

## THE CASE FOR MINIMUM ENERGY PERFORMANCE STANDARDS

Australian and New Zealand energy efficiency regulators are proposing the introduction of minimum energy performance standards (MEPS) for computers and monitors. This fact sheet is the first stage in the public consultation process aimed at agreeing MEPS levels.

### Computer and Monitor Stock Growth

Since IBM introduced the first personal computer in 1981, the world has seen phenomenal growth in both office and home use of computers. This growth is hard to accurately assess as up-to-date statistics about the entire Australian and New Zealand markets are difficult to obtain.

However, one authoritative source of data, the Australian Information Industry Association (AIIA), estimated that in 2006 there were 24 million computers used in Australia spread across the home, small business, corporate and government sectors.

**Table 1: Computer and monitor stock in Australia, 2006**

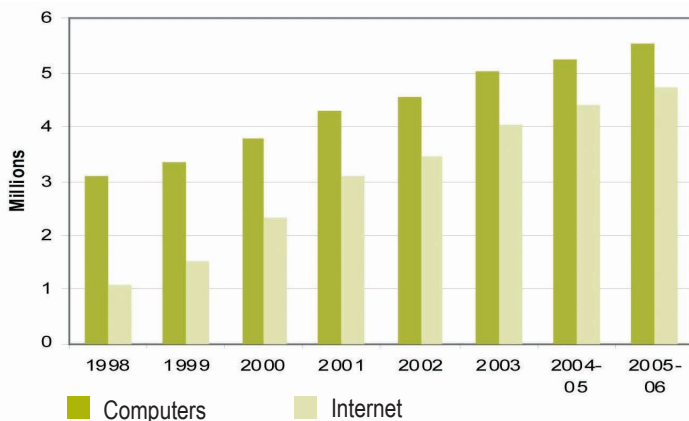
	PC	CRT	LCD	Notebook*
Office	12.8	10.2	2.6	3.2
Domestic	7.6	7.2	0.4	0.4

\* Please note references to the term 'notebooks' also includes laptops and tablets. 'Notebooks' together with personal computers (PCs)/desktops, integrated computers and desktop-derived servers make up our definition of 'computers'. In addition, cathode ray tubes (CRT) and liquid crystal display (LCD) monitors are the types of monitors considered in the study.

IDC Australia published data for the 2004-2006 period which showed expected continued growth in this market, increasing at some 20% per annum in Australia.<sup>1</sup>

At first glance this indicates a significant increase from the 9.2 million computers that was estimated as recently as in 2002.<sup>2</sup> Extrapolating from the 9.2 million, using this historical market data, suggests there were at least 19 million computers in use in Australia in 2006 – nearly one for each individual in Australia

**Figure 1: Household penetration of computers and the Internet in Australia**



### Energy Consumption

The exact amount of energy consumed by computers in Australia is hard to define. However, recent Australian Bureau of Statistics (ABS) data shows two thirds of Australia's 8 million homes now have access to at least one computer and more than half of these homes have access to the internet<sup>3</sup>.

The hours of usage of computers and the internet in the business sector is increasing according to many domestic and international sources. With easier and more affordable access to broadband internet, growth in e-learning, e-commerce and e-government, media, transport and health facilities offering online-services, the overall computer energy consumption is rising dramatically.

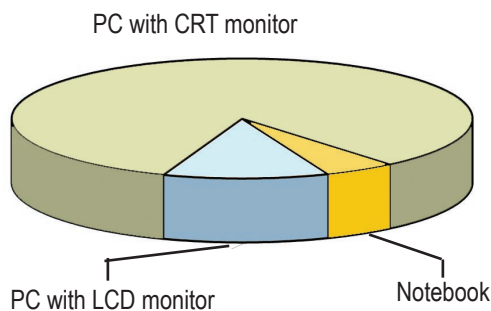
Research has been undertaken in Europe and America into home and office computer energy consumption patterns. If the assumptions derived from the research are applied to Australian stock, we can estimate that computer and monitor energy consumption approached 6,800 GWh in 2006.

<sup>1</sup> <http://www.itfacts.biz/index.php?id=P3591>, IDC Australia

<sup>2</sup> Recycle IT! Summary report – NSW Dept. of Environment and Conservation 2004

<sup>3</sup> ABS 4160.0 2005-06

Figure and Table 2: Energy consumption of laptops, desktop (PC) with CRT and LCD monitors

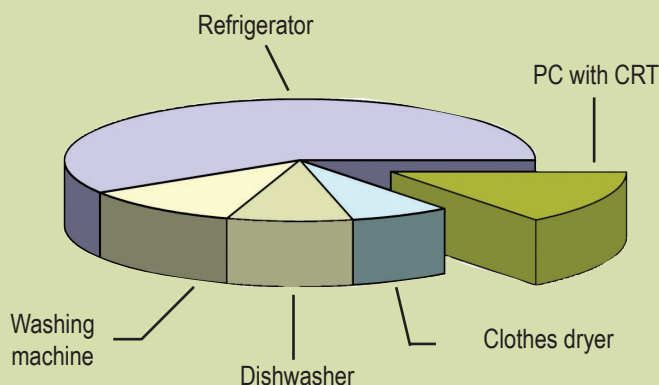


2006	GWh	Office %	Home %
PC with CRT monitor	5,672	69%	31%
PC with LCD monitor	790	91%	9%
Notebook	335	93%	7%

## Comparison of Computer Energy Consumption With Other Household Products

Computers may use more energy than some energy-hungry appliances already the subject of mandatory market regulation. In fact, energy consumption of a personal computer with a CRT monitor can exceed most common laundry appliances such as clothes dryers, clothes washers and washing machines. Houses networked with several computers with internet access, delivered by a router, server and with printer capability will use significantly more energy. The energy consumption of that system may even approach same levels of energy as a family refrigerator in some homes.

Figure and Table 3: Comparison of computer energy consumption with other household products



2006	GWh
PC with CRT	242
Clothes dryer	120
Dishwasher	144
Washing machine	187
Refrigerator	990

## Energy Projections

In the absence of market intervention, the energy consumption of computers and monitors is projected to increase largely because of two following scenarios depicted by the Figures 4 and 5. The first scenario represents a range of downward pressures on computers and monitors due to reductions in monitor energy consumption as the market moves towards LCD from CRT, and, to increasing sales of laptops and notebooks instead of personal computers. Figure 4 assumes very conservative stock growths of between 5% and 10% for the home and office sectors respectively. The second scenario, depicted by Figure 5, adopts the aggressive growth rates in both sales, based on IDC Australia sales growth data of 20%, and energy consumption. It predicts even greater power usage as consumers move to larger screens and more affordable computers continue to enter our market (encouraging more sales growth).

Scenarios depicted in Figures 4 and 5 forecast the energy consumption of computers and monitors will be circa 10,000 GWh in 2014 and 2009 respectively. In the low growth scenario, saturation is forecast to occur in 2014 and in the high growth scenario, saturation is forecast to occur in 2009.\*

Government will continue to engage with the computer industry and those who collect data on computers and monitors to refine estimates of future energy projections. Current trends show that consumers are purchasing more LCD monitors, switching from CRT monitors that consume more energy.

\* 'Market saturation' is a term used to describe a situation in which a product has become fully diffused (distributed) within a market.

Figure 4: stock growths of 5 - 10%

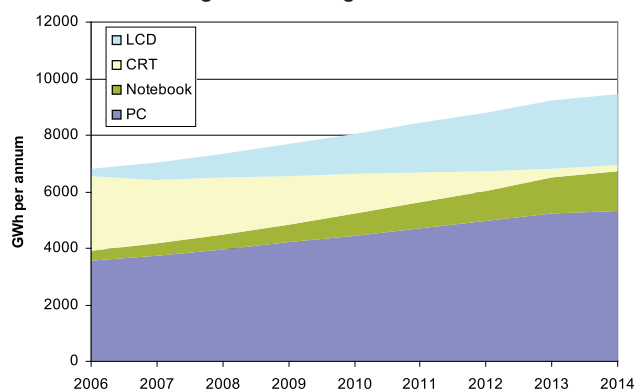
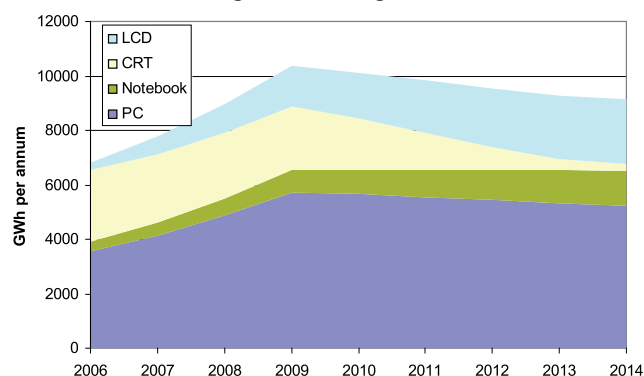


Figure 5: stock growths of 20%



## Energy Saving Potential

Scope certainly exists to reduce the energy consumption of all computers and monitors, as evidenced in the tables opposite. In the United States, the Environmental Protection Agency (EPA) gathered data on 141 PCs from six manufacturers and 89 notebooks from six manufacturers to establish the degree of compliance of existing computer stock with its most recent specification.<sup>4</sup>

Energy consumption is highly dependant upon computer and monitor types and time in the various operational modes (see Table 4). Figure 6 shows typical energy consumption in home and office use. With an office PC, if the CRT monitor is replaced with an LCD monitor, annual energy consumption can be reduced from 380kWh to 280kWh. Similarly, using an LCD monitor instead of a CRT monitor in the home will save 55kWh annually.

US EPA data also showed that the compliance rate for idle mode (on, but not being used) could double just through the use of a more efficient internal power supply. Current power supplies are typically 65% to 70% efficient at idle power levels, although 80% efficient, comparably priced power supplies are already available and used by some manufacturers.<sup>5</sup>

The European Commission's Preparatory Study for Eco-design Requirements of Energy Using Products (EuP)<sup>6</sup> report on computers and monitors concurs with the US conclusions on power supplies and indicates significant energy savings can also be made by improved power management (see Figure 7). Estimates were compared to a base case annual energy consumption (includes all energy from production, distribution, use and disposal).

The EuP study also forecasts costs of power management, efficient power supplies and other initiatives. With respect to power management, simple software and enabling power management delivers energy savings between 20% to 35% for computers and 30% to 40% for monitors. The report also forecasts that efficient power supplies might increase prices by 5 Euros for each product.

Table 4: EPA Compliance Results

2006	Desktops	Notebooks
Idle State	28%	30%
Sleep Mode	90%	72%
Standby (Off Mode)	79%	81%
All Requirements	21%	25%
Overall Specification - all Desktops and Notebooks	22%	

Figure 6: Typical Energy Consumption

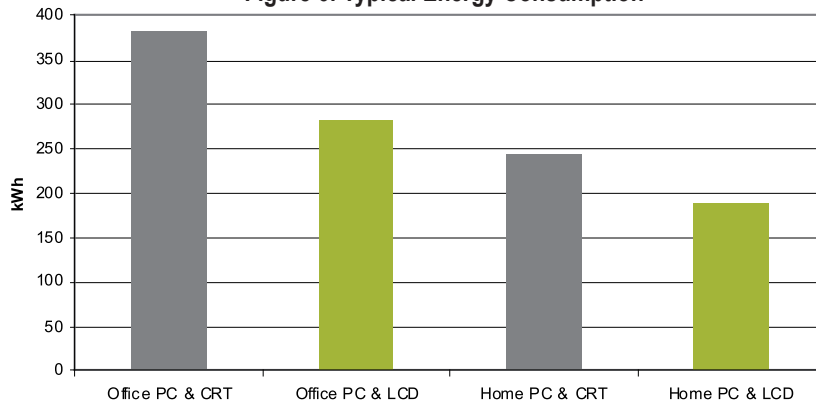


Figure 7: EuP Potential Energy Reduction

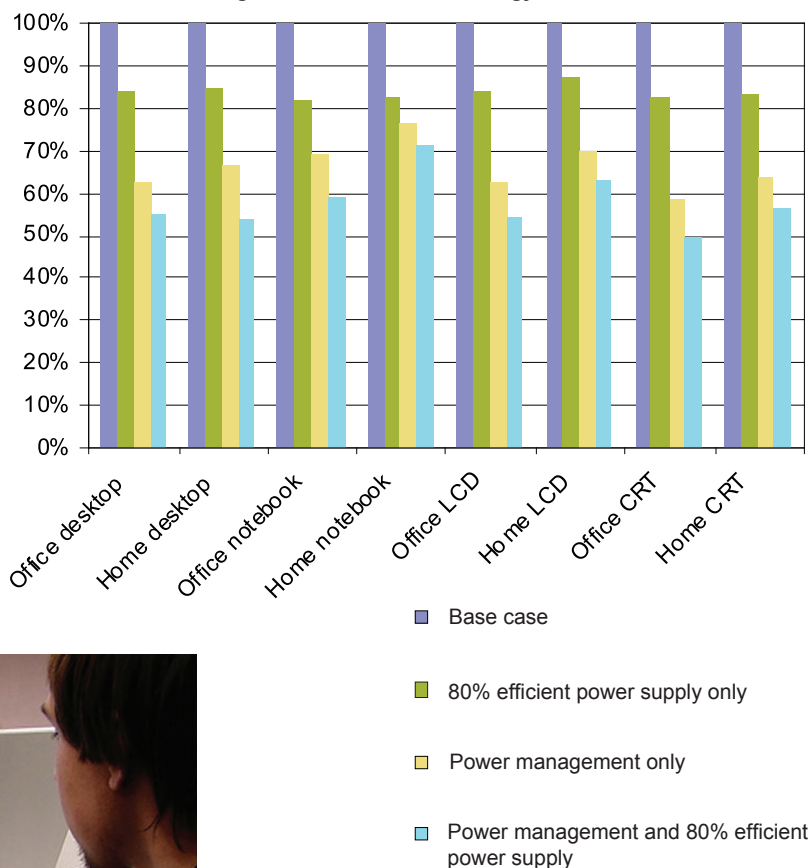


Photo courtesy of flickr CC BY-CC-SA

<sup>4</sup> [http://www.mtprog.com/ApprovedBriefingNotes/PDF/MTP\\_BNICT18\\_2007March30.pdf](http://www.mtprog.com/ApprovedBriefingNotes/PDF/MTP_BNICT18_2007March30.pdf)

<sup>5</sup> <http://www.powerpulse.net:80/story.php?storyID=17523&source=1>

<sup>6</sup> [www.ecocomputer.org](http://www.ecocomputer.org)

**Table 5: Computer market share in Australia**

Brand	Q1 2005 <sup>7</sup>	Q1 2006 <sup>8</sup>	Q1 2007 <sup>9</sup>
HP	16.3%	18.6%	20.5%
Dell	13.3%	15.3%	15.4%
Acer	10.4%	12.3%	11.8%
Toshiba	5.2%	7.8%	8.6%
IBM/Lenovo	8.1%	6.0%	6.9%
Apple	3.5%	3.2%	5.0%
Asus	N/A	N/A	3.7%
Optima	3.0%	2.3%	N/A
Others	40.2%	34.5%	28.1%

**Table 6: Computer monitor market share in Australia**

Brand	Q1 2005 <sup>10</sup>	Q1 2006 <sup>11</sup>	Q1 2007 <sup>12</sup>
Samsung	15.5%	20.0%	18.7%
BenQ	14.5%	15.7%	8.6%
LG Electronics	18.0%	14.8%	16.6%
Viewsonic	N/A	12.4%	17.4%
Acer	11.1%	11.9%	9.8%
Philips	10.2%	N/A	N/A
Others	30.7%	25.2%	28.9%

<sup>7</sup> [http://www.idc.com.au/press/release.asp?release\\_id=159](http://www.idc.com.au/press/release.asp?release_id=159)

<sup>8</sup> [http://www.idc.com.au/press/release.asp?release\\_id=230](http://www.idc.com.au/press/release.asp?release_id=230)

<sup>9</sup> <http://www.gamepro.com.au/index.php/id;1150810906>

<sup>10</sup> [http://www.idc.com.au/press/release.asp?release\\_id=164](http://www.idc.com.au/press/release.asp?release_id=164)

<sup>11</sup> [http://www.idc.com.au/press/release.asp?release\\_id=253](http://www.idc.com.au/press/release.asp?release_id=253)

<sup>12</sup> <http://www.gamepro.com.au/index.php/id;263831746>

<sup>13</sup> Source – Ecocomputer.org

## Industry Partners

The Australian computer and monitor markets are dominated by international companies. Brand names have significant market share and compete against 'white box' or generic brand computer suppliers.

International voluntary programmes have encouraged improvements in computer and monitor energy performance and demonstrate what is technically and commercially possible but global suppliers are still not delivering the optimum efficiency for all products in all markets

## Energy Star & Other Programmes

By far the most comprehensive and influential programme is the US ENERGY STAR programme. First implemented in 1999, the programme has revised its energy efficiency parameters to the most recent computer version 4.0, effective from July 2007. This current version expanded the scope of the specification to target not only desktop and laptop/notebook computers, but also desktop derived servers, games consoles, workstations and integrated computers. With respect to computers, Australia's initial focus on computers will be on desktop and notebook models.

The energy specification encompasses the additional modes of 'off' and 'idle', which is the state after the computer operating software has loaded and the computer is ready for use. ENERGY STAR requirements specify that display and computer power management must be enabled at shipment. The requirements also specify that conversion efficiency of the power supply be a minimum of 80% for desktop computers and for notebook computers must be compliant with the ENERGY STAR specification for external power supplies (AS/NZS4665).

Other programmes exist around the world but they are often based on developments from ENERGY STAR. Its programme for monitors is also the most comprehensive and influential programme. The most recent version (Version 4.1, Tier 2) commenced in January 2006 set maximum power levels for two automatic sleep modes and specified the modes: 'off', 'sleep' and 'active'.



**Table 7: Basic summary of computer programmes and their specifications**

Programme	Country	Date	Type	Notes
Eco-label – the Flower	European Union	2005	Voluntary	PCs and notebooks – sleep 5W, Off 2W
ENERGY STAR	USA	July 2007	Voluntary	PCs - sleep 4W, Off 2W, Notebooks – sleep - 1.7W, Off 1W. Idle power depends on computer category
ENERGY STAR	EU	July 2007	Voluntary	Replica of US ENERGY STAR
TCO Label	Global	2005	Voluntary	PCs – sleep 5W, off 2W Notebooks – sleep 4W, off 2W
Nordic* Eco-labelling. The swan	The five Nordic countries	2005	Voluntary	PCs and notebooks – sleep 5W, Off 2W
Blue Angel	Germany	2006	Voluntary	PCs On (ACPI S3) 4.5W Off 2.5 – 3.5W depending upon wake up. Notebooks On (ACPI S3) 3.5W Off 2W
Group for energy efficient appliances	6 EU countries	2006	Voluntary	PC, notebook, desktop computers – Sleep 5W Off 2W Idle 70W
CECP	China	2003	Voluntary	Sleep 10W, Off 3W. Time to sleep – 30 minutes
KEMCO	Korea	2003	Voluntary	Default sleep time and maximum power <sup>14</sup>
KEMCO	Korea	2005-7	Voluntary	Energy Boy label if <1W sleep. External power supplies 0.5 – 0.75W
KEMCO	Korea	2009	Mandatory	External power supplies – Energy Star tier 1
		2010	Mandatory	1 W warning or compliance label
Executive Order 13221/ FEMP	USA	2001	Recommended for Federal purchases	Standby/off only. Desktop ≤ 2W, Integrated computer ≤ 3W, Notebook ≤ 1W, Workstation ≤ 2W
Energy Policy Act 2005	USA	Sept. 2005		Requires federal agencies to buy either ENERGY STAR products or products designated as energy efficient by the Federal Energy Management Program (FEMP).
Executive Order 13423/ FEMP	USA	2007		Requires federal agencies to activate ENERGY STAR “sleep” features on computers and monitors and mandates that federal agencies buy EPEAT registered (ENERGY STAR) products.
Top Runner	Japan	2007		The Top Runner program aims to raise energy performance of future products above that of the most energy efficient product in the current market. 2007 targets have been set for a range of computer classifications and performance is measured by the average of standby and idle power per million calculations. Compliance is measured weighted average efficiency of shipments in each classification. That is a manufacturer can supply compliant and non compliant products as long as the weighted average meets the target for the classification. Top Runner also includes specifications for hard disk drives.

Note: \*Nordic countries include Sweden, Norway, Denmark, Finland and Iceland

**Table 8: Basic summary of computer monitor programmes and their specifications<sup>15</sup>**

Programme	Country	Date	Type	Off	Sleep	Active
ENERGY STAR	USA	2006	Voluntary (Tier 2)	1W	2W	If Megapixels (MP) less than 1, then 23W
ENERGY STAR	EU	July 2007	Voluntary	2W	4W	
TCO Label	Global	2006	Voluntary	1W	2W	If MP greater than 1, then 28 x MP
Eco label the Flower	EU	2005	Voluntary	1W	2W	
Blue Angel	Germany	2006	Voluntary	1W	2W	
Group for energy efficient appliances	6 EU countries	2006	Voluntary	1W	2W or 2.3W with USB	
CECP	China	2003	Voluntary	2W	4W	NA
KEMCO	Korea	2004	Voluntary	2W	4W	NA
Executive Order 13221/ FEMP	USA	2001	Recommended for Federal purchases	1W	NA	NA
Energy Policy Act 2005	USA	2005				Requires federal agencies to buy either ENERGY STAR products or products designated as energy efficient by the Federal Energy Management Program (FEMP).
Executive Order 13423/ FEMP	USA	2007				Requires federal agencies to activate ENERGY STAR “sleep” features on computers and monitors and mandates that federal agencies buy EPEAT registered (ENERGY STAR) products.

<sup>14</sup> <http://www.clasponline.org/programinfo.php?no=786>

<sup>15</sup> Source – [ecocomputer.org](http://ecocomputer.org) and [energystar.gov](http://energystar.gov) links to federal sites

## Consumer Demand for Information

In March 2007 an Australian survey of 1500 on-line internet users was conducted by AC Nielsen to investigate consumer attitudes towards computers and energy labelling. Ninety-five per cent of computer/internet users were in favour of mandatory labelling of computers and monitors. During that study, 1400 people were contacted by phone, over 80% of those respondents were in favour of mandatory labelling of computers and monitors. This statistically relevant sample clearly indicates consumers value energy performance information. Given the positive consumer response to the survey, some form of endorsement labelling is required and government will engage with industry to design a suitable mechanism.

## The Australian and New Zealand Regulatory Plan

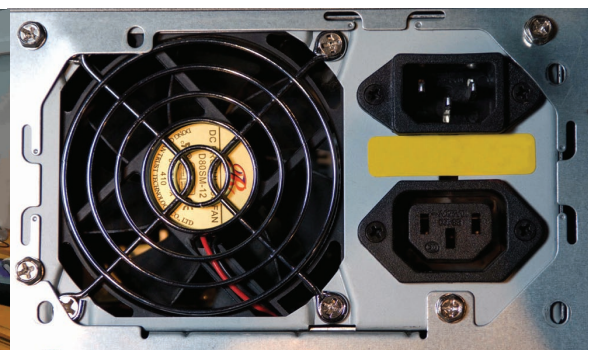
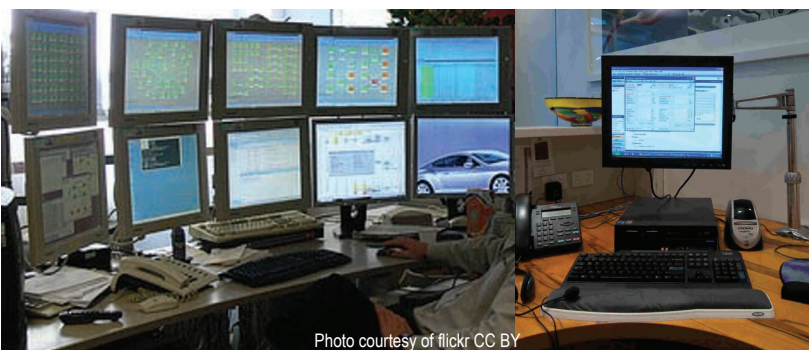
In October 2004, energy efficiency regulators announced plans to consider minimum energy performance standards for computers and monitors.<sup>16</sup> The intention to push efficiency through regulation was further supported at the 2006 Standby Conference in Australia.<sup>17</sup> This fact sheet launches the consultation process for regulating computers and monitors in Australia and New Zealand and will be supported by a more detailed technical case.

Australian and New Zealand energy efficiency regulators are proposing to recommend basing regulatory energy performance and labelling schemes on the US ENERGY STAR specifications – specifically the existing Computers Version 4.0 and Monitors Version 4.1 as ENERGY STAR specifications are essentially the de facto global test and performance standards for computers and monitors.

Australian and New Zealand energy efficiency regulators are proposing to recommend minimum energy performance standards (MEPS) for both computers and monitors from October 2009.

The Australian and New Zealand Government will also develop a strategy for computers covering the next 10 years that will include:

- An initial focus on desktop computers, notebooks and computer monitors.
- The use of measures to cover all modes of operation: potentially ranging through 'off', 'passive standby', 'active standby' and 'on', as technology and testing becomes available.
- Further measures for imaging and networking equipment, workstations and servers at a later stage.
- Research on the energy implications of networked homes.
- Data centre energy performance – direct energy consumption and air-conditioning energy consumption.



<sup>16</sup> <http://energyrating.gov.au/library/details200406-mepscomputers.html>

<sup>17</sup> National Standby Conference – Canberra, November 2006

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