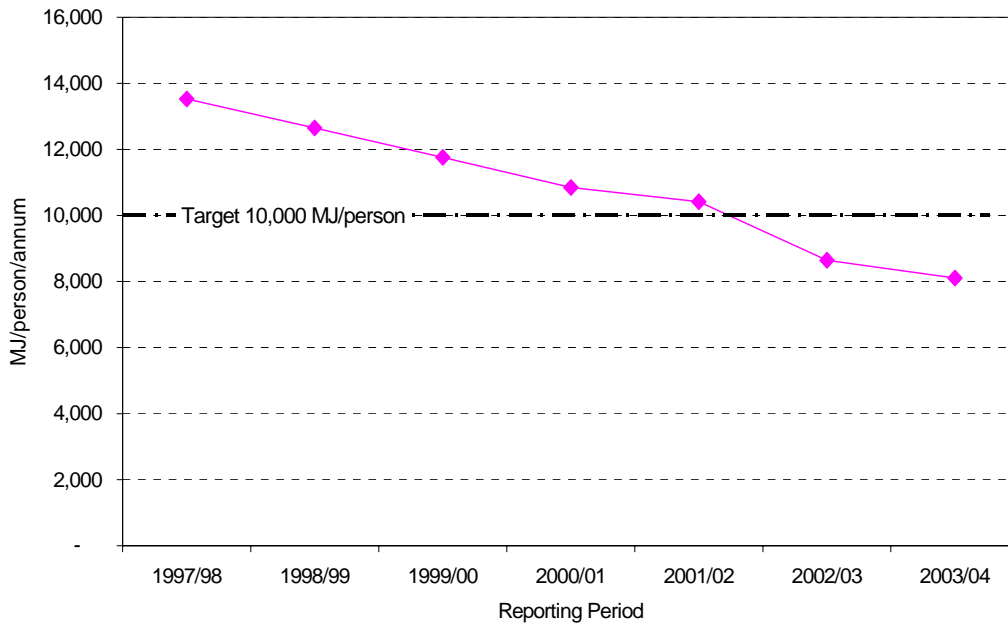
greenhouse gas emissions. For the two office based targets this meant a 25% reduction in average energy intensity and for the Defence Establishments target a 25% reduction in energy consumption. Targets are being considered as part of the development of the Government's energy strategy.

Office buildings

In 1997/98 Tenant Light and Power intensity was almost the same as it was in 1992/93. However, following the establishment in 1997 of the Tenant Light and Power target of a 25% improvement by 2002/03, performance actually improved by 33%. This is illustrated in Figure 3. Between 1997/98 and 2003/04 performance has improved by 36%.

The Central Services category target was, in aggregate, also exceeded. Since 2002/03 Central Services achieved a further reduction of 7% and Tenant Light and Power achieved a 3.7% reduction.

Figure 3 Trends in Office -Tenant Light and Power energy intensity



Individual agency performance against targets can be found in the league tables in Annex C. As stated previously, such performance should be considered in conjunction with the Agency comments provided in Annex B.

Defence establishments

Although Defence Establishments energy consumption increased this year by 5.6%, last year showed the third consecutive improvement. It should be noted that the LPG consumption which had been reported under the Department's Laboratories in previous years has been reported in Defence Establishment this year. The increase in energy consumption should be seen in the context of the increases in demand placed on the services of the department in the recent past.

The Green Vehicle Guide target

In February 2003 the APS Roundtable (comprising Secretaries of portfolio Departments and large agencies) noted an environmental target covering approximately 8,000 vehicles within the Australian Government Tied Contract Fleet based upon a rating scheme called the Green Vehicle Guide.

The guide provides all new light vehicles up to 3.5 tonnes gross vehicle mass with a rating based upon overall environmental performance. This overall performance is derived from a rating out of ten for greenhouse emissions and also out of ten for air quality emissions, providing a combined score out of twenty.

At the end of 2002 it was estimated that 14% of the fleet were in the top half of the scale (with a GVG score equal to or above 10.5). The target aims to increase the proportion of vehicles with scores in the top half of the Green Vehicle Guide to 28% by December 2005, while maintaining the Australian-made proportion of the fleet. This responds to the Prime Minister's commitment made in his 1997 statement, *Safeguarding the Future: Australia's Response to Climate Change* for a challenging but realistic fuel efficiency target for the Australian Government fleet.

The Green Vehicle Guide, jointly developed by the Department of Transport and Regional Services and the Australian Greenhouse Office in 2004, is on the internet. Further information is available on the Green Vehicle Guide website:

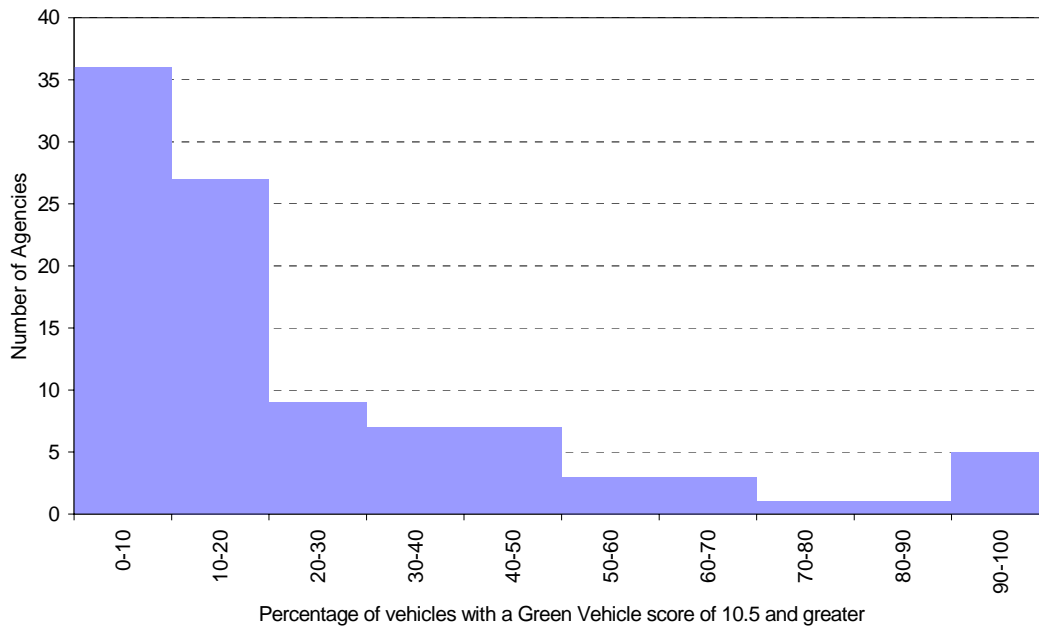
www.greenvehicleguide.gov.au .

Government departments and agencies have provided indicative Green Vehicle Guide performance for their passenger vehicles. Senior Executive Service (SES) and fit for purpose vehicles (eg, vans, mini-buses and utilities) are not included in the reporting requirements. However some agencies included SES vehicles this year.

Green Vehicle Guide performance across agencies is illustrated in the histogram in Figure 4. The figure indicates that up to 20 per cent of vehicles in use by more than 55 agencies have a Green Vehicle score of 10.5 or better.

New approaches for the Australian Government fleet will be considered as part of the development of the Government's new energy management strategy for its own operations.

Figure 4 Performance against the green vehicle guide scores



Other categories

In other end-use categories, no targets were 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.

For other categories of buildings such as Laboratories, Public Buildings and Law Courts, the Australian Greenhouse Office is

developing energy benchmarking strategies prior to setting energy targets at a future date.

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 and boiling water units. 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 was set for 2002/03.

Performance against target

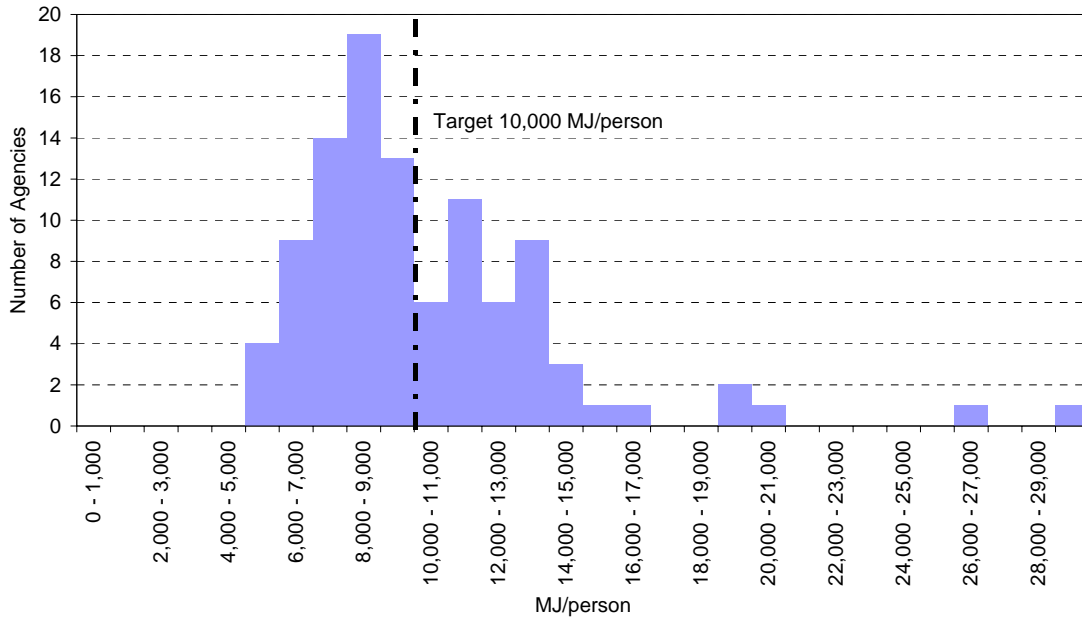
Average performance in the Office - Tenant Light and Power end-use category was 8,643 MJ/person. Figure 7 shows the distribution of performance about the 2002/03 target of 10,000 MJ/person target. Agencies reporting at the higher end of the spectrum are the Supervising Scientist Division, Australian Transaction Reports and Analysis Centre (AUSTRAC), the Family Court of Australia, Geoscience Australia, and the Attorney General's D Branch.

The Supervising Scientist Division reports that the high intensity was caused by a two fold increase in staff number and a seven fold increase in office space leading to a disproportionate increase in energy consumption. The D Branch reports that high rates of

building use are contributing to their high intensity levels but reported a 16% improvement since last year. Geoscience Australia explains that staff movement from a building in the Office – Tenant Light and Power category to a building in the Other Buildings category caused decreases of 63% in total GJ and 75% in occupancy. This resulted in an intensity increase of 46%.

AUSTRAC has advised that its high intensity in this category was caused firstly by its facilities being in use for extended hours, and secondly by the continuous operation of computer facilities and a computer room with a high level of mechanical equipment, including supplementary air-conditioning units. The Family Court of Australia also attributes its high intensity to extensive computer facilities and their air conditioning system.

Figure 5 Histogram of Tenant Light and Power performance

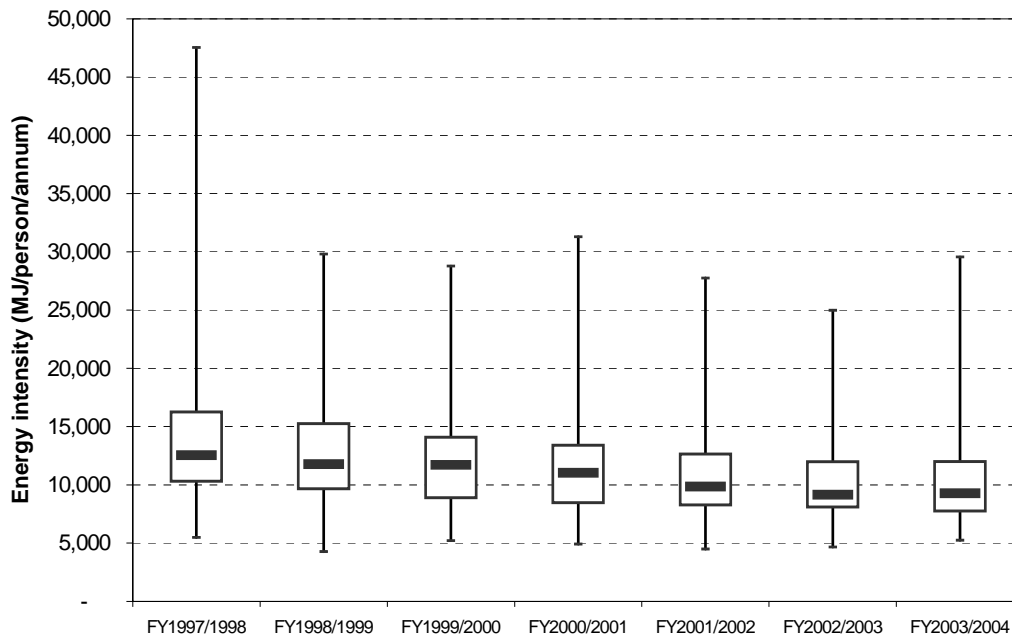


The average energy intensity has fallen by 3.4% in the past year, further bettering the 10,000 MJ/person target surpassed in 2002/03. This is partly due to a reduction in the average floor area per person, which is now below 21 m²/person (compared with nearly 28 m²/person in 1997/98). However, as for the past couple of years, the reduction in Tenant Light and Power intensity is greater than the reduction in average floor space per occupant.

Box Plots

Figures 6, 9, 10, 11, 12, 13, 14 and 16 are box plots which show for each end-use category the maximum and minimum intensity each year, the median value, and the box shows the 25th and 75th percentile limits.

Figure 6 Box plot of Tenant Light and Power energy intensity



Metering

There are still many buildings where tenant energy consumption is not measured directly, but is calculated by formula from the total building consumption.

Calculation of energy consumption is most common in buildings currently or formerly owned by the Australian Government and introduces a significant level of uncertainty into the figures for both Tenant Light and 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 for agencies to justify investing in efficiency measures if the energy consumption formula attributes a significant part of the resulting savings to other tenants, or the building owner.

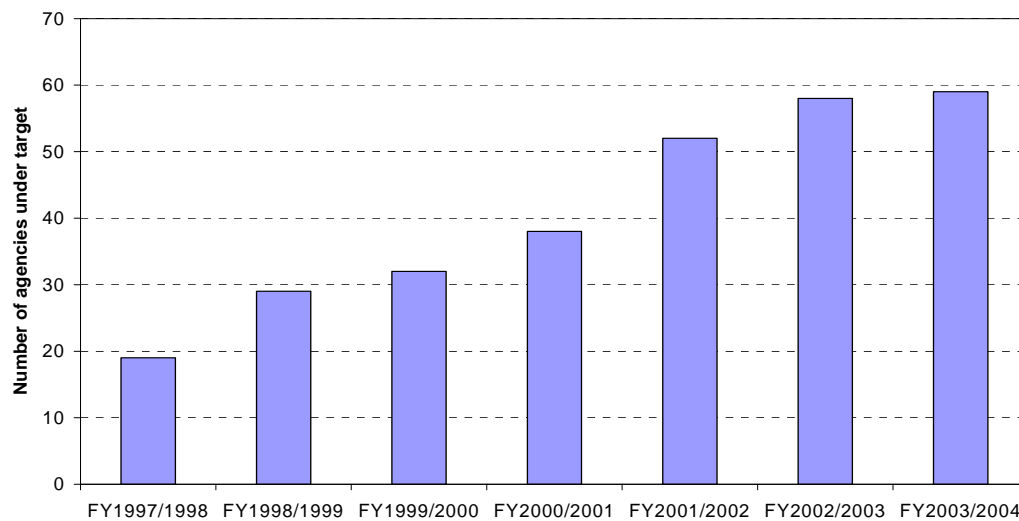
There has been further improvement in the provision of appropriate metering over the past year but energy contract negotiations, fit-outs and upgrades continue to present unrealised opportunities for low cost meter installations.

The Australian Greenhouse Office is continuing to test several available methodologies, including the development of a Green Lease Schedules (GLS) to determine their applicability for Australian Government new and refurbished office buildings. Particularly, the GLS is expected to assist Australian Government agencies in negotiating and maintaining energy efficiency measures over the term of the lease for new leases and major refurbishments.

Progress

To further illustrate progress, Figure 7 shows the number of agencies each year operating at or better than the target level set for 2002/03. This year, 59 of the 101 agencies reporting Tenant Light and Power consumption are better than target. In 1997/98, only 19 of 91 agencies were operating below target.

77% of all Tenant Light and Power consumption is reported by agencies operating at a level better than the target. If all agencies currently operating worse than the target were to improve so that they were operating at 10,000 MJ/person, there would be a further reduction of only 55,000 GJ, or 4.8% of current Tenant Light and Power consumption.

Figure 7 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, lobby lighting, hot water and office uses.

The Property Group of the Department of Finance and Administration reports the Central Services energy consumption of Australian Government-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.

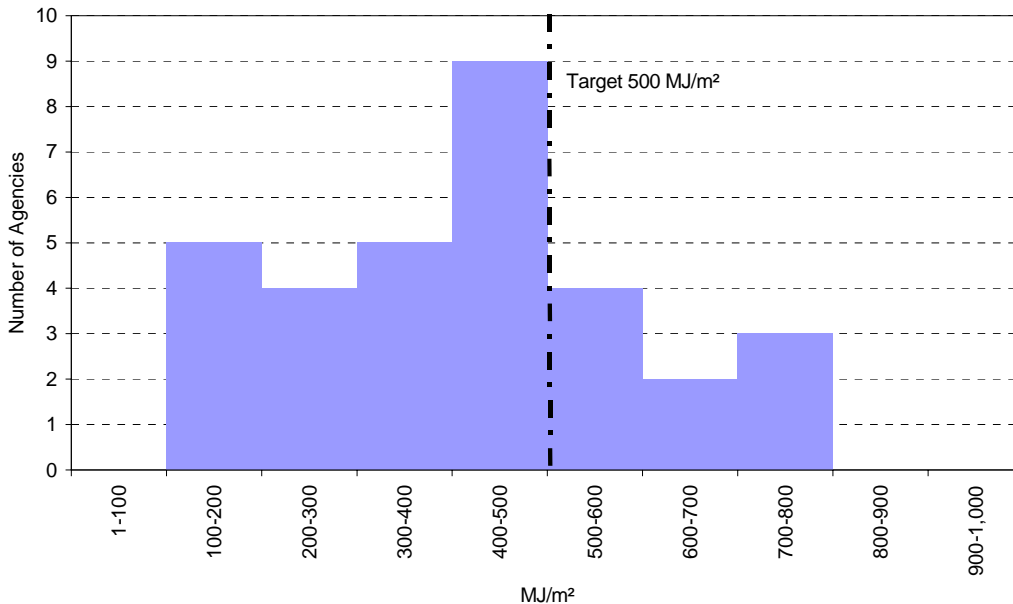
The key indicator in this category is MJ/m²/annum. This recognises that building central services will typically service an entire building regardless of occupancy. An agency wide performance target of 500 MJ/m²/annum has been set.

Performance against target

The reported average performance of 446 MJ/m²/annum improves on last year's average of 480 MJ/m²/annum. Figure 8 shows the distribution of performance about the 500 MJ/m² target.

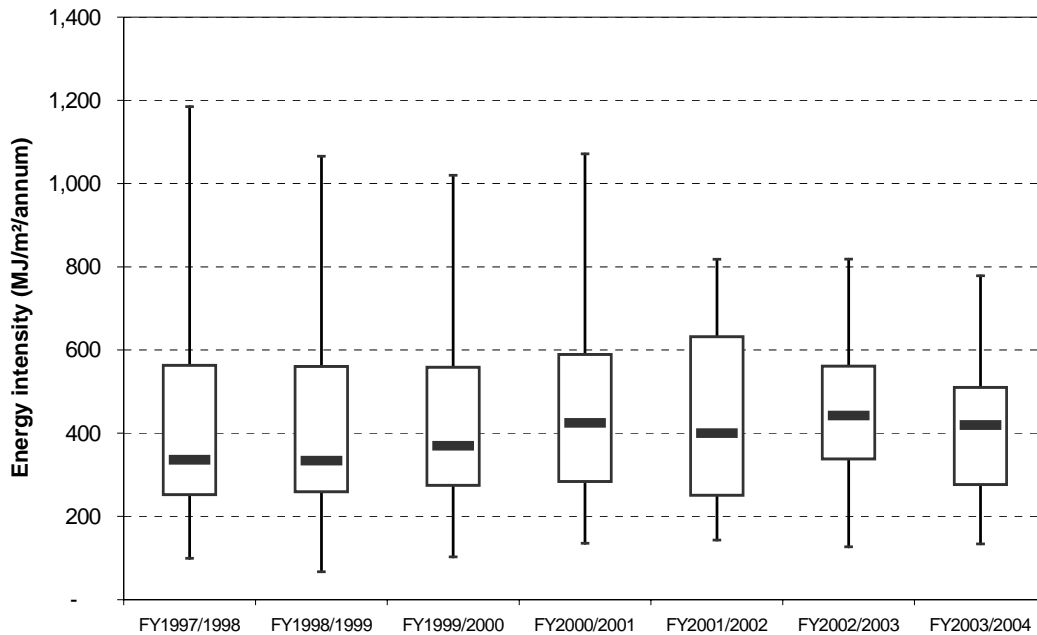
Some of the agencies reporting at the higher end of the profile have special circumstances such as 24 hour operation that limit their ability to improve in the short term. Some of the extremes are also caused by inadequate metering and reliance on formulae to establish the split between Tenant Light and Power and Central Services.

Figure 8 Histogram of Central Services performance



Leasing

Australian Government 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.

Figure 9 Box plot of Central Services energy intensity

Public Buildings

Description

This category includes energy consumed in buildings which are accessed 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.

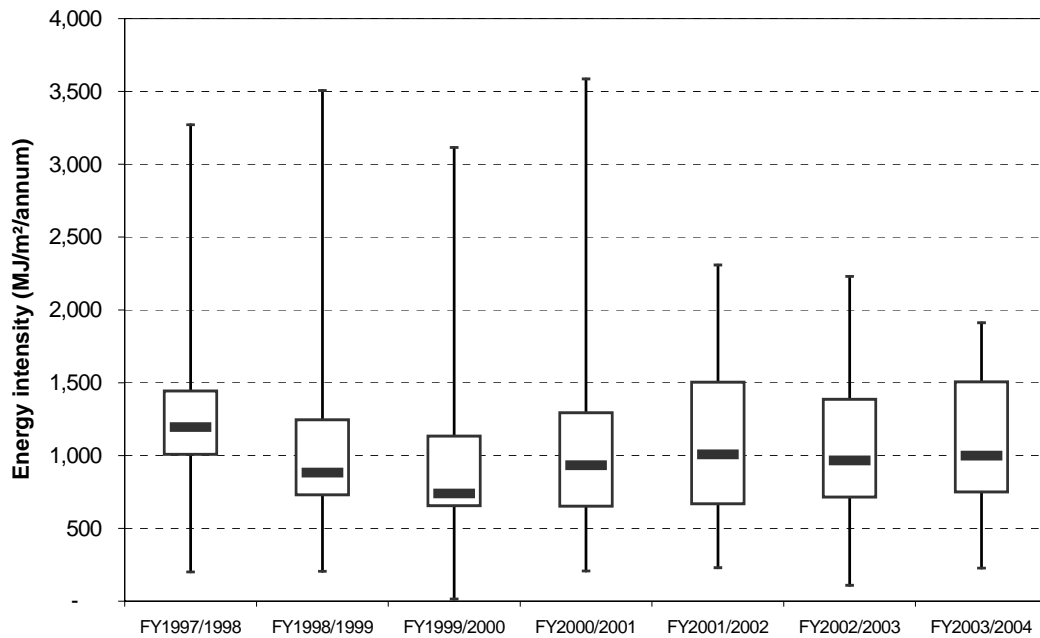
The key indicator in this category is MJ/m²/annum. No target has been set in this category because these buildings tend to have individual operational requirements.

Discussion

The calculated energy intensity of 1,124 MJ/m² is 1.4% higher than that reported last year. Last year's decline of 6% would have been improved upon, however the small increase can be attributed to a large reduction in floor area reported by the national Capital Authority, and an unexplained increase in energy use by the Great Barrier Reef Marine Park Authority, both leading to an increase in MJ/m²/annum.

The intensity dip in the middle years is mostly due to data error.

Figure 10 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

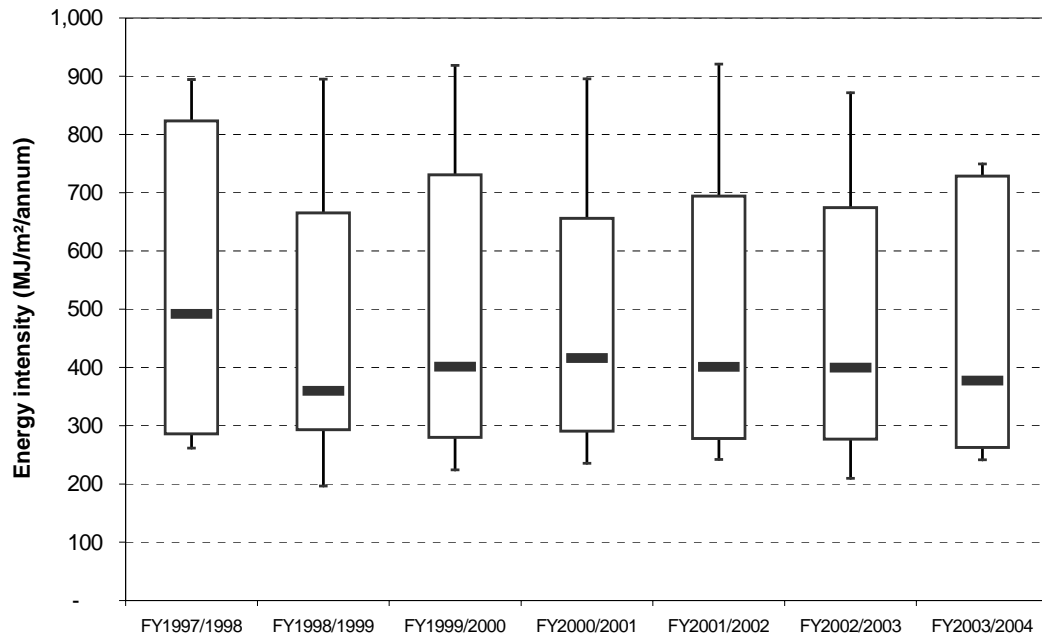
specialised building. No performance target applies to this category because of the diverse nature of the facilities.

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

Discussion

The average energy intensity is now 596 MJ/m², up moderately (by 3.8%) on last year (noting that the box plot shows the median and not the average). Significant moves included Law Courts Limited and the Family Court achieving declines in MJ/m² of 14% and 6% respectively. The Commonwealth Law Courts showed an increase of 8% in MJ/m².

Figure 11 Box plot of Law Courts energy intensity



Climate Controlled Stores

Description

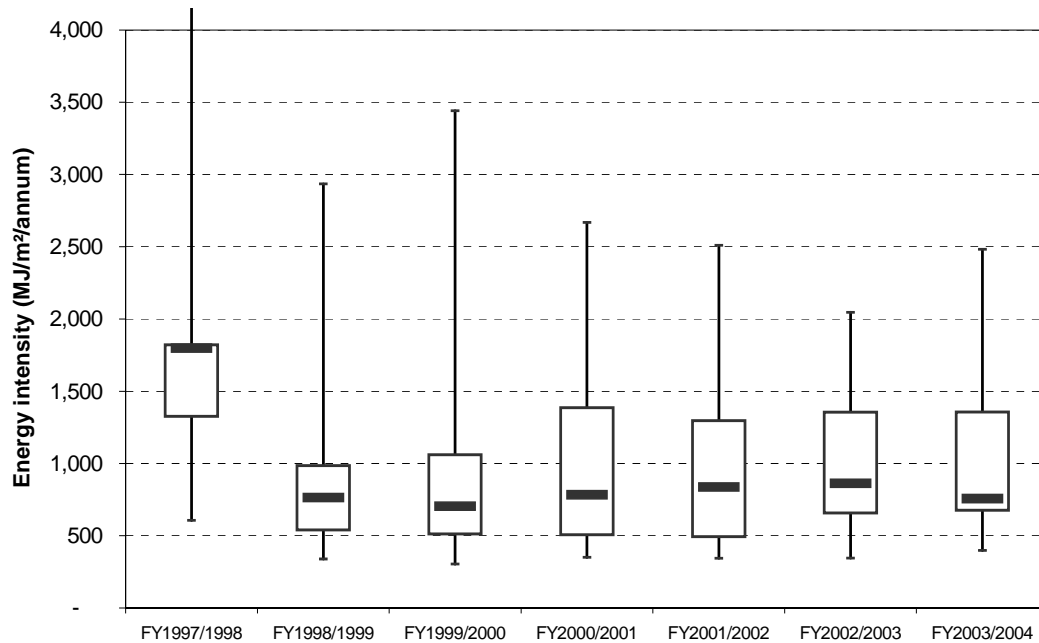
Climate Controlled Stores require close control of internal environmental conditions on a 24-hour basis to maintain the quality of the goods being stored. While cool stores and cold stores fit into this category, these buildings are more typically maintained within a tightly controlled range around 20°C 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. The key indicator for this category is MJ/m²/annum.

Discussion

Energy intensity in this category has increased by 13% this year to 742 MJ/m². Significant increases occurred at the National Archives of Australia and at the National Gallery of Australia.

An increase of 28% at the National Archives of Australia was caused by a reduction in the area of a number of repositories. The increase of 15% at the National Gallery of Australia was due to a large increase in usage and activity within the store, and the receipt of several extraordinary volumes of works of art into the store.

The Australian War Memorial achieved a significant reduction of 20%. The decrease reflects reduced collection movements during the year and the close monitoring of building management practice as well as some boiler maintenance down time.

Figure 12 Box plot of Climate Controlled Stores energy intensity

Laboratories

Description

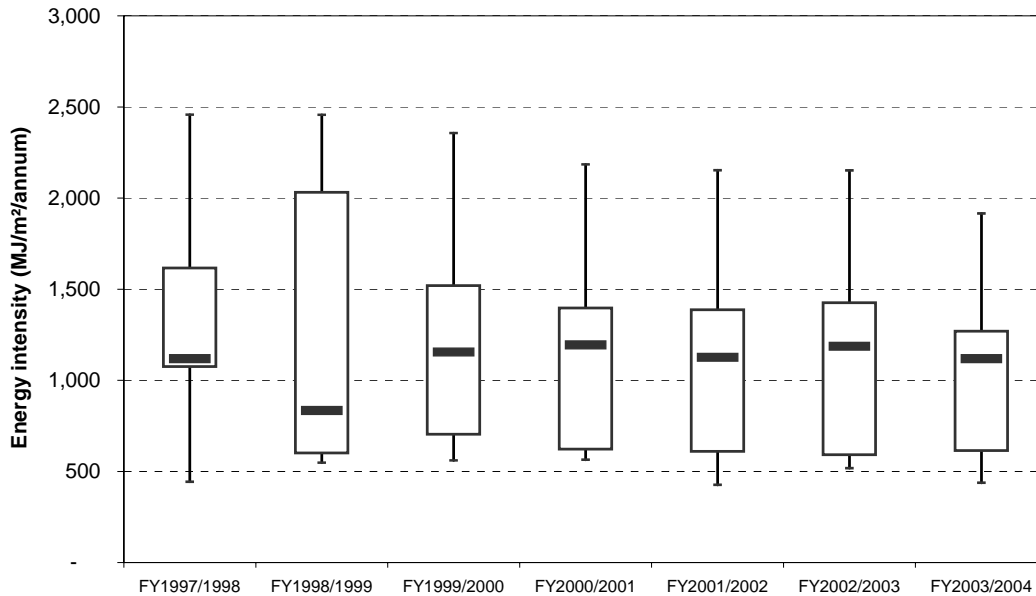
This category covers all energy use in buildings that, as their primary function, are used as laboratories. For this type of facility, the key indicator is MJ/m²/annum.

Discussion

The average intensity of Laboratories was 1,146 MJ/m² in 2003/04, up 11.4% on the previous year. Most of the increase can be attributed to the CSIRO which used over 70% of the total energy reported used in laboratories, and which reported a 20% increase in intensity in 2003/04. This increase in intensity, measured in

MJ/m²/annum, was caused by an increase in total GJ of 5% combined with a decline in total floor area of 13%.

Figure 13 Box plot of Laboratories energy intensity



Other Buildings

Description

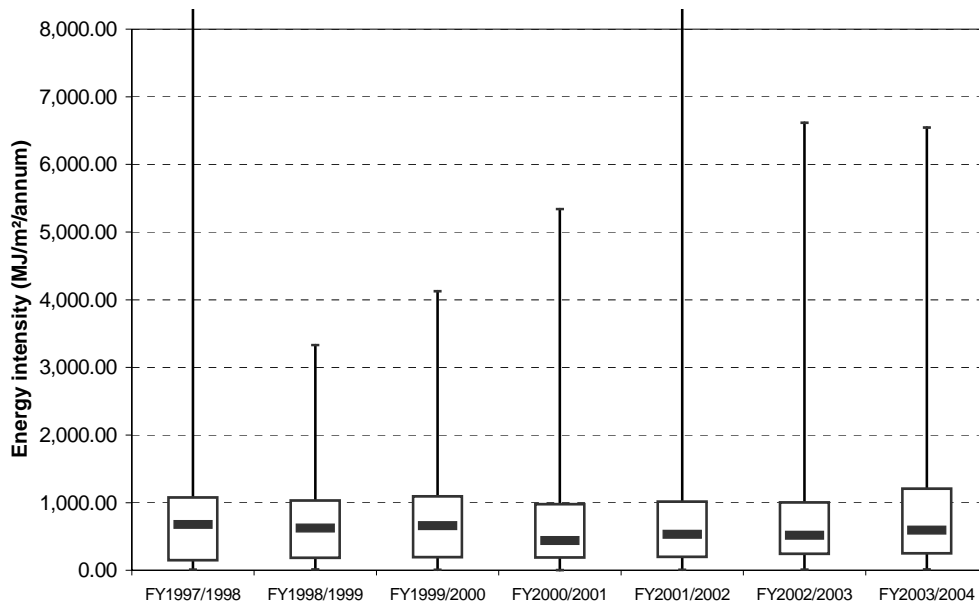
The energy performance of buildings not reported elsewhere is included in the Other Buildings category. These buildings range from simple storage sheds through to radio transmitters. As a result, energy performances in this category cannot be compared in any meaningful way, and the key indicator of MJ/m²/annum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

Discussion

The energy intensity of Other Buildings decreased by 1.8% to 831 MJ/m²/annum. The diversity of this category can be seen clearly from the wide range of reported intensities.

The Australian Bureau of Statistics showed an increase in intensity. However, it reported a reduction in overall energy consumption in this category achieved by more efficient space utilisation. This will result in lower energy costs and greenhouse emissions in the future.

Figure 14 Box plot of Other Buildings energy intensity



Passenger Vehicles

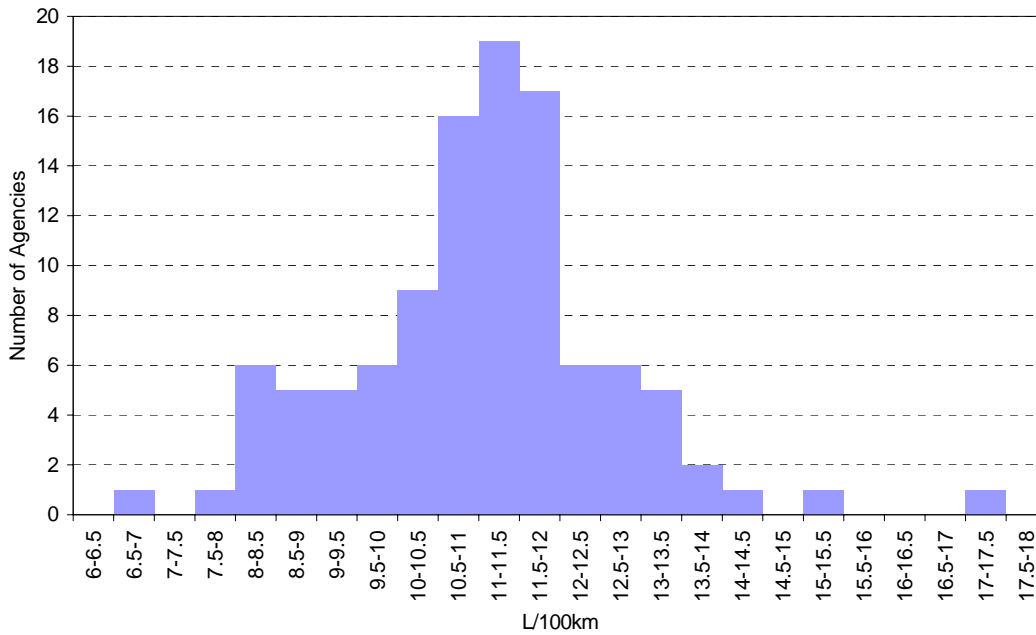
Description

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 15 Histogram of Passenger Vehicle performance



Discussion

The average fuel consumption of 3.4 MJ/km, or around 10.9 L/100km is up nearly 6% in that reported last year.

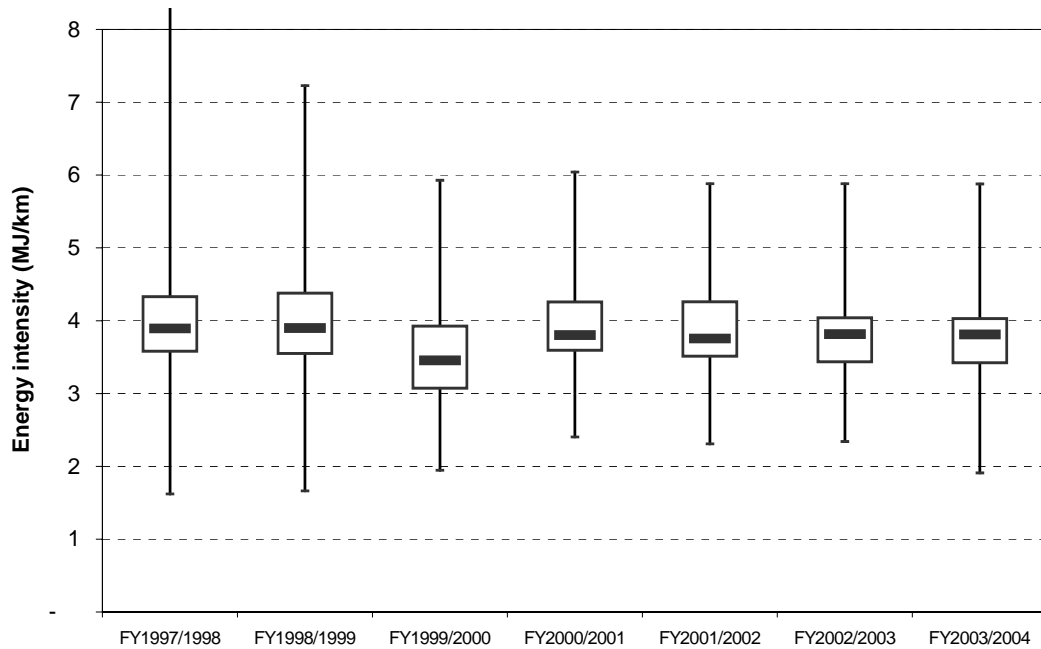
The distribution of Passenger Vehicle energy performance shown in Figure 15 indicates that most agencies are operating in the range 10-12 L/100km, or around 3.5-4 MJ/km.

A number of Agencies have reported vehicle data provided by LeasePlan which was based on the Fringe Benefits Tax year which

runs from April to March. This is included in this report as if it was for the financial year.

The limitations of data used for this category has been mentioned earlier in this report, and the figures reported here should be treated with caution.

Figure 16 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 decreased by 29% to 415,000 GJ this year. As noted earlier, this decrease is likely to reflect the change in operational priorities for this year, not a long-term trend. As mentioned previously, most of the decline this year was caused by the Department of Defence reallocating petrol usage previously reported in Other Transport to the Passenger Vehicles and Defence Operations categories in order to reflect more accurate usage of their petrol powered vehicles.

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 report 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.

Performance against target

Defence Establishments' energy consumption increased this year by 5.6% to 3,062,891 GJ. The reported performance should be seen against a background of higher demand on the Department of Defence's services. The increase this year is due to improvements in data collection, construction and operation of new buildings, installation of additional high energy using equipment, significant infrastructure upgrades, and an increase in the workforce of almost 3%.

Defence Operations

Description

This category covers the fuel used in aircraft, tanks, ships, vehicles etc for Defence Operations.

Discussion

Defence Operations accounted for a total consumption of just over 12.8 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 increased by 7.4% to 84,794 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 over 67,000 GJ is down by 10% on last year. A decrease in station population during summer and winter (especially at Mawson and Macquarie Island), ongoing energy management programs at the stations as well as wind turbines being commissioned at Mawson, contributed to the reduction.

Policy administration

Introduction

For the 2003/04 financial year, policy development and the functions identified in clause 5.1 of the policy document *Measures for Improving Energy Efficiency in Commonwealth Operations*, included at Annex D, were carried out by the Buildings, Finance and Government Team of the Australian Greenhouse Office (AGO) which is now part of the Department of Environment and Heritage (DEH). Reporting functions were conducted by the AGO's Reporting and Performance Monitoring Team.

Prior to that, responsibility for administration of the policy was shared between the Department of Industry, Tourism and Resources (DITR) and the AGO. The policy, reporting and advisory functions were consolidated in the AGO from the beginning of July and officially transferred to the AGO on 1 December 2003. The AGO became two Divisions of DEH on 28 October 2004.

The policy detailed in *Measures for Improving Energy Efficiency in Commonwealth Operations* is currently being reviewed to align with the Government's recent Energy White Paper, *Securing Australia's Energy Future*. The AGO is developing a new energy policy for Government Operations. The proposed new policy will focus on revising the energy intensity targets and end use categories. Issues such as advancing metering reform for Defence establishments and developing a green lease schedule for Commonwealth agencies so that building owners and tenants can be accountable for building energy performance are being explored to support the revised targets.

The following is a summary of actions for the continued implementation of the policy during 2004/05 and an indication of future directions.

Collaborative energy procurement and electronic metering

The AGO managed the whole of government ACT electricity contract involving 53 Australian Government agencies and over 230 sites. The contract includes a minimum of 5% new green energy, with options for higher amounts of green energy if agencies so choose. The AGO chose to purchase 100% new green electricity. The National Science and Technology Centre (Questacon) purchases 15% new green electricity.

As part of the whole of government ACT electricity contract, electronic metering, providing half-hour readings in real time has been installed in the 230 sites from September 2002. The AGO continues to work with the energy retailer and the data provider to present the meter data to agencies in easily accessible ways. Better access to direct energy consumption information is increasing agencies' understanding of actual energy use and assisting them in identifying opportunities for improving efficiency. The AGO has also directly assisted several agencies to analyse the data from the electronic meters and advised on how this could be used, in conjunction with knowledge of the building operations, to identify opportunities for improving performance.

Energy management advice

The AGO provided advice to several Australian Government agencies that have negotiated new leases and major refurbishments. The AGO has also made representations to the Joint Standing Committee on Public Works to ensure compliance of major building fit-out works with the Australian Government energy efficiency policy.

Agencies preparing to undertake new works should note that the minimum standard under the current policy is derived from the 1994 Building Owners and Managers Association of Australia (BOMA) Energy Guidelines and this is equivalent, in most instances, to a 4.5 – 5 star Australian Building Greenhouse Rating (ABGR).

Currently DEH is developing the Green Lease Schedule (GLS), which will assist Australian Government agencies in negotiating and maintaining energy efficiency measures over the term of the lease for new building and major refurbishment projects. The GLS has been developed after preliminary assessment was undertaken in early 2003 of the current commercial building leasing arrangements regarding energy management and the implications of these for Government agencies to implement energy efficiency improvements in new buildings and tenancies. Work is now progressing on developing model schedules that better address energy efficiency requirements in tenancy and pre-commitment leases. This work has resulted in the inclusion of the Green Lease Schedule in the pre-commitment leases of two new Australian Government building developments. In addition, a number of other Australian Government agencies with upcoming building developments are currently considering adopting similar lease arrangements for their new premises.

Communication and education

In February 2004 the AGO conducted an Australian Government Energy Manager Forum at the new Department of Immigration and Multicultural and Indigenous Affairs building in Belconnen. This forum highlighted innovative energy efficiency practices and experiences by agencies and promoted effective actions to all agencies.

With the development of new energy efficiency policy strategy for the Australian Government's operations, it is anticipated that further workshops and forums will be held to inform and engage stakeholders of new energy targets and tools to assist agencies with meeting these targets.

Future directions

The AGO, which now holds responsibility for the policy, is in the process of formulating a new 15 year energy efficiency policy strategy that will set revised targets and incorporate innovative measures such as the Green Lease Schedule for various leasing

arrangements. The new strategy will also seek to complement other Australian Government energy and environmental policy frameworks, such as Environmental Management Systems and Greening of Government initiatives.

Agencies will continue to report to DEH through the on-line Energy Data Gathering and Reporting system for the 2004/05 year.

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:

- Centrelink provides an account of achieving better performance against Government energy targets and reduced property operating expenses in a large and geographically diverse portfolio.
- The Department of Family and Community Services reports on their energy reduction strategy which included becoming a member of Greenhouse Challenge, improving property service provision arrangements, and implementing an Environmental Management System (EMS).
- The Department of Health and Ageing reports on a number of energy savings efforts including the completion of a major lighting upgrade for its core buildings under an Energy Performance Contract.

Centrelink's Energy Management Contract

Centrelink recognised that to comply with the Commonwealth *Policy Measures for Improving Energy Consumption in Commonwealth Operations*, it required expert advice and assistance. It was clear that achieving reductions in greenhouse gas emissions, better performance against Government energy targets and reduction in Property Operating Expenses running costs was a huge challenge in a portfolio as large and geographically diverse as Centrelink's.

Following a lengthy procurement process, a contract was signed in March 2003 with AGL Energy Services. AGL has engaged Exergy

Australia to provide further specialist input to the project, and together with Jones Lang LaSalle (JLL), Centrelink's outsourced real estate services provider, Centrelink has assembled a strong team to face its energy management challenges.

The AGL contract includes the following initiatives:

Review of Base Building Briefs

AGL has completed revision of Centrelink's suite of Base Building Briefs. The revised briefs ensure that all new precommitment buildings are designed to achieve a 4 star rating under the Australian Building Greenhouse Rating Scheme. In particular a lot of work was put into the lighting specifications, which now call for a maximum intensity of 10W/m². There are currently around 18 buildings either in planning or site selection phases that are subject to the new building requirements. Over time this should have a positive impact on the agency's energy consumption.

Energy efficiency advocacy and site assessment for new buildings

To ensure developers comply with the new building specifications, AGL will review all base building plans, in particular services plans and specifications. Advice is also given to developers regarding any design alternatives to improve the building's energy performance. To further reinforce the benefits, instruction has been issued to Jones Lang LaSalle, that energy components of the Base Building brief are non-negotiable in terms of the Agreement to Design Construct and Lease.

Minimum Energy Efficiency for new Leases

While the revised Base Building Brief addresses new buildings, it was decided to tackle the remainder of the portfolio through their leases. Centrelink has had a gross lease document as its standard requirement default for some years, but there is a range of net and hybrid documents in use throughout the network. A lease checklist was developed with AGL, which calls for an ABGR of 3.5 Stars, reviewed every 2 years, lighting density of less than 12.5W/m², switching and other building improvements. The Centrelink National Lease is being changed to reflect these measures and JLL has been instructed to include the requirements into future lease negotiations. Even if all the points are not agreed with landlords, Centrelink can then consider the viability of funding the capital upgrades or indeed its future tenure in that building.

Energy Auditing

Energy Auditing is a key component of the Energy Management Program. Audits are scheduled at a rate of 100 per year and around 130 have been completed to date. The audits are generating a range of recommended building upgrade works, the majority being lighting. A typical scope of works may include delamping/relamping with new generation triphosphor tubes, replacement of fittings, new reflectors, autotransformers and replacement of dichroic fittings with compact fluorescent fittings.

In addition to energy saving opportunities, the audits are also uncovering a significant number of sites where the metering arrangements do not reflect lease conditions. One of the most common is where Centrelink is the sole occupant of the building, on a gross lease and a single electricity meter is discovered. In many cases, Centrelink is paying the entire bill, including Central Services – a landlord responsibility under the lease. These matters are referred to JLL for recovery from lessors.

Energy Data Services

It is a truism that without accurate and effective consumption data it is impossible to manage or reduce consumption. With 478 leases and 430 sites across Australia, data management has represented a huge challenge. In particular the dynamic nature of the portfolio meant that a database would need plenty of “smarts” to facilitate compliance with the energy intensity and end use requirements of the Commonwealth Policy.

AGL were commissioned to develop a Centrelink specific database on a Microsoft Access platform. They worked very closely with Exergy and JLL to develop a tool that would ensure quality consumption data was available to meet our annual reporting obligations as well as allowing ongoing energy management on a site-by-site basis. It contains details of all Centrelink’s leases, staff numbers, energy consumption and costs. The database was delivered in time to generate this year’s *Energy Use in the Australian Government’s Operations* report. Data is entered directly from invoices by JLL as part of their role in payment of all energy invoices on behalf of Centrelink and it provides an accurate baseline from which to benchmark future initiatives.

Stakeholder Engagement

The key to success of any energy management process is the engagement of stakeholders from our Executive through to Customer Service Centre (CSC) staff. So far AGL has prepared a presentation for Centrelink's Executive, presented to our Property Managers and Environmental Management Team Conferences.

The Next Step

Having done such a large number of energy audits, which have identified savings opportunities at almost every site, it is recognised that if these are to be harvested, action must be taken to implement the identified Energy Conservation Measures (ECM). AGL, in conjunction with Centrelink, has recently concluded a tender process to select a national contractor to rollout identified ECMs. The rollout is subject to approval of a business case, but paybacks of under 3 years are achievable. If approved the rollout is scheduled to commence in early 2005.

The Department of Family and Community Services' Energy Reduction Strategy

The Department of Family and Community Services (FaCS) has approximately 1,900 staff in 20 leased sites throughout Australia. The majority of these sites are multi-tenanted arrangements and in the main the department is only responsible for Office Tenant Light and Power electricity consumption.

In November 2004 FaCS published its first Triple Bottom Line Report covering the social, environmental and economic performance of its operations in the 2002/03 financial year. A number of difficulties were encountered in compiling and analysing electricity consumption data for publication in the Triple Bottom Line Report including lack of data for many sites and reliability issues with the data provided.

FaCS realised that a major component of its operational costs was not being effectively managed. This realisation prompted the Department to make public commitments in the 2002/03 and 2003/04 Reports to better understand, monitor and manage electricity consumption, and to undertake work to increase the energy efficiency of its leased building stock. A number of actions

were undertaken to ensure that FaCS met these commitments including:

- **Joining the Australian Greenhouse Challenge.** Commitments made in the Australian Greenhouse Challenge Cooperative agreement align with and reinforce Triple Bottom Line Report commitments.
- **Improved property service provision arrangements.** FaCS built more effective and timely data collection and reporting requirements into contracted property service provision arrangements. In addition, under this contract FaCS now works in partnership with the property services provider to improve the environmental and cost performance of leased office space.
- **Environmental Management System.** FaCS used the implementation of an Environmental Management System in its largest stand-alone site, Juliana House in the ACT, to identify and test energy saving initiatives. Successful initiatives are rolled out to the rest of the FaCS network

Juliana House Energy Initiatives

Juliana House has been established as the test site for initiatives designed to reduce power consumption in the Department of Family and Community Services. Built in 1970, it is a 10 story building of 6,600 square meters housing 450 staff. Smart electricity metering has been installed which allows for the monitoring of electricity consumption down to 30-minute blocks.

FaCS formed an EMS Working Group for Juliana House to drive the implementation of the EMS for the building. The first task for this group was to identify the environmental impacts of the Department of Family and Community Services' operations in the building, including energy consumption, and to develop cost effective initiatives to allow FaCS to better understand and reduce these impacts.

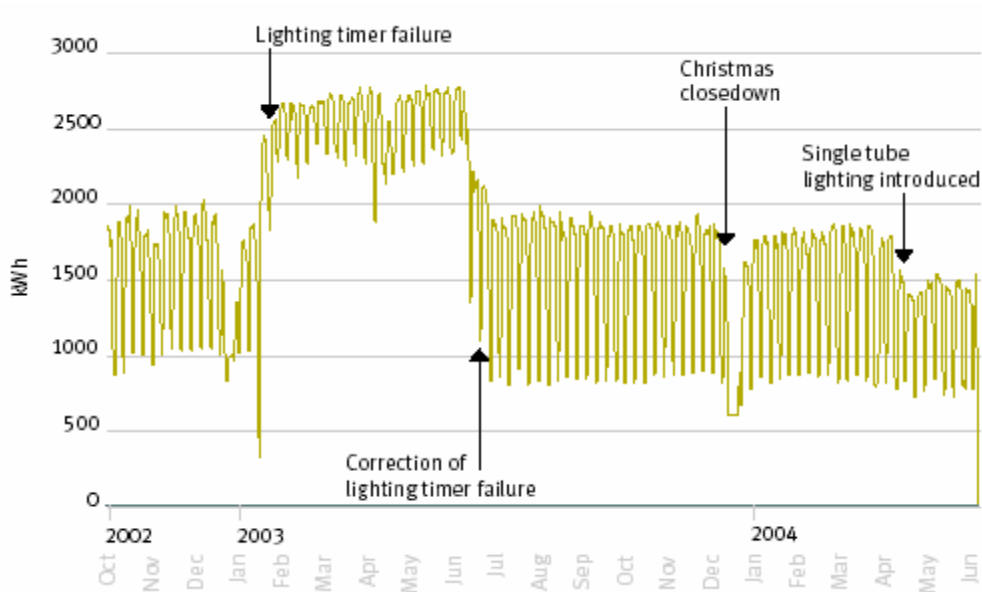
Energy efficiency work undertaken in Juliana House to date include:

- correcting a failure in the lighting management system
- retrofitting existing double Halo phosphor tube light fittings with single tri-phosphor tubes
- installing timers on kitchen boilers

- shutting down of all non-essential equipment over the Christmas/New Year close down

The graph below derived from smart meter data displays the impact of individual energy savings initiatives in Juliana House.

Figure 17 Electricity Consumption for Juliana House in kWh- October 2002 to June 2004



These initiatives resulted in an electricity consumption reduction in Juliana House in the 2003/04 financial year of 27% compared to the previous year. The payback period for the implementation of these initiatives was approximately 9 months. It has also highlighted issues with baseline energy consumption at this site which are currently being investigated.

Juliana House has provided the evidence base to promote energy saving initiatives across the Department of Family and Community Services. The single triphosphor tube retrofits are taking place in all FaCS sites and other initiatives, such as placing timers on kitchen boilers, are being implemented where appropriate. Work is now beginning on developing and implementing improved PC power management practices throughout the Department of Family and Community Services. In

addition, FaCS is working with its property services provider to conduct Level 2 energy audits at 5 sites which have high electricity consumption profiles.

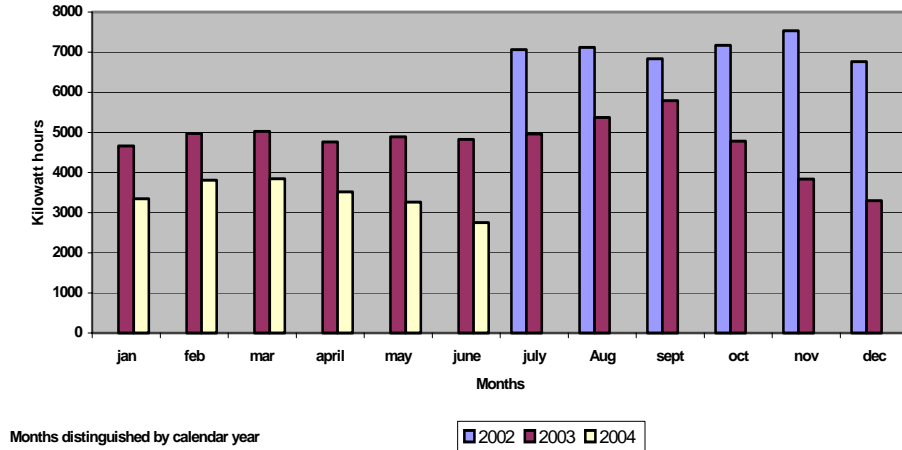
The Juliana House experience has taught FaCS that with well targeted effort and little cost, substantial and ongoing energy and cost savings can be achieved.

Energy saving by the Department of Health and Ageing

The Department of Health and Ageing (DOHA) has undertaken a number of energy saving initiatives during the reporting year including completing a major lighting upgrade for its four core buildings. Two of these buildings have been responsible for nearly 60 per cent of the total departmental tenant light and power consumption. The upgrade work was completed under an Energy Performance Contract which offers guaranteed savings and a return on investment as well as focusing attention on outcomes and ongoing improved performance. Energy Performance Contracts also offer unique partnership opportunities through transference of risk and the prospect of tapping system expertise to implement energy efficiency projects.

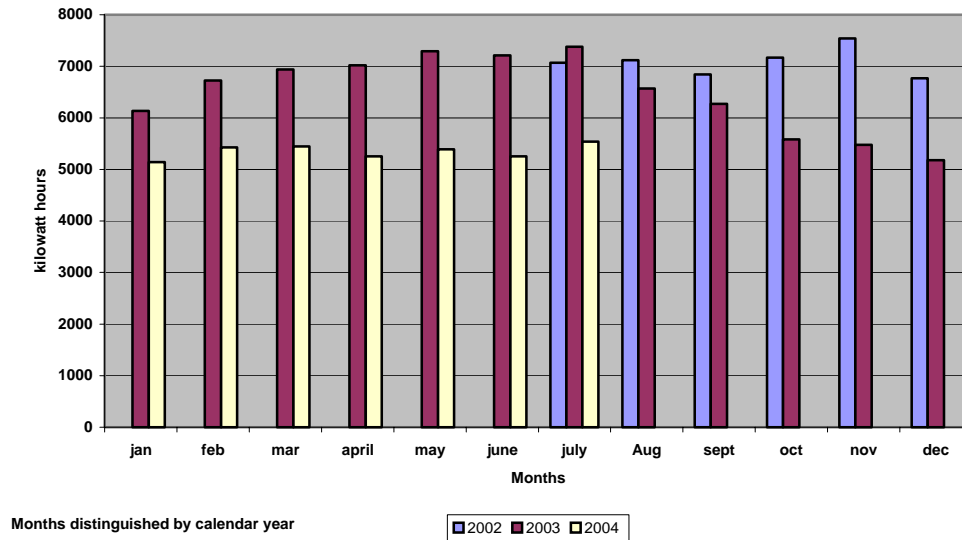
Though it is as yet too early to evaluate the Energy Performance Contract, it is clear that in the six month period since completion of the upgrade work the two main buildings have registered a significant reduction in energy and consequent reductions in CO₂ emissions as shown in 2004 consumption in the graphs below. The upgrade included an occupancy-based lighting control system to provide optimum lighting conditions, and as a result illumination levels in the two main buildings are at least 30 per cent higher and more uniform despite the number of lamps being reduced by 50 per cent.

Figure 18 Albemarle Tenant Energy July 2002–June 2004 Average Daily Consumption Trends



Figures 17 and 18 underscore the history of data collection and energy management as experienced by many agencies. For instance, the 2002 data reflects a period when the buildings each had a single meter and electricity usage was allocated between tenant and house on an agreed percentage basis. In January 2003 separate tenant and house meters were installed and commissioned. As Figure 18 shows, simply by identifying tenant consumption separately, the department made significant savings. The improved and separated meters also permitted, for the first time, analysis of consumption on a daily basis including documentation of the high level of after hours and weekend consumption. The major energy reductions from late 2003 into 2004 are due to the lighting upgrade. Lower energy illumination reduced business hours consumption and lighting control systems significantly reduced after hours and weekend energy usage.

Figure 19 Alexander Tenant Energy July 2002–June 2004 Average Daily Consumption Trends



Access to high quality data from the upgraded buildings has encouraged a more critical look at consumption patterns in the other buildings occupied by DOHA in the ACT and nationally. For instance, interrogation of high weekend energy consumption in a couple of buildings disclosed that some owners' services had been inadvertently linked to tenant meters. In other instances, lack of reliable and timely data demonstrated the difficulties in identifying and managing bad practices, such as non-powering down of lights and equipment out-of-hours, leading to over-consumption. Of course, like many agencies DOHA is a co-tenant in many locations and is not able to regulate when invoices and data is received from facilities managers. In some instances there have been delays of up to nine months in the receipt of energy information. Co-tenancy arrangements can also result in frustration for staff when they realise that the department does not reap benefits from controlling local consumption as energy billing is based on percentages agreed in leases. To this end, where it is feasible, DOHA has been seeking to install separate metering with revised billing arrangements in shared buildings.

Aside from the raw energy data DOHA has grappled with compiling accurate occupancy data to ensure credible intensity calculations. Occupancy data needs to reflect a staff profile that includes many part-timers, contractors, consultations and some Therapeutic Goods Administration colleagues working in DOHA buildings. DOHA continues to have difficulty in accurately identifying occupancy because human resource data is linked to pay records and collected on a divisional/state basis. As such, the data does not record consultants and contractors paid through invoices nor does it capture staff of outsourced providers located within DOHA buildings. In past years contractor occupancy data was very roughly estimated but the basis of these estimations is being increasingly refined through snapshot reports and tracking back finance expenditure against contracts. DOHA is continuing to refine the occupancy methodology.