EQUIPMENT ENERGY EFFICIENCY PROGRAM

Consultation Regulatory Impact Statement

SUPPLEMENTARY INFORMATION

Proposed Minimum Energy Performance Standards for Computers and Computer Monitors

Issued by the Equipment Energy Efficiency Committee under the auspices of the Ministerial Council on Energy

A joint initiative of Australian, State and Territory and New Zealand Governments

SUPPLEMENTARY INFORMATION

A Consultation Regulatory Impact Statement (RIS) has been prepared following extensive engagement with stakeholders and is a precursor to the preparation of a Decision RIS. A RIS is required whenever new or more stringent mandatory energy performance measures are proposed by government. Under the guideline agreed by all Australia jurisdictions and New Zealand, product regulation is undertaken only where the benefits outweigh the costs to the community; and the cost of improving appliance efficiency is outweighed by the energy and greenhouse gas (GHG) emissions savings made over the lifetime of the product.

This report has been prepared to supplement the Consultation RIS by providing additional details of the analysis of the benefits and costs of regulating Minimum Energy Performance Standards (MEPS) for desktop, notebook/tablet, integrated computers, small-scale servers and computer monitors.

This document is further development of the technical report which was the initial analysis of the potential for the introduction of MEPS for computers and computer monitors, published in October 2007. This report is available at

http://energyrating.gov.au/library/pubs/200712-computers-monitors.pdf

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GLOSSARY AND ABBREVIATIONS

ABS	Australian Bureau of Statistics
AS/NZS	Australian and New Zealand Standards
BAU	Business as usual
CO_2-e	Carbon dioxide equivalent units
CoAG	Council of Australian Governments
COP	Coefficient Of Performance
CRT	Cathode ray tube
DCCEE	Department of Climate Change and Energy Efficiency
EC	European Commission
EECA	Energy Efficiency and Conservation Authority – New Zealand
EPA	Environment Protection Agency (USA)
EPS	External Power Supply
EU	European Union
E3	Equipment Energy Efficiency Committee (formerly NAEEEC)
GATT	General Agreement on Tariffs and Trade
GWA	George Wilkenfeld & Associates
GWh	Giga watt hour – 1 million watt hours
IEC	International Energy Commission
kt	Kilo tonnes – 1 thousand tonnes
kWh	Kilo watt hour – 1 thousand watt hours
LCD	Liquid crystal display
MEA	Mark Ellis & Associates
MEPS	Minimum Energy Performance Standards
MFD	Multi-function device – imaging equipment
MoU	Memorandum of understanding
MRET	Mandatory Renewable Energy Target
Mt	Mega tonnes – 1 million tonnes
NAEEEC	National Appliance Equipment and Energy Efficiency Committee (now E3)
NPV	Net Present Value
NZ	New Zealand
PSMA	Power Supply Manufacturers Association (USA)
RIS	Regulatory Impact Statement
SMPS	Switch Mode Power Supply
SNZ	Standards New Zealand
TTMRA	Trans Tasman Mutual Recognition Agreement

1 COMPUTERS AND COMPUTER MONITORS

Until 2004, with the publication of the report *Minimum Energy Performance Standards for Computers and Computer Monitors*[1], E3 (formerly NAEEEC) had not focused on computers and computer monitors as a separate product category, but had been developing policies applying to end-use appliances. These policies are outlined below.

ENERGY STAR®
New Zealand actively promotes international ENERGY STAR® for some office and home entertainment equipment, specifically:

- Computers and computer monitors
- Printers and fax machines
- Photocopiers
- Multi-function devices
- TVs
- VCRs
- Audio and DVD products.

ENERGY STAR® is a voluntary program whereby conforming products are required to meet ENERGY STAR® criteria, which are identical to those in the US. These criteria currently refer only to standby modes, although the current US criteria for computers, computer monitors and imaging technologies include criteria for active mode.

STANDBY POWER PLAN
In 2003 and 2004, NAEEEC published a series of Standby Profiles, indicating the Government's plans for a range of appliances. These include:

- Photocopiers
- Computer Printers
- Scanners & Multifunction Devices
- Portable Stereos
- Video Cassette Recorders
- Modems
- PC Speakers
- Garage Doors
- Burglar alarms
- Integrated Stereos
- Set Top Boxes

In accordance with the Standby Strategy, proposed efficiency targets were identified for each appliance and the Government signalled its commitment to publish the required criteria in Australian Standards.

1.1 STANDBY POWER STRATEGY

Standby power is the energy consumed by an appliance while it is not performing its primary function. In 2006 standby power of all appliances accounted for around 10% of the energy consumed in Australian homes. Since 2002, a national Standby Power Strategy has been in place with the aim of curtailing excessive standby power (MCE 2002, *Money Isn't All You're Saving*). The strategy runs until 2012 and involves formulating coordinated product-

[1] http://energyrating.gov.au/library/details200406-mepscomputers.html

specific plans to address excessive standby over the next ten years, within the umbrella of the IEA "One Watt" initiative.[2] In 2004 E3 identified computers and computer monitors as products suitable for specific action under the plan.

> *'The global computing industry continues to grow rapidly, developing new technologies and applications at a breathtaking rate. International interest in minimising the negative environmental impacts is substantial, for example through improving recycling and disposal practices, and through reducing energy consumption. While Australia is a small part of the world computer market, the Australian community has an opportunity to benefit from international experience to develop a considered and proactive stance for products supplied to our country.'* [MEA 2004]

Subsequently Australian and international studies have identified computers and computer monitors as priority candidates for intervention to address their energy consumption. The results of these studies are documented in the E3 report '*Analysis of Potential for Minimum Energy Performance Standards for computers and monitors*'[3] [E3 200712] and are expanded upon in this analysis.

With the rapidly growing international focus on the energy performance of these globally traded products, Australia identified the need to develop internationally harmonised standards. In August 2007, Australia proposed the establishment of harmonised standards among the major trading countries at the Asia Pacific Partnership (APP) Buildings and Appliances Task Force (BATF). This proposal was accepted and the BATF agreed to make computers and computer monitors priority products. The proposal recommended that standards and performance requirements are based upon the internationally recognised US ENERGY STAR® specifications for computers and computer monitors.

1.2 Scope and definitions

In line with the BATF proposal, this RIS addresses the testing and the energy performance requirements of desktop, notebook/tablet, integrated computers, small-scale servers and LCD computer monitors for a range of operational modes.

It is proposed that the Australian and New Zealand standards adopt the definitions and terminology of the US and European ENERGY STAR®[4] [5]program to provide for internationally harmonised specifications. This should simplify processes and recognises that computers and computer monitors are globally traded products.

1.2.1 Computers

A computer is defined as a device which performs logical operations and processes data. Computers are composed of, at a minimum:

- a central processing unit (CPU) to perform operations;

[2] In 2003, to provide a uniform test method for the measurement of standby power consumption, Standards Australia published AS/NZS 62301 Household Electrical Appliances—Measurement of Standby Power (a clone of IEC CDV draft).
[3] http://www.energyrating.gov.au/library/pubs/200712-computers-monitors.pdf
[4]http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Version5.0_Computer_Spec.pdf
[5] http://www.energystar.gov/ia/partners/product_specs/program_reqs/displays_spec.pdf

- user input devices such as a keyboard and mouse; and
- a monitor to display output information.

Computers include both stationary and portable units, including desktop computers, integrated computers, notebook computers, tablet PCs and small-scale servers.

Although computers must be capable of using input devices and displays; computer systems do not need to include these devices on shipment to meet this definition.

Within the RIS, four types of computers are addressed.

1.2.1.1 Desktop computer

Is a computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilise an external computer display, keyboard, and mouse.

1.2.1.2 Integrated computer

Is a desktop system where the computer and computer display function as a single unit and receive its AC power through a single cable.

Integrated computers come in one of two possible forms:

1. a system where the display and computer are physically combined to form a single unit.

or

2. a system packaged as a single system where the computer monitor is separate but connected to the main chassis by a DC power cord and both the computer and display are powered from a single power supply. As a subset of desktop computers, integrated computers are typically designed to provide similar functionality as desktop systems.

1.2.1.3 Notebook/Tablet/Netbook computers

A computer designed specifically for portability and to be operated for extended periods of time without a direct connection to an AC power source. Notebooks, tablets and netbooks utilise an integrated display and are capable of operation from an integrated battery or other portable power source. In addition, most of these products use an external power supply and have an integrated keyboard and pointing device, though tablets use touch-sensitive screens. Notebook, tablet and netbook computers are typically designed to provide similar functionality to desktop computers except within a portable device. For the purposes of this report, docking stations are considered accessories, therefore the performance levels associated with these products are not included.

1.2.1.4 Small-scale Server

A computer that typically uses desktop components in a desktop form factor, but is designed primarily to be a storage host for other computers. A computer must have the following characteristics to be considered a Small-Scale Server:

a) Designed in a pedestal, tower, or other form factor similar to those of desktop computers such that all data processing, storage, and network interfacing is contained within one box/product;

b) Intended to be operational 24 hours/day and 7 days/week, and unscheduled downtime is extremely low (on the order of hours/year);

c) Capable of operating in a simultaneous multi-user environment serving several users through networked client units; and

d) Designed for an industry accepted operating system for home or low-end server applications (e.g., Windows Home Server, Mac OSX Server, Linux, UNIX, Solaris).

Small-Scale Servers are designed to perform functions such as providing network infrastructure services (e.g. archiving) and hosting data/media. These products are not designed to process information for other systems or run web servers as a primary function. Small-Scale Servers in this specification are limited to computers marketed for non-data centre operation (e.g. homes, small offices).

1.2.2 Computer Monitors

A commercially-available, electronic product with a display screen and its associated electronics encased in a single housing that is capable of displaying output information from a computer via one or more inputs, such as VGA, DVI, and/or IEEE 1394. The computer monitor usually relies upon a cathode-ray tube (CRT), liquid crystal display (LCD), or other display device. This definition is intended primarily to cover standard computer monitors designed for use with computers. In the RIS, the computer monitor must have a viewable diagonal screen size greater than 30.5 cm (12 inches) and must be capable of being powered by a separate AC wall outlet or a battery unit that is sold with an AC adapter. Computer monitors with a tuner receiver which operate as televisions are not included. CRT computer monitors are also not included as they are being replaced by LCD computer monitors expect for use in a very small number of specialist applications.

1.3 Operation

1.3.1 Computers

Computers typically operate in four modes.

Standby Level (Off Mode): The power consumption level in the lowest power mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the appliance is connected to the main electricity supply and used in accordance with the manufacturer's instructions. For systems where Advanced Configuration and Power Interface (ACPI) standards are applicable, Standby (Off) correlates to ACPI System Level S5 state.

Sleep Mode: A low power state that a computer is capable of automatically entering after a period of inactivity or by manual selection. A computer with sleep capability can quickly 'wake' in response to network connections or user interface devices with a latency of ≤ 5 seconds from initiation of wake event to system becoming fully usable including rendering of display. Sleep Mode most commonly correlates to ACPI System Level S3 (suspend to RAM) state for systems where ACPI standards are applicable

ACPI is the industry standard power management technology which enables the operating system to control power to a computer and peripheral devices.

Idle State (On or 'In Use' mode): The state in which the operating system and other software have completed loading, a user profile has been created, the machine is not in sleep mode, and activity is limited to those basic applications that the system starts by default.

Active State (On or 'In Use' Mode): The state in which the computer is carrying out useful work in response to:

a) prior or concurrent user input

or

b) prior or concurrent instruction over the network. This state includes active processing, seeking data from storage, memory, or cache, including idle state time while awaiting further user input and before entering low power modes.

Other modes: Other modes are used to reduce power consumption, such as hibernate and hard disk(s) off.

Hibernate is an additional low power option that typically must be activated by the operator or system administrator. This is more likely to be implemented on notebook computers, activated when the notebook is using its internal battery and the operator wishes to achieve maximum computer usage time.

Hibernate saves an image of all open files and documents, then powers down the computer. When the power is turned on, all the files and documents saved are opened exactly as they were prior to hibernation.

Hard disk(s) off switches off the power that spins the hard disk after an operator set time. Again this is more likely to be activated for notebooks using the internal battery.

1.3.2 COMPUTER MONITORS

Computer monitors typically operate in three modes.

On Mode/Active Power: The computer monitor is connected to a power source and produces an image. The power requirement in this mode is greater than the power requirement in Sleep and Off Modes described below.

Sleep Mode/Low Power: The reduced power state that the computer monitor enters after receiving instructions from a computer or via other functions. A blank screen and reduction in power consumption characterise this mode. The computer monitor returns to On-Mode with full operational capability upon sensing a request from a user or computer (e.g., user moves the mouse or presses a key on the keyboard).

Off Mode/Standby Power: The power state when the product is connected to a power source, produces no images, and is waiting to be switched to On Mode by a direct signal from a user/computer (e.g. user pushes power switch). The lowest power consumption mode, which cannot be switched off (influenced) by the user, and that may persist for an indefinite time when a computer monitor is connected to the main electricity supply and used in accordance with the manufacturer's instructions.

1.4 ENERGY PERFORMANCE

1.4.1 PERFORMANCE BY MODE

The US, EU and UK have conducted studies to obtain information on the power and energy performance of computers and computer monitors which are detailed in the European Union EuP Lot 3 report.[6] Similar data is also available for Australia from NAEEEC reports published in 2005. This is supplemented by data obtained through DCCEE commissioned testing of 56 computers sourced on the open market in 2009. The data indicates that computer power levels (Watts) are similar across the major markets (Table 1 to Table 5).

Table 1: Comparison of Desktop Computer Power Studies

	IVF Office	IVF Home	ENERGY STAR®	MTP lowest[7]	MTP Highest	NAEEEC Home[8]	NAEEEC Council[9]	DCCEE 2009
On/idle	70.5 – 78	50 – 79.7	23 – 221	39.4 – 55	192 – 218	65 – 140	28.1 – 90	18 – 163
Sleep	1.2 – 4.2	2.61 - 5	1.4 – 10.1	1.8 – 2.34	72.2 – 125.3		1.5 – 6.8	1.8 – 11.9
Off	1 – 2.3	0.7 – 3	0.4 – 10.1	0.9 – 1.31	9.64 – 13.04	0.7 – 7	0.7 – 2.3	1.1 – 6.7

Table 2: Comparison of Notebook Computer Power Studies

	IVF Office[10]	IVF Home	ENERGY STAR®	NAEEEC Home	NAEEEC Council	DCCEE 2009
On/idle	18 – 34.6	17 – 34.2	6.8 – 38.1	Note 1	15.4 – 44.6	9.8 – 37.4
Sleep	1.7 – 7.7	0.5 – 5	0.3 – 3.5	Note 1	Note 1	0.8 – 3.5
Off	0.3 – 3	0.28 – 3	0.1 – 2.4	Note 1	Note 1	0.4 – 2.6

Note 1 – data is available, but not included as the power recorded may be influenced by the condition of the batteries.

Table 3: Comparison of CRT Computer Monitor Power Studies

	IVF	TCO 2005	NAEEEC Home[11]
On/idle	75	60.4	60
Sleep	9	2.6	4 (est)
Off	1	2.2	2.2 (est)

[6] http://extra.ivf.se/ecocomputer/downloads/Eup%20Lot%203%20Final%20Report%20070913%20published.pdf
[7] PICT02-MTP-Desktop-PC-Testing-Activities-Results-v2.1.pdf
[8] http://energyrating.gov.au/library/pubs/200602-intrusive-survey.pdf 2005 data only
[9] http://energyrating.gov.au/library/pubs/200522-standby-local-gov.pdf
[10] European Union Energy using Products EuP Lot 3 study http://www.ecocomputer.org/
[11] http://energyrating.gov.au/library/pubs/200602-intrusive-survey.pdf 2005 data only

Table 4: Comparison of LCD Computer monitor Power Studies

	IVF	TCO 2005	ENERGY STAR®[12] 17 – 19 inch
On/idle	30 – 70	17.1 – 47	17.2 – 36.3
Sleep	0.65 – 2	0.5 – 4	0.4 – 1.6
Off	0.65 – 2	0.5 – 3	0.3 – 1.3

Table 5: Comparison Power Management Data – percentage of products with power management enabled

	Computers	Computer monitors
TIAX[13] USA Office	6 – 25%	
MTP[14] Home	22%	73%
NAEEEC Council	15%	86%
NAEEC Home	23%	

The industry driven Climate Savers Computing Initiative[15] estimates are even higher and that possibly 90% of desktop computers have the power management function disabled.

1.4.2 Energy Consumption by equipment type and use

The 2007 EU study[16] analysed and compared energy consumption data from a range of European and US reports. This study estimated the average annual energy consumption, by operational mode, for computers and computer monitors used in the office and home environments. As there is close agreement in the range of power levels between this study and the 2009 DCCEE testing, this data has been used to estimate current Australian and New Zealand energy consumption and potential savings from implementation of energy efficiency requirements. Figure 1 shows estimates of annual energy consumption by computer and computer monitor type, market sector and operational mode.

To put their typical energy consumption in Australia into perspective, Figure 3 compares their annual energy with that of common household products already regulated for energy performance.

12 http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/monitors/Draft_5.0_Dataset_Analysis.xl
13 Quoted from EuP Lot 3 study
14 UK Market Transformation Programme – Monitoring Home Computers
15 http://www.climatesaverscomputing.org/
16 European Union Energy using Products – http://extra.ivf.se/ecocomputer/downloads/Eup%20Lot%203%20Final%20Report%20070913%20published.pdf

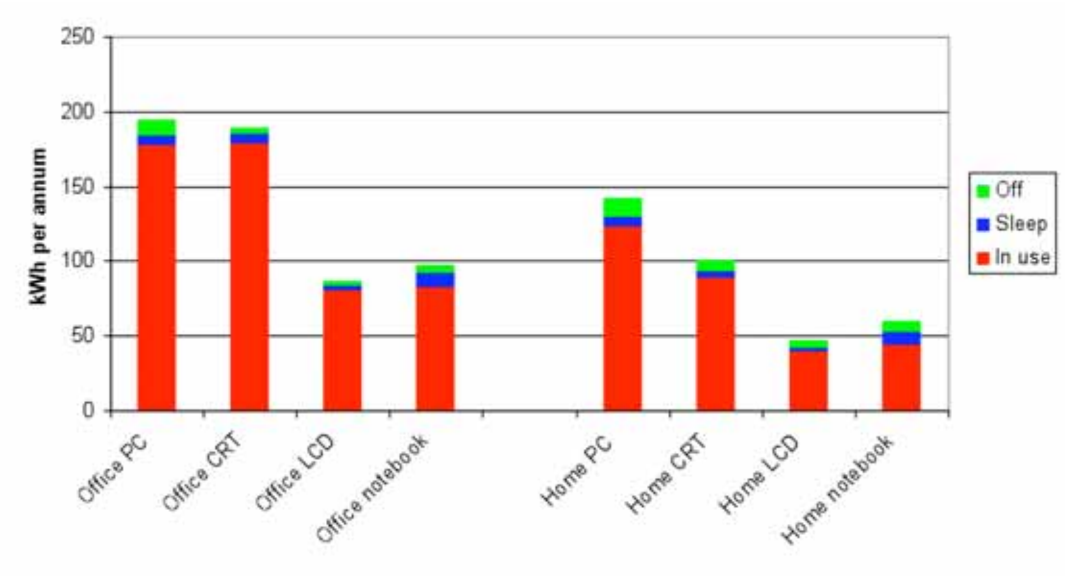

Figure 1: Energy consumption by equipment type, market sector and operational mode

Figure 2 is an alternate view of these estimates showing energy by mode as a percentage.

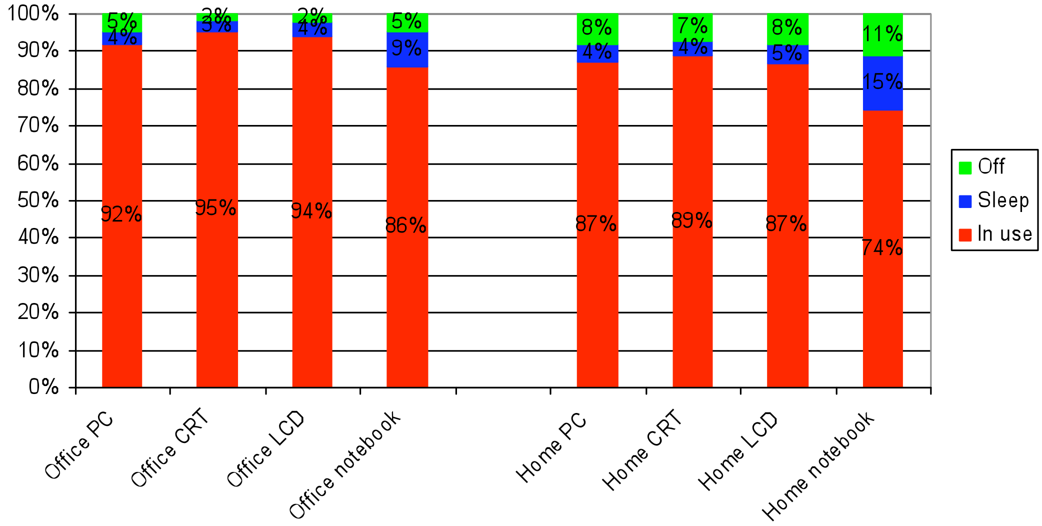

Figure 2: Energy consumption by equipment type, market sector and mode (%, per annum)

Notable points from the two figures are:

- 'In use' is the most significant energy consuming mode, irrespective of the product or market sector.
- LCD computer monitors consume significantly less annual energy than CRT computer monitors.
- Notebooks consume significantly less overall energy and spend less time in the 'in use' mode than desktop PCs i.e. there is a higher probability that power management remains enabled for notebooks than PCs, due to the requirement of users to maximise battery power.

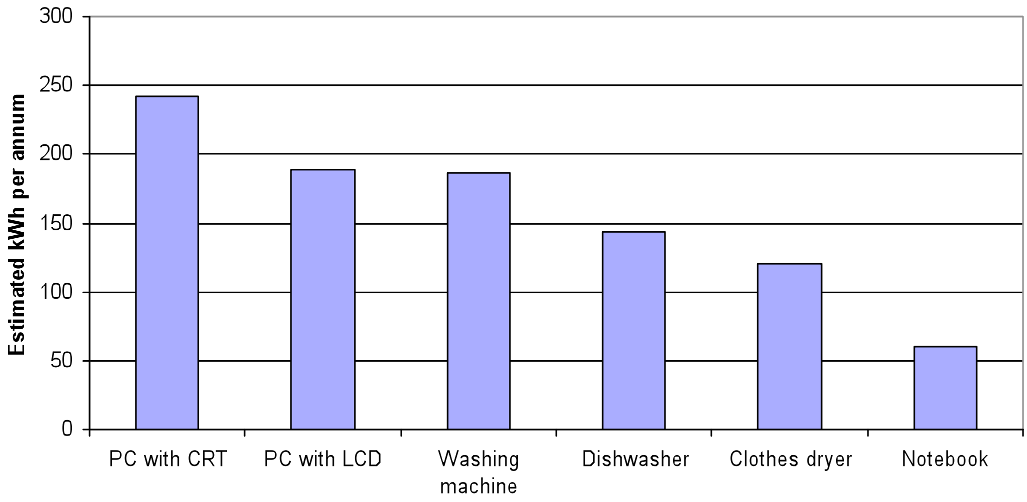

Figure 3: Typical Energy Consumption of Computer Systems and Regulated Whitegoods

1.5 The Computer and Computer monitor Market

1.5.1 Industry Profile - Computers

The supply of computers in Australia is dominated by a relatively small number of international brand names. There are also other importers and local ‘white box’ suppliers that build computers utilising imported components. ’White box’ computers are mostly limited to the desktop market and not the notebook market due to the simplicity of assembly of components into an enclosure – ‘white box’. It is estimated that the major impact of the introduction of MEPS will be confined to approximately 35 to 50 businesses.

Table 6 provides a summary of some historical sales data showing trends.

Table 6: Australian computer sales share

Brand	Q1 2005[17]	Q1 2006[18]	Q1 2007[19]	Q1 2008	Q1 2009
HP	16.3%	18.6%	20.5%		20%
Dell	13.3%	15.3%	15.4%		17%
Acer	10.4%	12.3%	11.8%		12%
Toshiba	5.2%	7.8%	8.6%		
IBM/Lenovo	8.1%	6.0%	6.9%		
Apple	3.5%	3.2%	5.0%		
Asus			3.7%		
Optima	3.0%	2.3%			
Others	40.2%	34.5%	28.1%		

1.5.2 Industry Profile - Computer monitors

Similar to computers, major brand names dominate the market. There are no known local manufacturers or assemblers of computer monitors, but local computer systems builders re-badge computer monitors supplied by manufacturers overseas. This market is quite variable, as can be seen in Table

[17] http://www.idc.com.au/press/release.asp?release_id=159
[18] http://www.idc.com.au/press/release.asp?release_id=230
[19] http://www.gamepro.com.au/index.php/id;1150810906

7, which provides a summary of some historical sales data to indicate trends. It has also been influenced by the availability of product, particularly in the LCD sector with trends to larger computer monitors.

Table 7: Australian computer monitor sales share

	Q1 2005[20]	Q2 2006[21]	Q1 2007[22]
Samsung	15.5%	20.0%	18.7%
BenQ	14.5%	15.7%	8.6%
LG Electronics	18.0%	14.8%	16.6%
Viewsonic		12.4%	17.4%
Acer	11.1%	11.9%	9.8%
Philips	10.2%		
Others	30.7%	25.2%	28.9%

1.5.3 Supply routes

The route to market, configuration and assembly location is highly dependent on the consumer segment type and is driven by consumer brand awareness (previous experience and/or marketing); computer configuration requirements; ease of purchasing; lead time; and quantity of product required. Table 8 shows the typical sales/lease and product supply options for computers.

Table 8: Supply options

Sales/lease options	Configuration/assembly options.
Web site	• Standard configuration as imported. • Custom configuration as imported. • Standard or custom configuration assembled locally utilising mostly imported components.
Retail outlet – brand name outlets or resellers.	• As imported or assembled locally.
Request for tender/supply contracts	• Standard configuration as imported or assembled locally. • Custom configuration as imported or assembled locally.
Factory door ‘white box’ assemblers	• Standard or custom configuration assembled locally utilising mostly imported components.
Self assembly	• Some more technical consumers purchase components locally or via the internet to assemble a system with their own configuration.

Various reports and industry sources indicate the ‘white box’ route could have accounted for as much as 30 to 45% of computer supply in 2006, however this diminished to less than 20% in 2008, with desktops, rather than notebooks, being the ‘white box’ product.

1.5.4 Stock

Whilst there have been a number of studies addressing information and communication technology (ICT) waste, in-use computer and computer monitor stock is difficult to assess. Various sources of data, including Australian Bureau of Statistics (ABS) and market research sales reports, have been assessed but

[20] http://www.idc.com.au/press/release.asp?release_id=164
[21] http://www.idc.com.au/press/release.asp?release_id=253
[22] http://www.gamepro.com.au/index.php/id;263831746

the question of how many computers and computer monitors are actually in use cannot be answered merely by historical sales data that have no regard for retirements or 'second-life' use. An authoritative industry source[23] estimated that there were some 24 million computers in use in Australia in 2006, equally divided between home, office and government sectors. Table 9 shows the estimated market use by computer and computer monitor type and application. Government and office are combined under the 'office' heading.

Table 9: Estimated 'in use' stock of computers and computer monitors – in millions, Australia 2006

	PC	Notebook	CRT	LCD
Office	12.8	3.2	10.2	2.6
Home	7.6	0.4	7.2	0.4
Total	20.4	3.6	17.5	2.95

At first glance this indicates a significant increase from the 9.2 million computers estimated to be deployed as recently as 2002.[24] Simply extrapolating from the 9.2 million in 2002, using the historical sales data, suggests there were at least 19 million computers in Australia in 2006. The International Telecommunication Union (ITU) also published country estimates of quantities of computers per capita[25] from 2000 to 2004. The ITU estimate is some 11 million in 2002 and there is close agreement for 2004. The stock of computers can now confidently be estimated as at least one computer for every person living in Australia.

Assuming the same penetration of computers and computer monitors in New Zealand, Table 10 shows the estimated New Zealand stock for 2006.

Table 10: Estimated in use stock of computers and computer monitors – in millions, New Zealand 2006

	PC	Notebook	CRT	LCD
Office	2.45	0.61	1.96	0.49
Home	1.46	0.08	1.38	0.07
Total	3.91	0.69	3.35	0.56

1.5.5 Market Trends

The time computers and the internet are used in the business sector is increasing according to many sources. With access to broadband internet, the growth in e-commerce and computers offering additional services, overall computer stock must be rising dramatically although little Australian data exists to verify this conclusion.

Australian Bureau of Statistics (ABS) data, as shown in Figure 4, indicates continued growth in household access to computers and the internet. This data only addresses households with computer access, not the total number of computers as some households have more than one computer. ABS data from 2005 indicates there were some 5.45 million computers in Australian households.

[23] AIIA – telephone conversation.
[24] Recycle IT! Summary report – NSW Dept. of Environment and Conservation 2004
[25] http://www.itu.int/ITU-D/ict/statistics/at_glance/Internet00.pdf series to 04

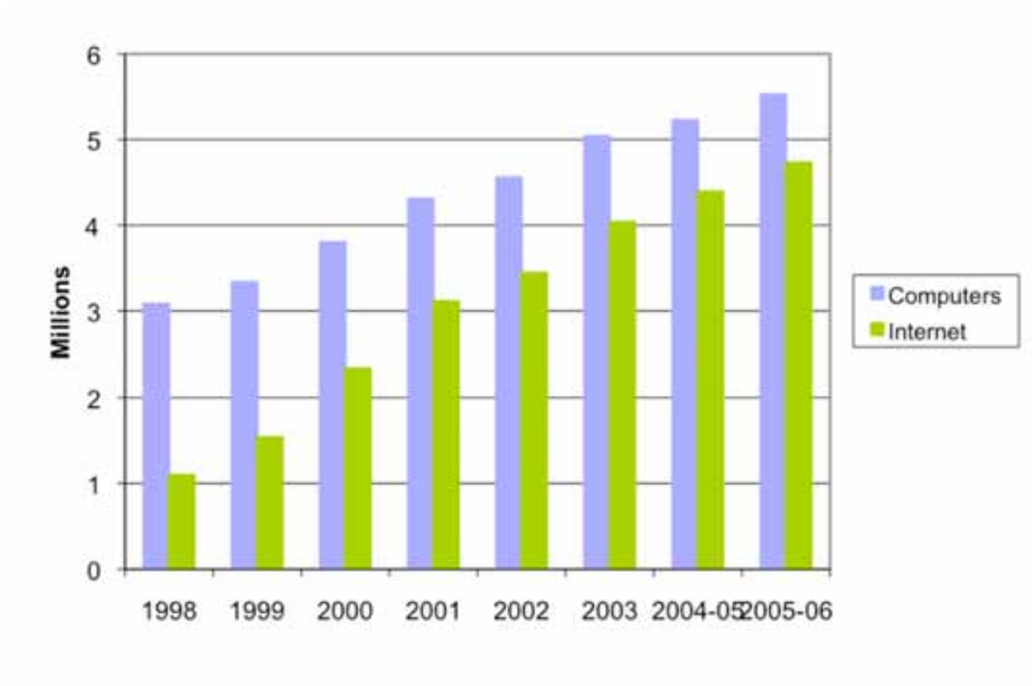

Figure 4: ABS household data for computers and internet access - Australia

Data from Statistics New Zealand[26] is limited to 2001 and 2006, however, the 2006 penetration is similar to Australia as shown in Table 11.

Table 11: Household computer and internet penetration, Australia and New Zealand

Country	Internet 2001	Computers 2001	Internet 2006	Computers 2006
New Zealand	37%	45%	64.5%	71.6%
Australia	31%	51%	59%	68%

Recent data[27] indicates strong and steady growth for computers and computer monitors. Notebook penetration is increasing at the expense of desktop computers, particularly in the home sector. The LCD computer monitor market share is increasing rapidly at the expense of CRT computer monitors. The trend to LCDs is driven by rapidly decreasing prices and the desire for more space on the desktop/workspace than afforded by CRT computer monitors. The demand for CRT computer monitors has diminished to all but a relatively small number of specialised sectors such as medical equipment and graphic design, thus dramatically reducing the quantity in use over a relatively low number of years.

Installed and forecast stock is key in the analysis of the total energy performance of computers and computer monitors. As such E3 have consulted with suppliers over a number of years to establish reasonable stock information and forecasts. Computer stock forecasts by type are shown in Figure 5 and Figure 6 for Australia and New Zealand, respectively. Growth to 2013 is driven by increased use of computers in both office and home sectors, trending to more widespread use of notebook and netbook computers—including multiple computers—in the home for both personal and educational purposes. Other

[26] http://www.stats.govt.nz/NR/rdonlyres/BA872497-4B85-4386-8395-3ACBEBDA7C4A/0/householduseofict2006hotp.pdf
[27] http://www.itfacts.biz/index.php?id=P3591, IDC Australia

market forces such as internet banking, online sales and availability of data on the internet has led to the forecast increase of computer stock to meet the demands and availability in both the supply and demand sides of the market. From 2013 total stock approaches market saturation; computer stock mix aligns with a forecast trend to notebook computers at the expense of desktop stock.

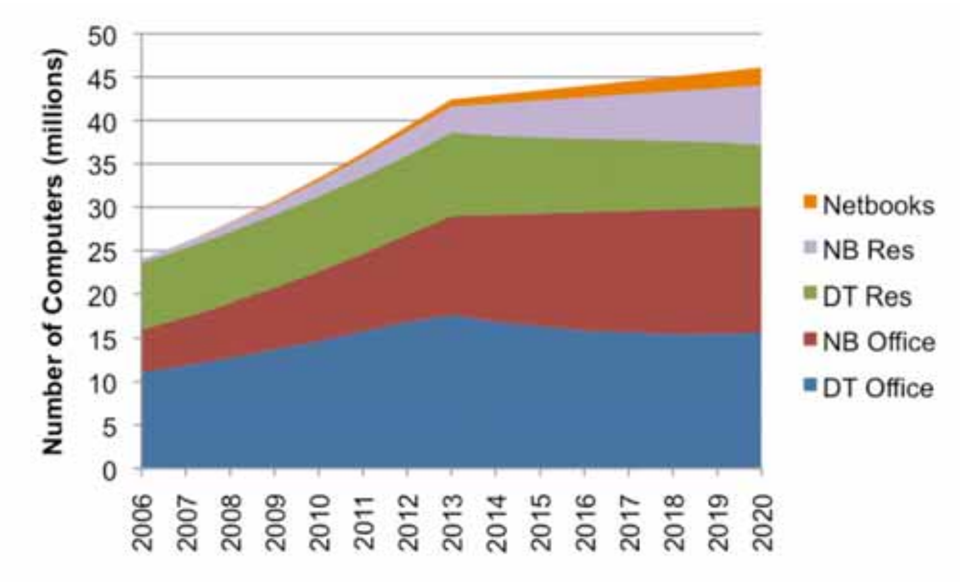

Figure 5: Australian computer stock forecast

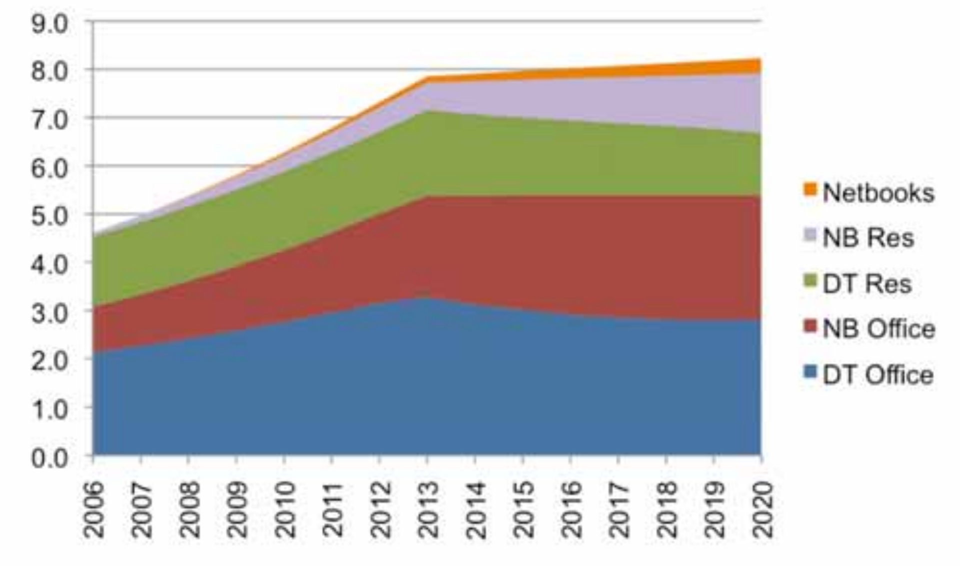

Figure 6: New Zealand computer stock forecast

Similarly, the forecast for computer monitors recognises the trend towards notebook computers with integrated computer monitors and the rapid trend away from CRT to LCD computer monitors; even though the CRT computer monitor may well have been fully functional at the time of replacement. The total computer monitor stock forecast tracks the desktop stock forecast but would be slightly higher due to the use of docking stations with separate computer monitors for notebook computers.

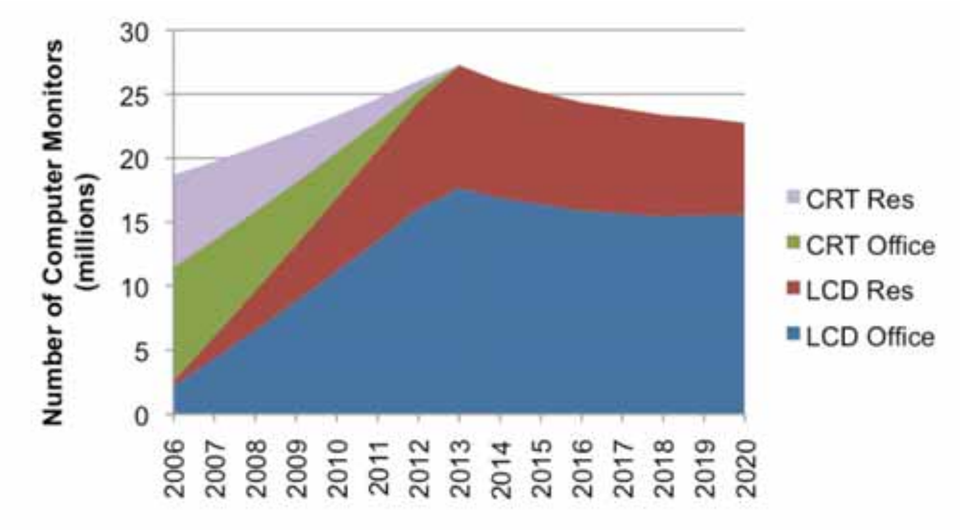

Figure 7: Australian computer monitor stock forecast

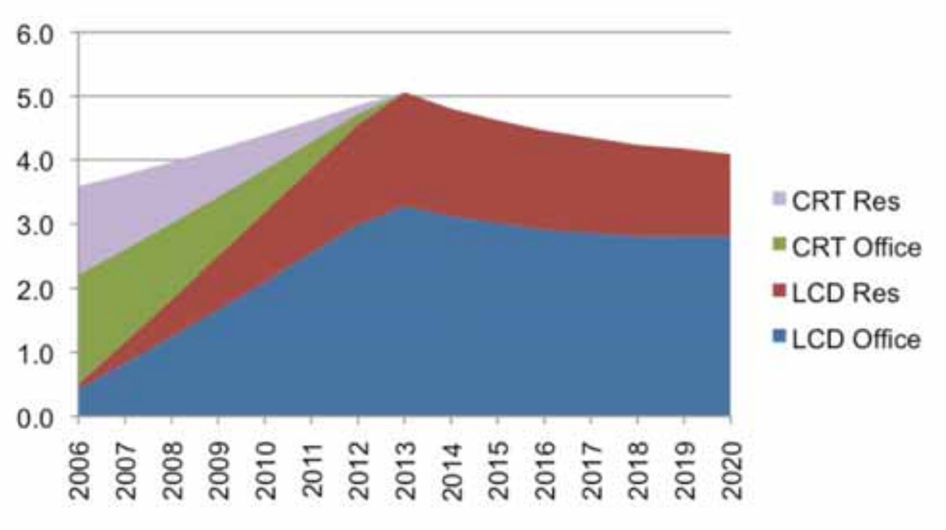

Figure 8: New Zealand computer monitor stock forecast

1.6 Energy and Greenhouse Gas Emissions

Electricity generation is a major contributor to Australia's emissions of greenhouse gases (GHG). Figure 9 shows estimated Australian GHG emissions by sector for 2005. The estimated total GHG emissions for 2005 are 559.1 million tonnes of CO2-e (NGGI 2005). The electricity generation sector represents the greatest contribution to Australia's GHG emissions.

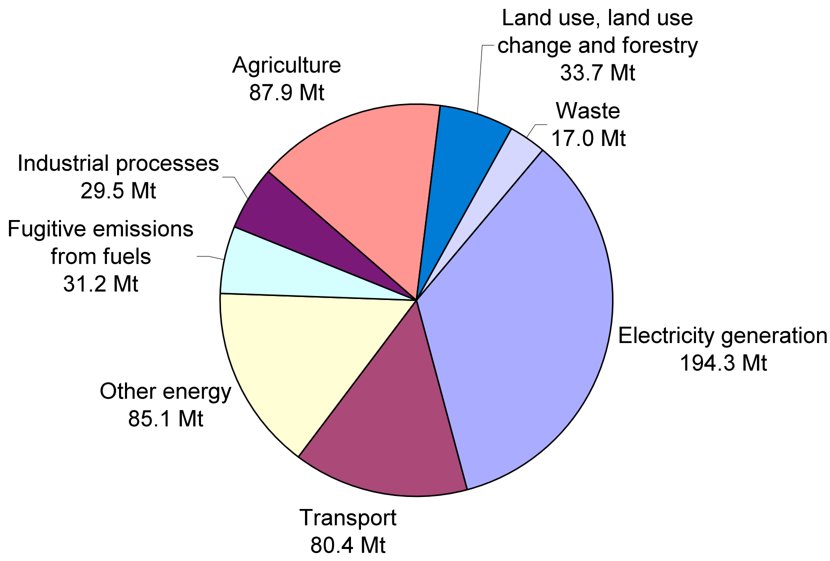

Figure 9: Australian Greenhouse Gas Emissions by Sector 2005 Mt $C0_2$-e [NGGI 2005]

Electricity generation accounted for 194.3 Mt C02-e or 34.7% of national emissions in 2005. Electricity generation emissions increased by 0.7 Mt (0.4%) from 2004 to 2005, but by 64.8 Mt (50.1%) from 1990 to 2005.

ABARE 2003 projects total electricity use to increase by an average of 2.2% p.a. between 2001 and 2020. Energy use in the commercial and services sector is projected to increase by 2.5% p.a. and by 2.2% in the manufacturing sector. Slowing, and ultimately reversing, the growth in electricity-related emissions is thus a high priority in Australia's GHG reduction strategy.

1.7 Contribution of Computers and Computer Monitors to Energy Use and Emissions

1.7.1 Forecast Total Energy Consumption – Business as Usual (BAU)

As discussed in section 1.4.2 this analysis utilises European unit energy data combined with Australian and New Zealand stock estimates to estimate total annual energy consumption. The methodology used to calculate these estimates is described in APPENDIX 8.

In addition to the direct energy consumed by computers and computer monitors there is also *indirect* energy impacts associated with operating them in spaces requiring heating or cooling. During periods of cooling, waste energy adds to the energy required by air conditioning systems and during periods of heating, waste energy is beneficial and thus reduces the heating energy load. Details of the additional indirect energy calculations are shown in APPENDIX 9.

Utilising the stock forecasts from section 1.5.5 for computers and computer monitors, combined with annual energy consumption from section 1.4.2 and additional indirect energy from APPENDIX 9, total BAU energy consumption by computers and computer monitors is forecast to grow as shown in Figure 10 for Australia and in Figure 11 for New Zealand. Total stock energy consumption increases as stock levels grow towards market saturation; then reduce due to increasing usage of lower energy consuming notebooks and LCD computer monitors in preference to desktop computers and CRT computer monitors respectively. Due to US ENERGY STAR® specifications and US Federal purchasing directives, lower energy consuming computers are appearing in the market, however, analysis of US registration data indicates relatively low numbers available to the US, Australian and New Zealand markets. Within the analysis, BAU annual energy consumption is forecast to reduce by 5% in 2011, 10% in 2011, and then 15% to 2020 for new BAU products.

From this base assumption it is estimated that the total energy consumption (direct and indirect) attributable to computers and computer monitors approached 7,392 GWh and 1,232 GWh in Australia and New Zealand respectively during 2006.

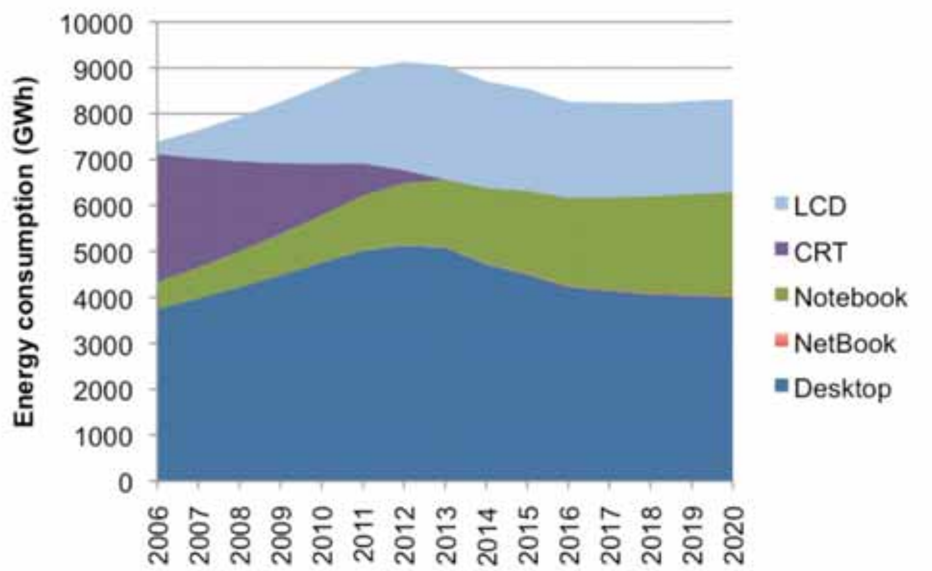

Figure 10: Australian projected BAU energy consumption

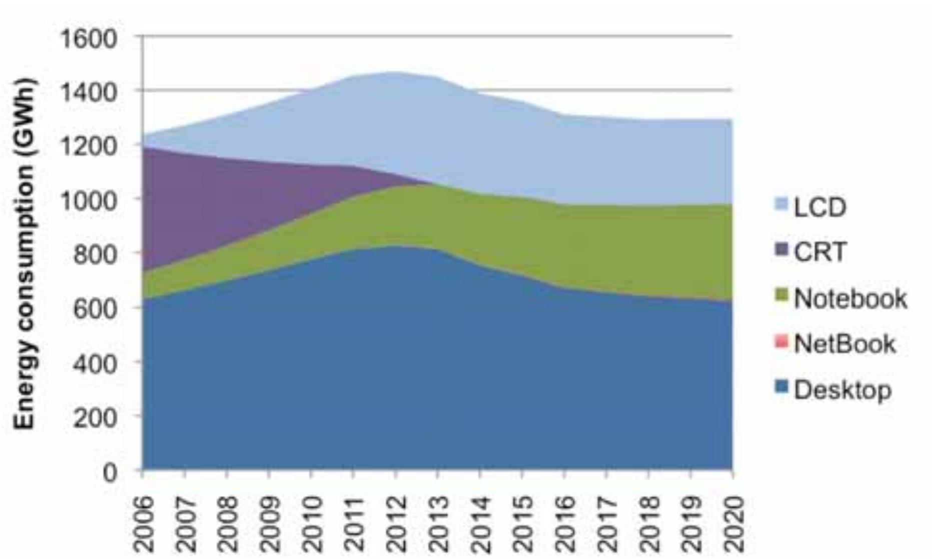

Figure 11: New Zealand projected BAU energy consumption

1.7.2 Greenhouse Emissions

Figure 12 and Figure 13 show the forecast BAU GHG emissions for Australia and New Zealand, respectively. The Australian forecast uses emissions intensity by State on the assumption that computers and computer monitors are deployed in proportion to household numbers in each state and territory. GHG emission factors are shown in APPENDIX 5.

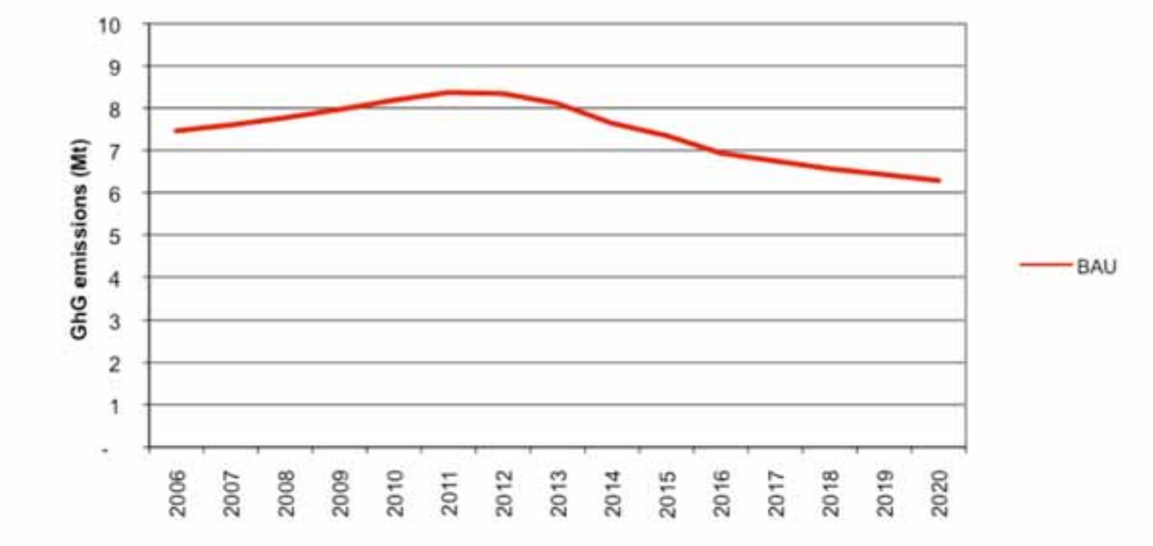

Figure 12: Australian projected BAU Greenhouse Gas Emissions from computers and computer monitors

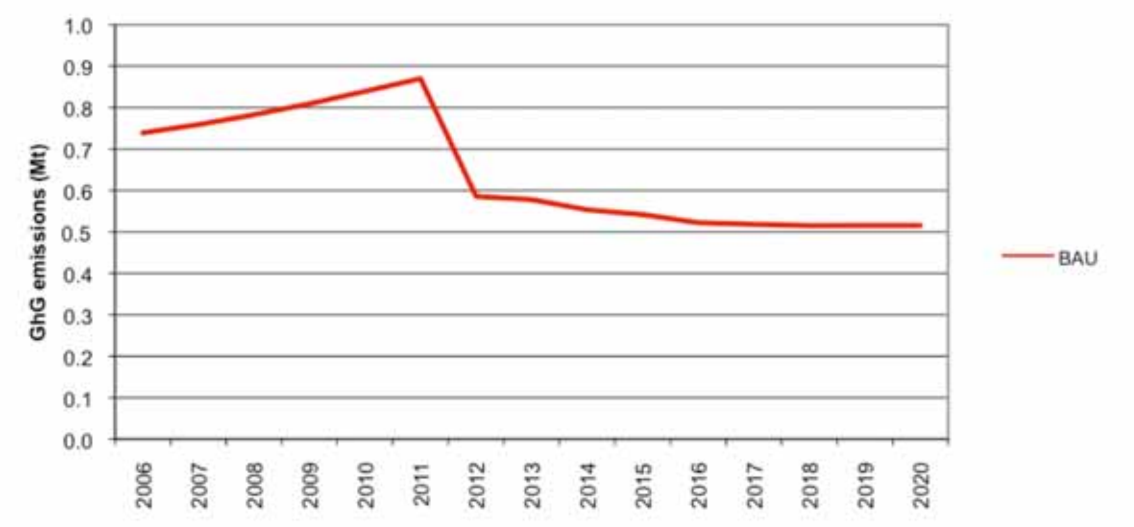

Figure 13: New Zealand projected BAU Greenhouse Gas Emissions from computers and computer monitors

NOTE – The New Zealand forecast shows a step reduction as emissions intensity is reported to reduce from 0.6kg CO_2 – e per kWh in 2011 to 0.4kg CO_2 – e per kWh in 2012 and remain at this level for the remainder of the analysis period.

2 BENEFITS AND BARRIERS TO IMPROVING ENERGY EFFICIENCY

Improved energy efficiency can help businesses and households to save money on their power bills. It can also help to delay or reduce the need for investment in expensive electricity infrastructure and at the same time address long term challenges such as climate change and energy security. Thus energy efficiency improvements have the potential to deliver significant economic, social and environmental benefits.

Yet there are many barriers that may prevent individuals and businesses from taking up energy efficiency improvements. These include:

- Lack of information – Consumers are often unaware of the benefits of energy efficiency and conservation how to realise them, and do not have the information necessary to make informed purchasing decisions.
- Split incentives/principal-agent problems – The principal–agent problem occurs when one party (the agent) makes decisions affecting the end-use energy efficiency in a given market, and a different party (the principal) bears the consequences of those decisions. Landlords who are responsible for paying for building improvements and supplying appliances may not directly get the benefits, such as lower energy bills or increased comfort. The proportion of computers and computer monitors supplied under these arrangements is likely to be insignificant. Likewise, tenants may not want to invest in improving homes or buildings that they do not own or may not occupy for long periods.
- Access to capital – Some consumers struggle to meet the initial costs of energy efficiency even though they are cost effective over time.
- Weak price signals – Energy pricing does not yet fully reflect the environmental and economic cost (the external cost or externality) of energy production and consumption.

Further information can be found in APPENDIX 10. The International Energy Agency (IEA) report on market barriers to energy efficiency in the end-use of energy (http://www.aceee.org/energy/IEAmarketbarriers.pdf) also provides a useful reference source.

Computers and computer monitors are now common products of varying complexity that are widely used in homes and offices for processing, retrieving and storing information for work, study and entertainment. Energy used for this activity accounts for about 3% of Australia and New Zealand's residential electricity consumption and 12 to 25% of office energy consumption, depending upon the type of office. As detailed in the following section, there is a significant gap between this current level of energy consumption and what could readily be achieved through relatively simple and inexpensive energy efficiency improvements. Moreover, the available data indicates that there is little correlation between energy efficiency, performance and price.

The following figures use DCCEE computer testing data and purchase price for computers, purchased and tested in 2008 and 2009, claiming to be compliant with ENERGY STAR® (E*) V 4.0[28] or V 5.0[29] (computers). TEC is the Typical

[28] http://www.energystar.gov/index.cfm?c=archives.computer_spec_version_4_0

Energy Consumption per annum as calculated using the ENERGY STAR® V5.0 metric. Caution should be used in interpreting these graphs, as price is influenced by many other factors apart from energy performance e.g. packaging, brand name, volume, features, retail margins etc.

Figure 14 shows price and TEC for category A to C desktop computers, where Category A is the simplest configuration and C the most complex higher performance configuration of those tested. Category B, which dominates sales, has the most samples for 2008 and ENERGY STAR® machines. The data indicates that from 2008 to 2009 substantially lower energy consumption is possible for the same purchase price. It also indicates there is no correlation between price and energy performance of the ENERGY STAR® compliant computers.

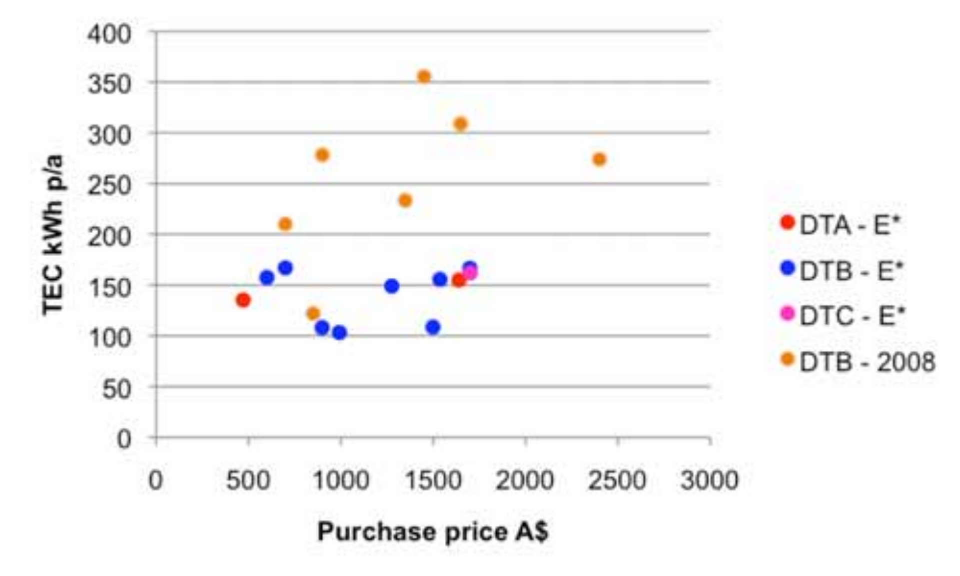

Figure 14: Typical annual energy consumption vs price – desktop computers

Figure 15 and Figure 16 show price and TEC for category A to C 2008 and 2009 notebook computers, where Category A is the simplest configuration and C the most complex higher performance configuration. There appears to be a correlation between price and energy for 2008 notebooks, however category A ENERGY STAR® notebooks show a downward trend in the price range from $500 to $1,200, however the higher priced computers show equal or greater energy consumption. This indicates that there is no substantial relationship between price and energy performance in this category and indeed lower energy consuming notebooks are available at the same price as 2008 notebooks.

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29 http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Version5.0_Computer_Spec.pdf

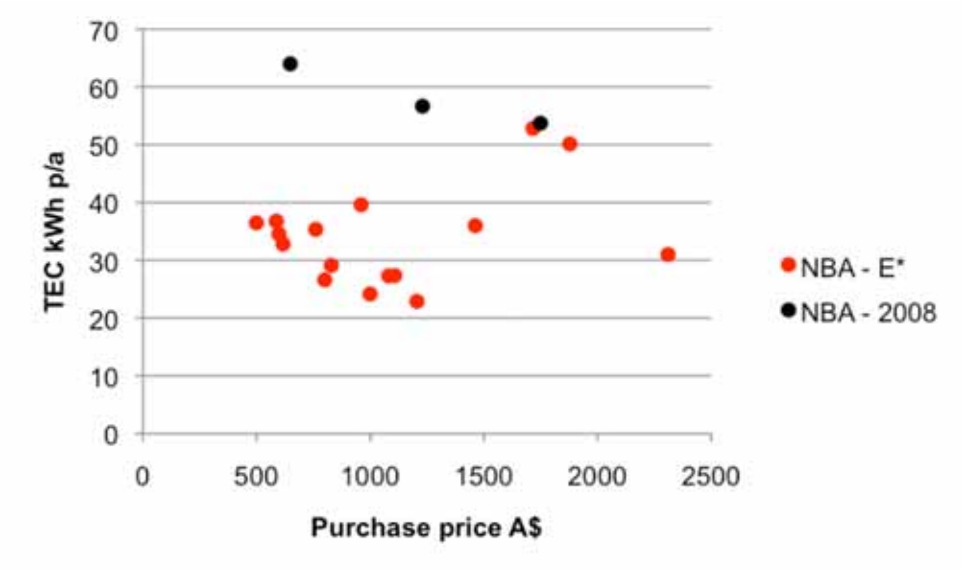

Figure 15: Typical annual energy consumption vs price – category A notebook computers

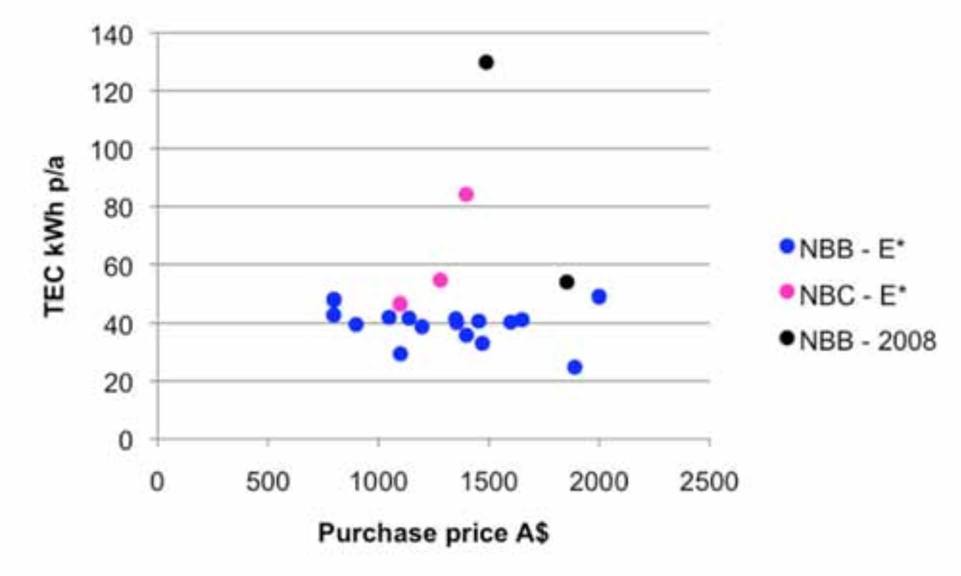

Figure 16: Typical annual energy consumption vs price – category B & C notebook computers

Whilst the sample size is small for 2008, there is a substantial difference between the worst performer and ENERGY STAR® compliant notebooks.

Category B ENERGY STAR® notebooks appear to consume similar energy irrespective of price, whilst the small sample size category C computers show dramatic increases in energy consumption with price.

It is also evident that there is very little energy information available to consumers thus compounding the problem. Further information is in section 2.4

2.1 INTERNATIONAL STUDIES

There have been various studies undertaken in other countries exploring the scope for energy efficiency improvements in computers and computer monitors. APPENDIX 11 summarises actions by energy efficiency expert groups, industry participants and governments. These recognise that market failure exists in the information technology arena and that some of the world's major jurisdictions intend to intervene via regulation.

2.2 EVIDENCE OF COMPUTER MARKET FAILURE IN AUSTRALIA

Drawing upon international studies and recent DCCEE testing, there is compelling evidence of market failure in both the supply and demand sectors of the market. As stated by the Climate Savers Computing Initiative, computer and computer monitor power requirements can be reduced by the use of more efficient components–such as internal power supplies–thus reducing energy consumption and power demand on the electricity network. Energy consumption can also be reduced significantly by enabling power management software *built-in* to the most common operating system software available from Microsoft and Apple. Studies, shown in section 1.4.1, indicate that <u>in use</u>, not necessarily as supplied, power management enablement for computers is in the range of 6% to 25% and circa 80% for computer monitors. Further information is contained in section 2.4

DCCEE testing utilised the US ENERGY STAR® V4.0 test method and performance benchmarks that came into force in July 2007. Whilst the sample size was relatively small, it is considered valid to compare the results to the US data and European analysis.

Figure 17 shows the desktop idle power results for each category of computer and their ENERGY STAR® V4.0 benchmark power[30]. The sample sizes for categories A and C are very small, but it does indicate that these categories may perform better than their benchmark power, however it is category B computers that dominate the market.

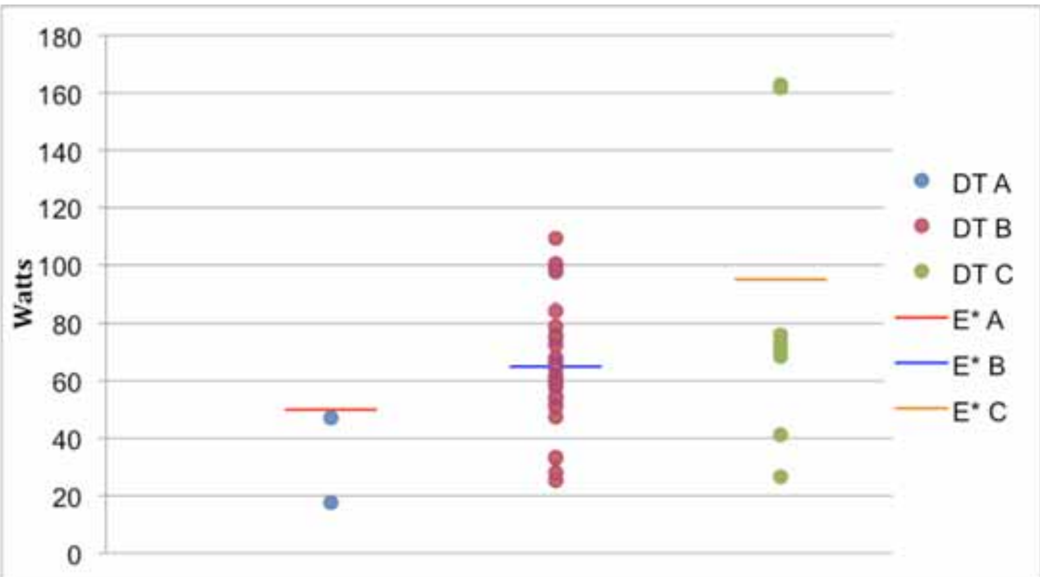

Figure 17: DCCEE Test Results – Desktop computer Idle Power by Category

45% of category B computers exceed the 65 Watts benchmark, with the worst performers consuming over 100 Watts. Given the dominance of idle mode to annual energy consumption, this power demand is a major contributor to the BAU case.

[30] http://www.energystar.gov/index.cfm?c=archives.computer_spec_version_4_0

Figure 18 compares the percentage of computers in a range of power bands for the DCCEE 2008/9 data to the US 2006 data. The DCCEE sample is smaller than the US sample, but it provides a good indicator that Australian sourced computers perform similarly to the 2006 US computers, with 55 to 85 Watts being the dominant power range.

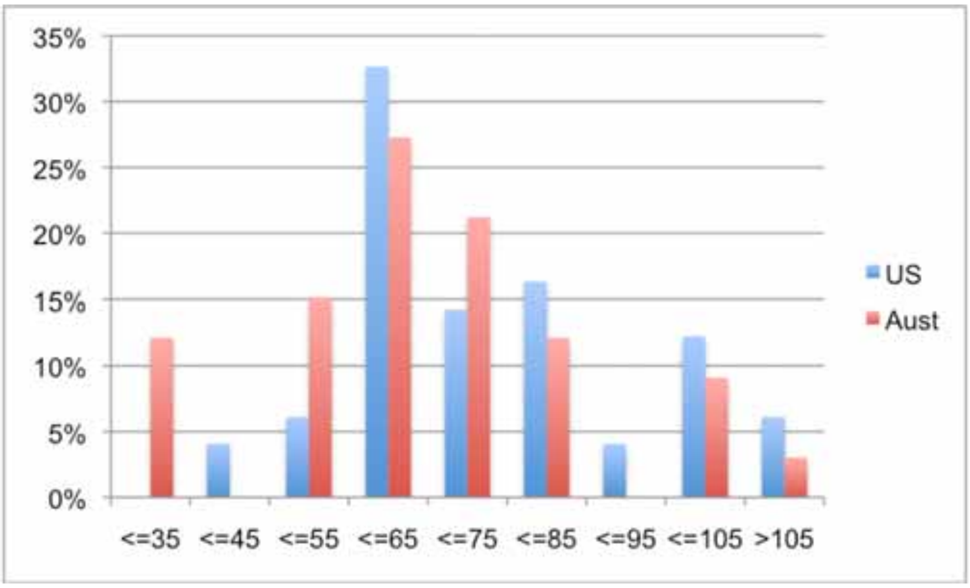

Figure 18: DCCEE Test Results – Desktop computer Idle Power and Quantity by Category

In the sample of 13 notebooks, idle power was much closer to the ENERGY STAR® benchmark, particularly in the B category, with one sample consuming almost double the next closest notebook.

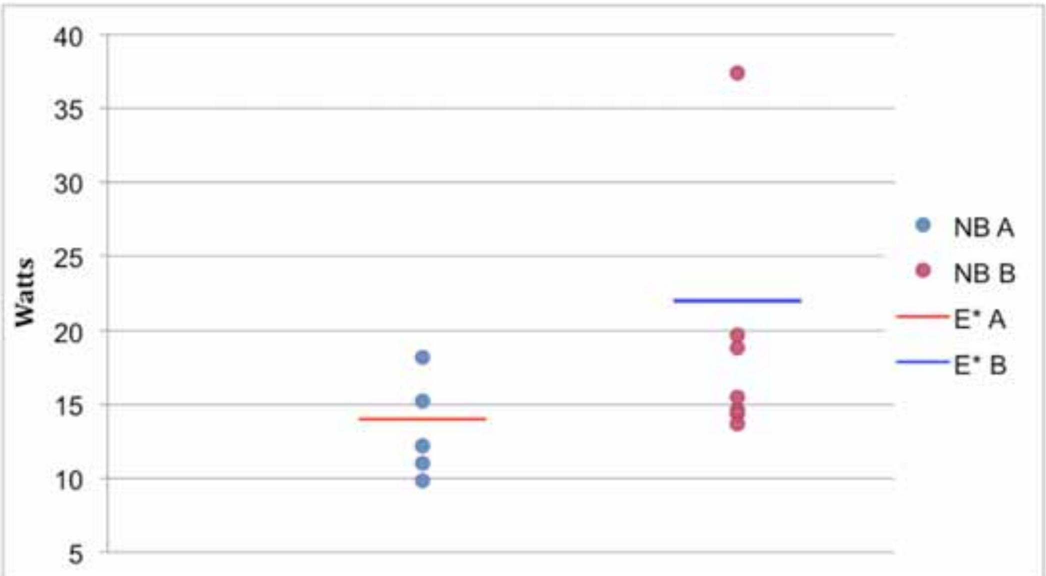

Figure 19: DCCEE Test Results – Notebook computer Idle Power by Category

These failures are not expected to be resolved in the business as usual case, resulting in forecast energy consumption almost double that which is achievable for the community at large.

Past action by suppliers, retailers and energy programs have not fully captured the greenhouse and energy opportunities already available. There is little evidence to suggest current *green* projects launched by parts of the industry will achieve these opportunities for the market in the near future. Some manufacturers and suppliers have taken the initiative to manufacture more energy efficient computers and computer monitors. However, in most cases the range is somewhat limited and targeted at government applications, driven in particular by *green* purchasing policies/directives. The available data shows this more efficient technology is not available to the community at large. Also of significance is the lack of energy performance data. The test laboratories commissioned to conduct the DCCEE testing reported extreme difficulty in obtaining/finding energy performance data for products under test.

The result is that government agencies impute, given the international trade in these products that overseas trends and experience also apply here. Anecdotal evidence suggests that Australian and New Zealand markets lag the major economies; the position in Australia may be marginally worse than in Europe and North America. The picture painted in the RIS may well be a best case scenario.

2.3 Computer monitor Market Failure

Computer monitor power data in Australia is limited however, being globally traded products, the following draws upon the comprehensive test data gathered by the US Environment Protection Agency (EPS) for their ENERGY STAR® program. The EPA tested 109 LCD computer monitors[31] and published data including screen size, resolution and power. **Figure 20** presents the data using “as shipped” power vs screen area and where applicable, subdivided by screen resolution. The chart shows a number of important factors.

For each screen area band and resolution (as indicated by single decimal point numbers within the chart), there is a wide range of power consumption between best and worst and there are many examples where larger screens consume less than smaller screens.

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31 http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/monitors/Draft_5.0_Dataset_Analysis.xls

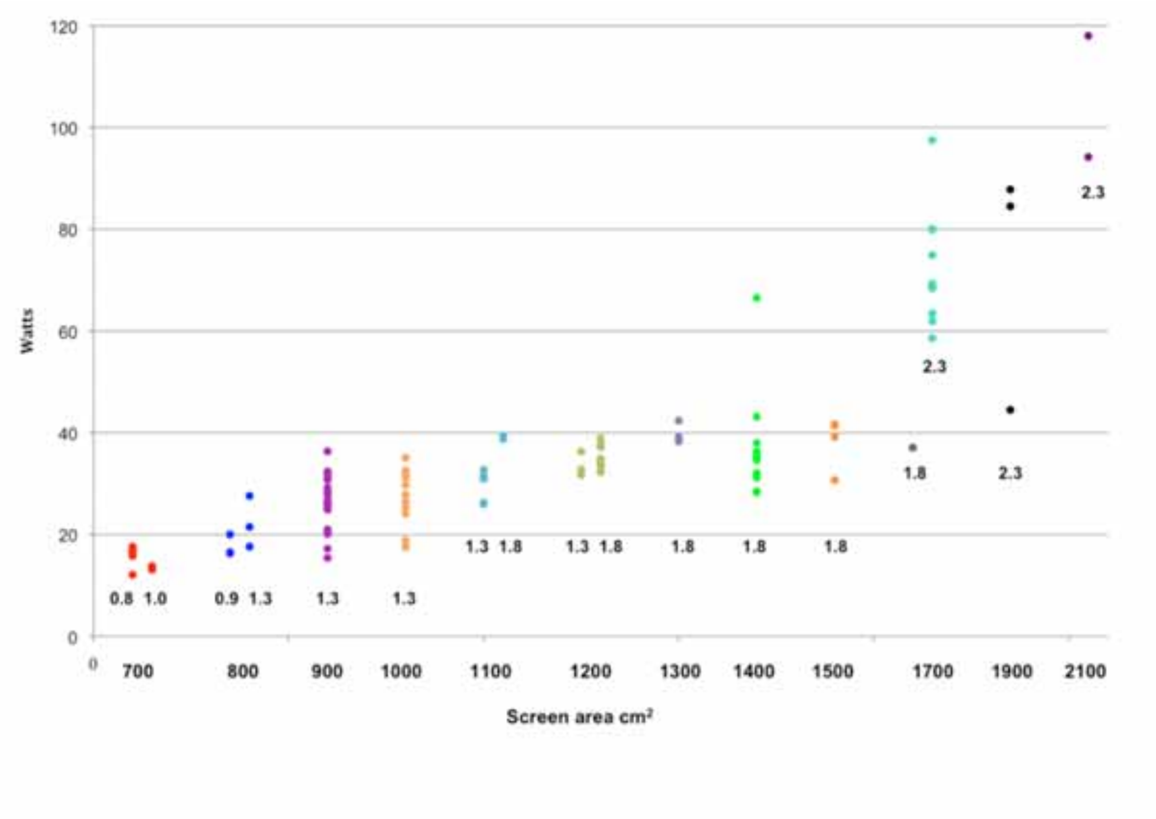

Figure 20: US EOA LCD Computer monitor Idle Power vs screen area and resolution

Off and sleep mode power performance was excellent with 98% of computer monitors being at or below 1 and 2 watts respectively.

As with computers, power supply efficiency is an important factor to reducing energy consumption, particularly in active mode. Significant energy savings can be achieved, compared to the base case, by improving power supply unit (PSU) efficiency only, power management (PM) only and PSU and PM combined, as shown in the earlier EuP analysis.

2.4 Information and Power Management Market Failure

Energy information

One of the most obvious barriers to the uptake of lower energy consuming computers and computer monitors is lack of information, awareness of the magnitude of energy consumption and the spread of power levels. Typically power specifications available to consumers are limited to the maximum AC power requirement.

Some computers and computer monitors in the Australian and New Zealand markets are promoted as ENERGY STAR® compliant, however procurement for the first DCCEE computer testing highlighted the rarity of this information. In a second series of tests[32], a laboratory was commissioned to source and test computers claiming ENERGY STAR® compliance. The laboratory reported extreme difficulty in identifying compliant computers in the Australian market.

> "*After a significant research effort 23 computers that made ENERGY STAR® claims were identified, and purchased, by a highly computer literate researcher.*

[32] http://energyrating.gov.au/library/details200913-energystar-computers-aust.html

The researcher reported very poor, inconsistent and hard-to-find market information about energy efficiency. An almost complete lack of detailed information about ENERGY STAR® computers on the Australian market forced the researcher to rely on lists of ENERGY STAR® compliant computers from the EPA website in the US to identify compliant models available for purchase in Australia"

Even if ENERGY STAR® marking is available it does not provide comparative power or energy information and does not specify which version/specifications apply. The principal requirement for consumers is that the computer and computer monitor meet their IT performance and/or visual requirements. If energy and or power data is not available, then it cannot be part of the decision making process.

The ENERGY STAR® computer report states

In general, the availability of ENERGY STAR® V4.0 and ENERGY STAR® V5.0 computers is quite limited, with the vast majority of computer models on the Australian market presently bearing no useful information regarding compliance with any energy efficiency standards.

With respect to lack of information on energy performance of products in general, Australia's Productivity Commission report, 'The Private Cost Effectiveness of Improving Energy Efficiency', identified the following relevant points:

"The most important barriers to the adoption of privately cost-effective energy efficiency improvements appear to be:

- *A failure in the provision of information…*

  Some government intervention to address these problems is appropriate. The Commission favours light-handed regulatory responses and information provision, rather than more prescriptive and intrusive approaches:

- *Mandatory labelling can be an appropriate way of providing information"*

Power management

From section 1.4.2, as shown in Table 12, BAU in-use energy accounts for a significant proportion of annual energy.

Table 12: Percentage of energy use by mode

Product	In use	Sleep	Off
Office PC	92%	4%	5%
Office CRT	95%	3%	2%
Office LCD	94%	4%	2%
Office notebook	86%	9%	5%
Home PC	87%	4%	8%
Home CRT	89%	4%	7%
Home LCD	87%	5%	8%
Home notebook	74%	15%	11%

Power management capability is built into computers, however many energy reports refer to low rates of enablement. Some data is available, as per Table 13, which shows that enablement rates are very low for computers and generally much higher for computer monitors. A general observation is that users set computer monitor management to activate a screen-saver mode, which is not a low power sleep mode.

DCCEE computer testing in 2009, found "out of the box" computer monitor power management was much better at 95% for desktops and 100% for notebooks. Computer power management of desktops showed 41% of the sample had no power management at all and another 13% had time settings that would be unlikely to be activated during normal computer use. 100% of notebooks had computer power management, but 36% had time settings unlikely to be activated.

Table 13: Power Management Data - Proportion of appliances with power management 'out of the box'

	Computers	Computer monitors
USA Office - TIAX[33]	6 – 25%	
UK - MTP[34] Home	22%	73%
Australian Councils[35]	15%	86%
Australian Homes[36]	23%	
Australian as bought computers 2009	Desktops 59% Notebooks 100%	Desktops 95% Notebooks 100%
Government in use computers 2009	Desktops 25% Notebooks 64%	Desktop 94% Notebook 91%

The DCCEE testing of computers that claim compliance with ENERGY STAR® identified that 4 of the 11 desktop computers and 2 of the 11 notebooks did not meet power management requirements!

In the US, the ENERGY STAR® program forecasts power management enablement rates of ENERGY STAR® compliant computers to increase in the office environment from an estimated 7% in 2005 to 10% in 2015. Household use enablement is forecast by the EPA to remain static at 15%[37] i.e. even in a market with high awareness of the ENERGY STAR® logo, the forecast is for continued very low implementation of a no-cost, significant energy saving option.

As a rule, unless specified in a procurement programme or by an IT policy, power management is not enabled for computers at time of supply of bundled packages nor in operating system software sold for subsequent installation. A number of factors are likely to account for not enabling power management.

[33] Quoted from EuP Lot 3 study
[34] UK Market Transformation Programme – Monitoring Home Computers
[35] http://energyrating.gov.au/library/details200522-standby-local-gov.html
[36] http://energyrating.gov.au/library/details200602-intrusive-survey.html
[37] http://www-library.lbl.gov/docs/LBNL/563/80/PDF/LBNL-56380_2007.pdf

- Lack of information, knowledge or interest in energy consumption and power.
- Lack of knowledge that power management options are available.
- Reluctance by consumers to modify default software/hardware settings on a product because it may not perform its intended function.
- In some environments it may be impossible for users to enable or modify power management settings due to default settings set by IT administrators.

In summary: if consumers do not have information or knowledge, there is failure in the market.

3 OBJECTIVES OF GOVERNMENT ACTION

3.1 OBJECTIVE

The primary objective is to bring about reductions in Australia and New Zealand's energy use and GHG emissions below what they are otherwise projected to be (i.e. the *business as usual* case), in a manner that is in the broad community's best interests.

A secondary objective is to provide consumers with a degree of consumer protection from unnecessary high running costs of computers and computer monitors, and to provide a level of insulation from the electricity price rises that will come from the introduction of the CPRS.

To be effective for manufacturers and suppliers, the proposed strategy should be in accord with international test methods and marking requirements – where available – as these are internationally traded goods.

Within the objective, it must also provide a broad positive financial benefit to end consumers, without compromising appliance quality or functionality.

3.1.1 AUSTRALIA'S POLICY CONTEXT FOR THE EQUIPMENT ENERGY EFFICIENCY PROGRAM

Energy consumed by appliances and equipment is a major source of GHG emissions in Australia. Improving the energy efficiency of appliances and equipment is a key objective for all Australian governments.

Performance codes and standards are the most widely used measures internationally to reduce energy use and GHG emissions from equipment and appliances. The Equipment Energy Efficiency (E3) Program embraces a range of measures aimed at increasing the energy efficiency of products used in the residential, commercial and manufacturing sectors in Australia. E3 is an initiative of the Ministerial Council on Energy (MCE) comprising of ministers responsible for energy from all jurisdictions, and is an element of both Australia's National Framework for Energy Efficiency (NFEE) and New Zealand's National Energy Efficiency and Conservation Strategy. It is organised as follows:

- Implementation of the program is the direct responsibility of the Equipment Energy Efficiency Committee (referred to as the *E3 Committee*), which comprises officials from Australian federal, state and territory government agencies and representatives from New Zealand.

These officials are responsible for implementing product energy efficiency initiatives in the various jurisdictions.

- The E3 Committee reports – through the Energy Efficiency Working Group (E2WG) – to the MCE, to whom it is ultimately responsible
- The MCE has charged E2WG to manage the overall policy and budget of the national program.
- The Australian and New Zealand members of the E3 Committee work to develop mutually acceptable labelling requirements and MEPS. New requirements are incorporated in Australian and New Zealand Standards (AS/NZS) and developed within the consultative machinery of Standards Australia.
- The program relies on state and territory legislation for legal effect in Australia, enforcing relevant Australian Standards for the specific product type. National legislation performs this task in New Zealand.

In October 2006, the MCE agreed to new criteria for assessing new energy efficiency measures. The MCE replaced its previous *no regrets* test (that a measure have private benefits excluding environmental benefits which are greater than its costs) with the criteria that the MCE would consider *"new energy efficiency measures which deliver net public benefits, including low cost greenhouse abatement measures that do not exceed the cost of alternate measures being undertaken across the economy"*.

This policy means the MCE will consider new regulatory measures that may have net up-front costs but have greater private economic and greenhouse benefits over the long term. The policy is based on the principle that prudent investment now may avoid more costly intervention later. This bipartisan agreement demonstrates the on-going commitment of all participating jurisdictions to using regulatory measures that deliver effective, measurable abatement.

The E3 program and its predecessors have operated since 1992 and were originally created as part of the Australian national greenhouse response strategy. The initial program was based on mandatory energy labelling for six types of domestic appliance to provide better information upon which purchasers could make informed decisions. By 1996, governments had agreed to introduce MEPS, which drove improvement by banning the sale of inefficient products from late 1999.

The Program measures improvement by increasing the number of products covered, increasing the stringency of existing energy requirements through a process of regular review, and increasing the intensity of the program in key areas so that a range of program tools are used to maximise the energy saving outcomes.

The main policy tools used to achieve these outcomes are:

- Mandatory MEPS – these are set out in the relevant product standard published by Standards Australia.
- Mandatory energy efficiency labelling – these are set out in the relevant product standard published by Standards Australia and Standards New Zealand.
- Voluntary measures including endorsement labelling, training and support to promote the most efficient products available.

The broad policy mandate of E3 has been regularly reviewed over the last decade and was most recently refreshed in 2004. Not only is any energy-using equipment type potentially included in E3 work plans for possible regulation but computers and computer monitors were specifically nominated for regulatory impact assessment in 2004.

To be included in the program, appliances and equipment must satisfy certain criteria relating to the feasibility and cost effectiveness of intervention. These include:

- potential for energy and GHG emissions savings;
- environmental impact of the fuel type;
- opportunity to influence purchase;
- the existence of market barriers;
- access to testing facilities; and
- considerations of administrative complexity.

Policy measures are subject to a cost-benefit analysis and consideration of whether the measures are generally acceptable to the community.

E3 provides stakeholders with opportunities to comment on specific measures as they are developed by issuing reports (including fact sheets, technical reports; cost-benefit analyses and regulatory impact statements) as well as stakeholder meetings. Regulation of computers and computer monitors has been a topic of discussion with key industry leaders for many years.

3.1.2 New Zealand's policy context for the Equipment Energy Efficiency Program

Energy-using products and appliances have an important influence on New Zealand's overall energy use. Improving the energy efficiency of products available on the New Zealand market will significantly reduce the energy these products consume, with consequent reductions in national energy demand and end-user energy costs.

These energy and related cost savings provide the following benefits:

National benefits:

- Economic growth – through improved productivity and international competitiveness of New Zealand businesses
- Enhanced security of supply - from reduced energy demand
- Reduced need to run fossil fuelled generation – particularly during periods of high demand or supply shortage
- Reduced need to invest in new energy supply infrastructure - with consequent reductions in costs and environmental impacts
- Reductions in the absolute amount of renewable electricity required for New Zealand to achieve its target of 90% renewable electricity generation by 2025
- Helping New Zealand to meet its international GHG emissions reduction commitments at least cost.

Benefits to the end-user:

- Lower operating costs for products and appliances, which will improve the competitiveness of individual businesses

- Lower costs for householders – thus improving their ability to afford higher quality lifestyles
- Allows energy users to better manage the impact of future energy prices, which are likely to incorporate a price on GHG emissions and be affected by a reduced availability of cheap supply options.

The New Zealand Energy Efficiency and Conservation on Strategy details specific work streams to achieve the goals of the New Zealand Energy Strategy (NZES) - including a focus on better products as part of a range of initiatives to improve end-use energy efficiency in the residential, commercial and industrial sectors. The current review of the NZES will put more emphasis on the government's priorities of increasing economic growth and energy security.

3.2 Australian and New Zealand Policy Responses to Global Warming

This regulatory proposal cannot be assessed in isolation; it forms part of a coordinated response by Governments to undertaking regulatory measures for any energy-using product that are cost-effective and meet agreed environmental and energy goals.

Australian and New Zealand policies are at the forefront of international work to improve the energy efficiency of globally traded equipment, which lower trading costs while still delivering environmental and economic benefits.

> *"The IEA estimates that under current policies, global emissions will increase 50% by 2030 and more than double by 2050. However, if we act now, this unsustainable and dangerous pattern can be curbed. IEA findings show that emissions could be returned to current levels by 2050 and even reduced thereafter, while an ever-growing demand for energy services, notably in developing countries, can be fully satisfied. Improving energy efficiency in the major consuming sectors – buildings and appliances, transport and industry – must be the top priority. While alleviating the threat of climate change this would also improve energy security and have benefits for economic growth."* – Claude Mandil, Executive Director, International Energy Agency (IEA), Paris, February 2007.

3.2.1 Australia's Response to Climate Change

Australia's greenhouse abatement and climate change policies have evolved consistently for more than 13 years, since the release of the National Greenhouse Response Strategy in 1997. The paper received overall bi-partisan support for national energy efficiency measures. APPENDIX 1 records some of the more important stages in that development.

In May 2007, the Prime Minister's Task Group released its report on the Introduction of an Australian Emissions Trading system, which endorsed the support of complementary measures as a means to address market failures where an Emissions Trading Scheme was not effective:

> *"Beyond information-based policies, energy efficiency policies could target areas where market barriers are likely to be more fundamental and enduring. This is likely to be in areas where consumers make infrequent decisions and where it is difficult to judge the energy and emissions implications. There is a good case for continuing the*

development of well-designed and consistent regulated minimum energy standards for buildings and households appliances. Purchase of energy-efficient products can have a large impact on aggregate emissions over time, and reduce the impact on household budgets of any rise in carbon prices". [DPMC 2007 p135]

Similarly in July 2007, the Prime Minister released 'Australia's Climate Change Policy – our economy, our environment, our future' (ACCP 2007). The policy again reasserted that energy efficiency regulation remains a key element of cost effective greenhouse abatement:

> *"Energy efficiency is an important way to reduce GHG emissions cheaply. Demand for electricity in Australia is expected to more than double by 2050. Improvements in energy efficiency have the potential to lower that projected growth, and avoid GHG emissions. They can also deliver a net financial gain for firms and consumers. … The MEPS program is one of the main success stories of the National Framework for Energy Efficiency (NFEE). The NFEE was developed cooperatively across jurisdictions and covers a range of policy measures, designed to overcome market barriers to energy efficiency."* (pp 16-17)

On 11 March 2008, Australia's ratification of the Kyoto Protocol was officially recognised by the United Nations Framework Convention on Climate Change (UNFCCC). Australia made an international commitment in December 1997 at Kyoto (Conference of the Parties COP3) to limit its GHG emissions growth to 108 per cent of its 1990 baseline, which equates to a nearly 30 per cent reduction from its 'business as usual' projections, by 2008-2012. The Australian Government has also released a report demonstrating how Australia intends to measure the reductions in emissions required under the Kyoto Protocol titled 'Australia's Initial Report under the Kyoto Protocol'.

3.2.2 New Zealand's Response to Climate Change

New Zealand ratified the Kyoto Protocol in 2002, and is committed to reducing its GHG emissions back to 1990 levels–on average–over the period 2008 to 2012 (or to take responsibility for any emissions above this level if it cannot meet this target).

Measures that help reduce energy-related GHG emissions make an important contribution to meeting this target. Implementing energy efficiency is widely regarded to be amongst the most cost beneficial ways to reduce GHG emissions.

The New Zealand Emissions Trading Scheme (NZ ETS) was enacted in September 2008. The incoming government established a special Select Committee to review the NZ ETS and related climate change matters in order to increase understanding and build a broader consensus on how to make more effective progress on climate change issues.

In August 2009, the NZ Government announced a 2020 target range to signal New Zealand's commitment to comprehensive efforts to address global climate change. The 2020 target was decided following consultation with New Zealand business, farmers, environmental groups, Māori, scientists, academics and other stakeholders.

More information on the NZ ETS is available at:

http://www.climatechange.govt.nz/emissions-trading-scheme/

4 PROPOSED REGULATION AND ALTERNATIVES

4.1 General Discussion

There are compelling reasons to introduce MEPS for computers and computer monitors. The evidence presented in this report is that the industry at large has not embraced more efficient products and that there is significant scope to improve both the energy consumption and power demand of computers and computer monitors. There is also evidence that the bulk of consumers are not minimising their computer and computer monitor energy consumption via power management functions already *built-in* to computers.

In summary, market failure exists and is forecast not to change significantly, leading to the requirement for some form of intervention to influence the supply and demand sides of the market.

Voluntary programs have influenced standby and sleep mode levels for many computers; however, on/idle mode performance of computers has not been driven by market forces, with the exception of some government purchasing policies and directives. Whilst government markets are large, the balance of the market (estimated at 66%) is disparate and does not have the purchasing power to demand better energy performance i.e. in the main, this market is limited to products as designed/manufactured by suppliers.

The energy performance of computer monitors in off, sleep and on modes appears to be more in accord with the specifications of voluntary measures; however, the evidence is that for many computer monitors, power demand is much greater than that of other models already in the market place. The evidence also indicates potential to specify even lower power levels than the MEPS levels, at some stage in the future, should the evidence indicate compliance with the proposed MEPS only, rather than voluntarily going beyond MEPS.

Computers and computer monitor systems consume significant amounts of energy and, as shown in Figure 21, this can exceed the typical annual energy consumption of products already subject to mandatory energy rating labelling in Australia and New Zealand.

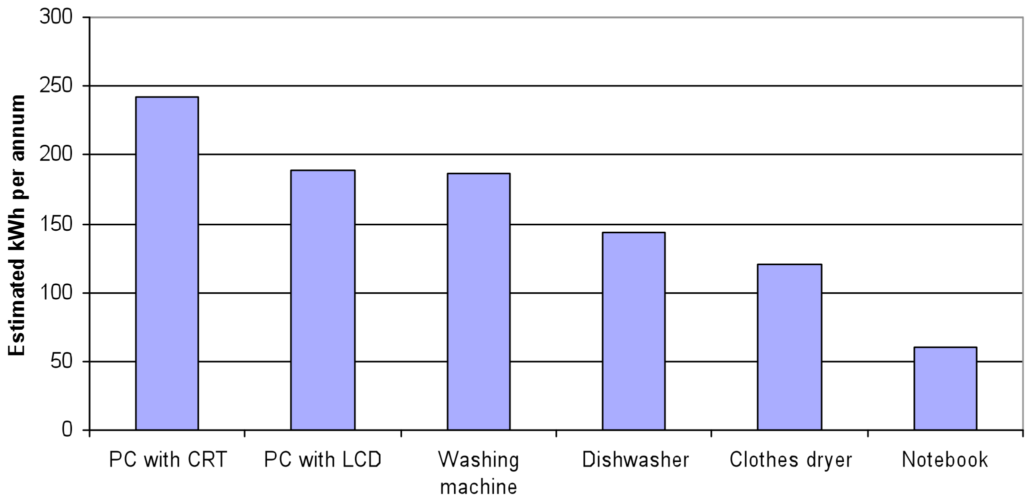

Figure 21: Estimated Annual Unit Energy Consumption of Computer Systems and Regulated Whitegoods

The whole market has experienced high growth and is forecast to continue due to increasing use of the internet in the home and office sectors, combined with cheaper, higher performance computers and reducing prices of LCD computer monitors. The 'in use' stock of computers and computer monitors is estimated to have more than doubled in the last four years and is forecast to continue for the foreseeable future. Australian Bureau of Statistics data[38] on household goods, published in 2005, as per Table 14 shows the penetration of home computers exceeds that of some products subject to mandatory energy performance labelling.

Table 14: Stock Data for Household Goods

Product	ABS estimates 2005
Clothes Dryers	4.32 million
Dishwashers	3.26 million
Washing machines	7.56 million
Computer systems	6.75 million

Combining the ABS household stock estimates with estimated annual energy consumption, Figure 22 shows that the stock of household computer systems consumes more energy than products already subject to mandatory energy performance labelling. Considering also office computer systems energy, the total energy consumption of computer systems dwarfs that consumed by some regulated whitegoods.

38 4602.0 - Environmental Issues: People's Views and Practices, Mar 2005

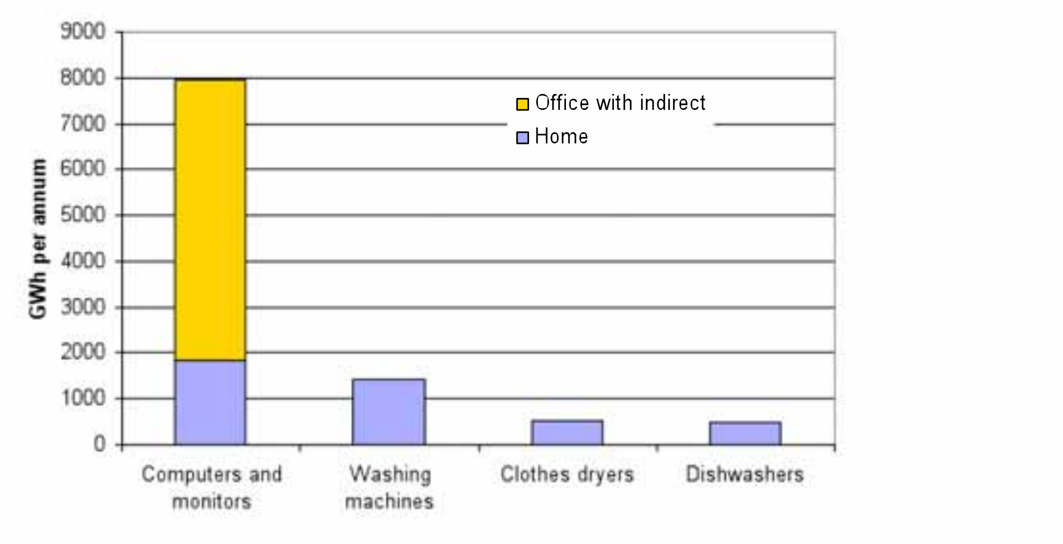

Figure 22: Total Estimated Energy Consumption, 2006 - Computer Systems and Regulated Whitegoods

Technical evidence from DCCEE and US EPA tests shows that low energy computers are available now and that many models have consumption levels well in excess of the low energy computers with the same or similar specifications.

Technical evidence for computer monitors shows that many low energy computer monitors models are available now and that many models have consumption levels well in excess of models with the same or similar display area and resolution.

The European analysis indicates energy savings up to 48% are achievable through the use of more efficient components and enabling power management software.

4.2 STATUS QUO (BAU)

This section outlines the status quo position which is used as the base case for comparative analysis with the regulatory option.

4.2.1 AUSTRALIA

In Australia the direct and indirect energy consumption for computers and computer monitors in 2006 is estimated to have been approximately 7,392 GWh, equivalent to annual GHG emissions of 7.46 Mt CO_2-e.

The annual energy consumption for the projected stock changes is shown in Table 14, which is a tabular form of the data shown in section 1.5.5

Table 14: Projected Australian BAU energy consumption

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
7931	8255	8615	8980	9128	9051	8704	8545	8262	8245	8229	8275	8314

4.2.2 New Zealand

In New Zealand the total direct and indirect energy consumption for computers and computer monitors in 2006 is estimated to have been approximately 1,232 GWh, equivalent to annual greenhouse emissions of 0.74 Mt CO_2-e.

The annual energy consumption for the projected stock changes is shown in Table 15, which is a tabular form of the data shown in section 1.5.5

Table 15: New Zealand - Forecast BAU Energy Consumption – GWh

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1304	1349	1399	1450	1465	1445	1384	1355	1306	1297	1288	1289	1289

4.3 Voluntary Efficiency Standards

Voluntary efficiency standards are a policy option that encourages equipment suppliers and/or manufacturers to voluntarily meet certain minimum energy efficiency levels, i.e. in the absence of regulation.

Success of this option relies on equipment suppliers and/or manufacturers being effectively encouraged to rationalise their model ranges to eliminate less efficient models, or to upgrade these models to meet the voluntary efficiency standards. The implementation of voluntary standards is often driven by government purchasing polices and can be limited to those products used by this market sector, thus leaving less efficient problems for general market use. As there are few commercial incentives to expand the voluntary measures to the balance of the market, it is unlikely that suppliers would willingly make these changes without significant government incentives or intervention. Also they will be disadvantaged by suppliers that do not participate in a voluntary scheme, who then may be able to sell their appliances at a price advantage.

The major examples of current voluntary efficiency standards are the ENERGY STAR® specifications V4.0 and V5.0 for computers and V4.1 and 5.0 for computer monitors. The list of compliant computer models available in the US is growing, however this is most likely driven by US Federal directives for federal agencies to purchase ENERGY STAR® compliant computers.

However, growing coverage of a voluntary scheme is no assurance that minimum standards are being met. The results shown in Table 16 show that (in an albeit small sample) some 36% of desktop and notebooks failed to meet the claimed standard.

Table 16: ENERGY STAR® compliance testing

Product	Qty tested	Failed power criteria	Failed power management criteria	Did not meet completely	Met completely	Failed to meet claim %
Desktops	11	0	4	4	7	36%
Notebooks	11	2	2	4	7	36%
Total	22	2	6	8	14	36%

Recent DCCEE testing of computers claiming to be compliant with ENERGY STAR® V4.0 or V5.0 raises concerns with respect to voluntary standards and their veracity.

For computer monitors there are a significant number of LCD models that meet the V4.1 tier 2 specifications, which were implemented in January 2006. Compliance with Tier 1 is almost universal, as this specification is no longer stringent having been in place since January 2005.

As data for pre Tier 2 computer monitors is not available from the US ENERGY STAR® web site, EU ENERGY STAR® data has been used to generate Figure 23. This shows the power spread of registered computer monitors compared to ENERGY STAR® V4.1 Tier 1 and Tier 2 power specifications. This figure demonstrates that there is a significant spread in active power for compliant LCD computer monitors utilising the ENERGY STAR® power metric based upon megapixels.

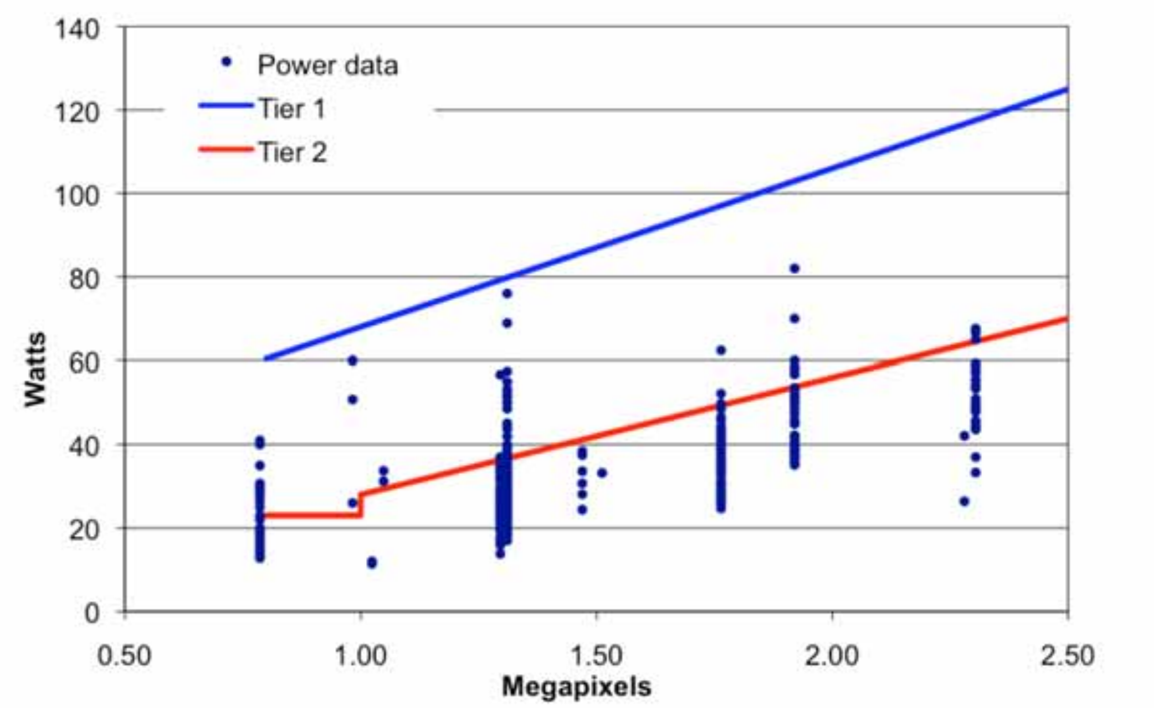

Figure 23: EU ENERGY STAR® Computer Monitor Power Spread

With respect to power management, the US EPA's goal is to achieve a 40% enabling rate nationally by 2010; 60% by 2012; and ≥ 80% by 2014, which is in a market where Federal Government computers and computer monitors are required to comply with ENERGY STAR® specifications, thus indicating that a significant proportion of the remainder of the market will not participate.

4.4 Voluntary Certification Program

A voluntary electrical performance certification program would require the establishment and approval of a third party test centre. Manufacturers would voluntarily supply computers and computer monitors for certification in order to gain a listing on, say, a web site.

As with other voluntary information-type programs, there is a tendency for only the better performing products to participate in an attempt to gain a marketing advantage over poorer performing products. This type of program can work in a market where consumers are looking for efficient products, but in the case of computers and computer monitors energy consumption is not a primary criterion in model selection.

During stakeholder consultation meetings, Australian industry has expressed concern about compliance, even with MEPS, by the white box manufacturers, leading to the conclusion that *brand-name* companies may participate in a voluntary scheme while others probably would not. This would then result in a commercial advantage to non-participants, thus increasing the probability of sales of poorer performing products.

The costs associated with this option, for participants and government, would be the same as the mandatory MEPS option. In addition it would also require a significant complementary consumer and salesperson education program, of quite a technical nature, in stores and in the media to convey the message. In summary the costs would be similar and the benefits lower than the MEPS option and is therefore not considered to be the best option to meet the objectives.

4.5 Voluntary endorsement labels (NZ Energy Star®)

ENERGY STAR® is an international standard for energy efficient electronic equipment, created by the US Environmental Protection Agency in 1992. Several countries around the world, including New Zealand since 2005, has supported and promoted the use of the US EPA ENERGY STAR® program. ENERGY STAR® is a voluntary endorsement labelling program and the ENERGY STAR® mark enables customers to identify energy efficient electronic products. The NZ ENERGY STAR® program increased customer awareness of the ENERGY STAR® mark to 76% in December 2010.

ENERGY STAR® has become the de facto test procedure for computers and computer monitors in the global market and is used as a mandated energy efficiency standard in purchases by the US and some US state governments. The Australian government, in the absence of an AS/NZ Standard, have stipulated ENERGY STAR® V4.1 as a minimum energy efficiency standard in recent computer purchasing contracts.

However, as noted in sections 4.3 and 4.4 above, voluntary programs have problems with respect to relevance to all suppliers and the impact that low cost, inefficient products will have on the market.

4.6 Dis-endorsement Label

The principle of a dis-endorsement label is to highlight that a product is an energy waster. This would require the establishment of test standards and power levels in each operational mode, as per MEPS. The use of the dis-endorsement label would only indicate that a particular product was below-the-bar without providing the consumer comparative information on how high more efficient products were above-the-bar.

Dis-endorsement labelling would require a significant complementary education program, of quite a technical nature, that would be beyond the comprehension of many consumers. Costs to manufacturers, importers; suppliers and governments would be similar to the MEPS option, with additional education program costs. Therefore the costs would be higher and the benefits lower, due to poor performing products still remaining in the market.

Dis-endorsement labelling is not aligned with performance rating initiatives internationally; this would make Australia a special case for these globally traded products, which stakeholder consultations have deemed imperative.

4.7 Levies and Emissions Trading

One way of increasing the uptake by the market of more energy efficient products is to increase the purchase and/or operating costs–of the inefficient products–to the consumer. This can be done by raising the price of the product or raising the price of the electricity the product consumes via a levy or an emissions trading scheme. These options are discussed below.

4.7.1 Equipment Levy

The equipment levy involves imposing a levy upon inefficient products which would raise their price and fund programs which would redress the greenhouse impact of equipment energy use. Two variations of this option are worthy of consideration:

- The proceeds from the levy are diverted to greenhouse-reduction strategies unrelated to product efficiency (i.e. the levy is 'revenue-positive').
- The proceeds are used to subsidise the costs of more efficient products so that any cost differentials between these and inefficient products are narrowed or eliminated (i.e. the levy is 'revenue-neutral').

There are significant issues surrounding the measurement of equipment, the costs of collecting such a levy and the allocation of the resulting funds which would need to be addressed in order to implement this option. It is also unclear how such a levy scheme could be efficiently managed and whether the costs of implementing such as scheme could be justified in terms of its impact. It is also understood that the use of such levies are not currently government policy, so this option will not be considered further.

4.7.2 Electricity Levy

At present, the cost of electricity faced by consumers reflects, however imperfectly, the cost of the capital invested in the electricity generation and transmission systems, operating and maintenance costs and taxes. They may also reflect the costs of controlling pollutants such as oxides of nitrogen and sulphur (NOx and SOx), for which emissions standards are currently in force in some areas. They do not reflect the value of GHG emissions; or rather they implicitly assign a value of zero to such emissions. In other words, greenhouse costs are not internalised in the electricity price. However, through the Australian Government's Mandatory Renewable Energy Target (MRET) and the NSW GHG Abatement Scheme (GGAS) program, some costs of GHG emissions are being imposed.

At present, electricity prices are sufficiently low that few consumers consider the cost of the electricity required by appliances when making a purchasing decision. One policy option would be to introduce a levy on the price of electricity to reflect the cost of GHG emissions from the production and combustion of the fuels used to generate it. This would raise the consumers' consideration of the energy efficiency of appliances and might encourage the uptake of more energy efficient products.

However, the Australian Government has decided to implement an emissions trading scheme and therefore it is very unlikely that an electricity levy would also be considered.

A low level electricity levy is currently already applied in New Zealand. The revenue from this levy is presently used to fund the operations and functions of the Electricity Commission, including some targeted electricity efficiency research and capital upgrade projects. None of these projects currently relate to the use or efficiency of computers and computer monitors.

4.7.3 AUSTRALIA'S EMISSIONS TRADING SCHEME

Australia has decided to introduce the Carbon Pollution Reduction Scheme (CPRS). The introduction of an Emission Trading Scheme (ETS) in the form of the CPRS is Australian Government policy, however by itself is unlikely to impact considerably on the energy use of computers and computer monitors. Current government policy is for implementation of the CPRS to be delayed until 2013. The energy price rises that might flow from the introduction of an ETS are unlikely to quickly lead to consumers being concerned about the energy use of computers and computer monitors, and consumers would still lack information on the energy usage of computers and computer monitors even if they were more concerned. Further, a range of financial concessions or exemptions may dampen any such price signals emanating from an ETS. Hence it is concluded that an ETS on its own is unlikely to affect computers and computer monitors energy performance or market take-up.

The Australian Government's Mandatory Renewable Energy Target (MRET) and New South Wales' Greenhouse Gas Abatement Scheme (GGAS) are examples of programs that have imposed some of the costs of GHG emission impacts on energy suppliers, which will have flow-on effects on retail energy prices. However, the implementation of a cap-and-trade GHG ETS, such as that announced in June 2007, could lead to the full cost of the GHG emissions impacts being reflected in energy prices.

The nature of the Australian ETS and the impact on the costs and benefits of the proposed policy approach for computers and computer monitors cannot be determined until the government has decided operational details of the ETS and until modelling of future electricity costs are available.

In terms of general policy, MEPS will complement the emissions trading scheme, as noted in the *Report of the Task Group on Emissions Trading* (Australian Government 2007):

> *"Emissions trading is not a panacea. A comprehensive response will involve complementary measures that address market failures not corrected by the emissions trading scheme. ... There will also be a continuing role for policies that improve information, awareness and adoption of energy-efficient vehicles, appliances and buildings." (p 12)*
>
> *"Beyond information-based policies, energy efficiency policies could target areas where market barriers are likely to be more fundamental and enduring. This is likely to be in areas where consumers make infrequent decisions and where it is difficult to judge the energy and emissions implications. There is a good case for continuing the development of well-designed and consistent regulated minimum energy standards for buildings and household appliances. Purchases of energy-efficient*

products can have a large impact on aggregate emissions over time, and reduce the impact on household budgets of any rise in carbon prices." (p 135);

4.7.4 New Zealand's Emissions Trading Scheme

In September 2007, the New Zealand Government announced an in-principle decision to use an ETS as its core price-based measure to reduce GHG emissions and enhance forest carbon sinks.

The New Zealand Emissions Trading Scheme (NZ ETS) was introduced in 2008, with various sectors to be phased in from 2008 to 2013. It was proposed that the first sector would include forestry, followed by liquid fossil fuels, then stationary energy and industrial processes, followed by agriculture, and waste. New Zealand units are expected to be the primary domestic unit of trade and the scheme would allow purchase from, and sale to, international trading markets.

Feedback from stakeholders and Māori will inform subsequent decisions on the design of the scheme and the ultimate form of legislation required to implement it.

The scheme is one of a range of policies and measures to reduce domestic GHG emissions and contribute to sustainable outcomes for New Zealand. Together such measures are intended to bring New Zealand's net emissions below BAU levels and comply with New Zealand's international obligations, including existing commitments under the Kyoto Protocol.

The scheme is intended to shift New Zealand's economy towards investing in and consuming goods and services with lower GHG emissions (e.g. investment in energy efficiency and renewable energy generation). This will be achieved by making the price of GHG emissions a factor in the decisions of both producers and consumers.

An initial report by the Emissions Trading Scheme Committee, released on 31 August 2009, made 34 recommendations. The report and its recommendations will inform current negotiations between political parties on the final form of a moderated NZ ETS.

More information on the scheme can be found in the Executive Summary available from New Zealand's Ministry for the Environment at:

http://www.mfe.govt.nz/publications/climate/

4.7.5 Conclusions

The two levy options proposed, equipment and electricity, are currently not government policy and would require extensive consultation at the highest levels of government. Hence these options are not worthy of consideration until such time as government policy changes to favour levy schemes.

It is unclear if an ETS alone would impact on the energy efficiency of computers and computer monitors. With the introduction of the CPRS emissions trading scheme in Australian and the NZ ETS in New Zealand the energy price rises that may flow from their introduction are unlikely to quickly lead to consumers being concerned about the energy efficiency of computers and computer monitors. Consumers would still lack information on the energy usage of these products even if they were more concerned. It is concluded that an ETS on its own is unlikely to affect computer and computer monitor energy performance or market take-up.

4.8 Outreach, Education and other Voluntary Measures

Extensive consultation with industry and the peak ICT industry body, the Australian Information Industry Association (AIIA), over a period of more than two years explored all feasible options for improving energy efficiency in the existing stock of equipment using outreach, education and other voluntary measures. Several options were identified, program concepts were developed and the ideas tested with industry participants. The proposed measures were those that industry was supportive of and that were accepted as having a higher likelihood of success, and of being affordable and practical. They include:

- Getting large ICT users to enable existing power management capabilities in equipment;
- training and educational efforts for ICT professionals and users, and
- promotion of exemplary equipment, capable of the highest levels of efficiency in operation, to large ICT buyers.

The proposals that have been developed in more detail are listed in APPENDIX 12. However, in short these measures revolve around the largest ICT users enabling power management on their existing stock of equipment, purchasing of the most exemplary new equipment (Energy AllStars) and development and promotion of web based industry and consumer education programs on energy efficiency with ICT.

Efficiency gains from some of the measures proposed, while potentially significant in the early years, decline rapidly within a few years as existing stock ages, and is replaced. In sum, using what are considered to be reasonable and potentially optimistic assumptions on success rates of the programs outlined, total energy savings are estimated to be more than 7,180 GWh over the period from 2010 to 2020. This equates to potential aggregate abatement over the period of greenhouse emissions from these measures of approximately 7.1 MT CO_2-e, given the programs are as successful as assumed.

It should be noted however that most of the benefits of the voluntary measures could still be captured, even with the introduction of MEPS, particularly from those programs focussed on improving the performance of equipment already in use throughout the economy.

4.9 Mandatory Energy Labelling

Mandatory energy labelling requires the application and display of a comparative energy performance label on products and packaging. It is designed to provide consumers with a visual display of the relative performance of one product compared to another. Energy labelling seeks to reduce consumers ‘search costs’ by presenting highly technical information in a format that can be readily understood and is available at point of purchase to assist in influencing consumers purchasing decision.

The comparative energy label which has been used for over 20 years in Australia on many whitegoods has been highly effective. It provides an easily understood and credible means for consumers to compare the performance of competing appliances. Even though the display of the label is mandatory in many cases, any benefit in terms of reduced energy consumption relies upon the selection of the appliance by the consumer. There are other groups of purchasers who are motivated to choose efficient equipment and who would use an energy rating label when making a purchase decision [39] However, many suppliers claim energy labelling of an entire computer system is impractical because:

- of the proliferation of labels already appearing on computers and computer monitors
- the particular sales model where computers and computer monitors are frequently sold 'in the box' or via websites (so the label would not be used or available to consumers at the time purchase)
- the range of optional componentry affecting efficiency within both the computer and computer monitor, which enables a purchaser to customise their system, would make the label scheme too complex and prone to error.

At the retail "on the shelf/take it now" level, the computer system configuration is generally fixed, although consumers can still customise a range of components. Similarly products purchased on-line generally have a base platform from which a consumer can customise usually from a drop-down list of options. In these two cases, any label applied at shipment would not reflect the computer's final configuration.

Corporate customers will often issue a request for tender with specific components and functions to meet a variety of corporate needs. This could add an extra cost for the supplier that is passed on to the customer with no energy efficiency benefit as the organisation has specified the configurations.

These arguments against mandating the use of labels on computers have been accepted by energy efficiency regulators.

Note that ENERGY STAR® has adopted a measuring methodology for computer monitors that is consistent with those introduced for televisions globally. As this methodology has also been used for television regulation in Australia, efficiency agencies will encourage the adoption of a voluntary industry labelling scheme for computer monitors, based on the ENERGY STAR® methodology. Such a voluntary scheme would see some energy use information provided on some computer monitors, just as it is provided now on TVs, as a precursor to any subsequent mandatory MEPS or other scheme.

5 Minimum Energy Performance Standards (MEPS)

MEPS aims to remove the worst performing products from the marketplace, rather than promoting the best. In Australia and New Zealand this is achieved by including the minimum energy performance (and possibly other) criteria within an Australian/New Zealand Standard, which is mandated through state, territory and New Zealand legislation. The energy performance criteria are

[39] Consumer Group Discussion on Purchasing Major Household Appliances with Reference to TVs and ICT, 2008, Winton Sustainable Research Strategies (available for download at http://www.energyrating.gov.au/library/details200806-focusgroup-tvpurchase.html

developed by a committee comprised of industry and government representatives.

A mandatory MEPS program will only apply to new stock of computers and computer monitors within the scope of the joint Australia/New Zealand Standard that are manufactured or imported on or after the implementation date. A further advantage of MEPS is that it creates a 'level playing field' that protects the investment of those wishing to sell more efficient products, since they know they will not be undercut by products which may be cheaper, but less efficient.

Australia and New Zealand have introduced MEPS for a range of products and have a very successful track record in this area. Further information is available from: http://www.energyrating.gov.au/meps1.html.

This option is based upon the introduction of joint AS/NZS to establish test specifications and proposed MEPS based upon the US Environmental Protection Agency's ENERGY STAR® specification V5.0 for computers and specification V5.0 for computer monitors. Energy labelling requirements, as discussed in section 4.9, would be of doubtful use for computers. Based upon the analysis shown in section 4.3, computer monitors exhibit a wide range of energy performance in active power mode and hence a comparative label may be of benefit to consumers, however this is not expected in the initial MEPS requirements.

The target date for introducing the proposed MEPS is 30 June 2011, by which time the ENERGY STAR® V5.0 computer specification will have been in place for two years and the computer monitor performance specification for almost 2 years for displays less than diagonal 76.2 cm and 18 months for displays diagonal 76.2 to 152.4 cm.

The introduction of MEPS based on the ENERGY STAR® specifications will only apply to computers and computer monitors manufactured or imported on or after the implementation date.

Computers

The proposed MEPS for defined categories of computers, based upon ENERGY STAR® specification V5.0[40], are as follows.

Table 17: Typical Energy Consumption (TEC) requirements

	Desktops and Integrated Computers (kWh)	Notebook Computers (kWh)
TEC (kWh) per annum	Category A: ≤ 148.0 Category B: ≤ 175.0 Category C: ≤ 209.0 Category D: ≤ 234.0	Category A: ≤ 40.0 Category B: ≤ 53.0 Category C: ≤ 88.5
Capability adders		
Memory	1 kWh (per GB over base) *Base Memory*:	0.4 kWh (per GB over 4)

40 http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Version5.0_Computer_Spec.pdf

	Categories A, B and C: 2 GB Category D: 4 GB	
Premium Graphics (for Discrete GPUs with specified Frame Buffer Widths)	Cat. A, B: 35 kWh (FB Width ≤ 128-bit) 50 kWh (FB Width > 128-bit)	Cat. B: 3 kWh (FB Width > 64-bit)
	Cat. C, D: 50 kWh (FB Width > 128-bit)	
Additional Internal Storage	25 kWh	3 kWh

Table 18: Operational Mode Weighting

	Desktop		Notebook	
	Conventional	Proxying	Conventional	Proxying
Time off	55%	40%	60%	45%
Time sleep	5%	30%	10%	30%
Time idle	40%	30%	30%	25%
Note: Proxying *refers to a computer that maintains Full Network Connectivity as defined in Appendix. For a system to qualify under the proxying weightings above, it must meet a non-proprietary proxying standard that has been approved by the EPA and the European Union as meeting the goals of ENERGY STAR®. Such approval must be in place prior to submittal of product data for qualification.*				

Power levels for small-scale servers shall be less than or equal to the values shown in Table 19.

Table 19: Power levels for small-scale servers

Category	Idle	Standby (off mode) WOL disabled	Standby (off mode) WOL enabled
A	≤ 50.0 W	≤ 2.0 W	≤ 2.7 W
B	≤ 65.0 W		

In addition, the regulatory proposal will also provide that:

- The appliance's internal and external power supplies meet the efficiency levels set out in Table 20. A declaration to this effect will be required at registration.

Table 20: Power supply efficiency

	% of rated power			Power factor at 100% rated power
	20%	50%	100%	
IPS efficiency	82%	85%	82%	> 0.9
EPS rating	Performance mark IV as per AS/NZS4665.2			

- The proposed regulation will also provide a *deemed to comply* option for small volume product types or types where test data is not available. If a supplier uses a more efficient power supply for computers and notebooks within agreed specific categories or sizes (to be advised) and reports this component at the time of registration, these types will be *deemed to comply* with the MEPS. The more efficient internal power supply specifications are based on aligning with the Climate Savers Computing Initiative levels as shown in Table 21.

Table 21: Deemed to comply internal power supply efficiency

Internal power supplies	% of rated power			Power factor at % of rated power
	20%	50%	100%	
IPS efficiency	87%	90%	87%	> 0.9 at 50%

Deemed to comply notebooks shall utilise an external power supply compliant with performance mark V as per AS/NZS4665

Computer monitors

The proposed MEPS for computer monitors, based upon ENERGY STAR® specification V5.0[41], Tier 1 levels are as follows:

Table 22: Maximum on mode power for computer monitors without automatic brightness control enabled by default

Display category	Maximum on mode power Watts
Diagonal Screen Size < 76.2 cm Screen Resolution ≤ 1.1 MP	PO = 6*(MP) + 0.007752*(A) + 3
Diagonal Screen Size < 76.2 cm Screen Resolution > 1.1 M	PO = 9*(MP) + 0.007752*(A) + 3
Diagonal Screen Size 76.2 – 152.4 cm All Screen Resolutions	PO = 0.04185*(A) + 8

Where Po = maximum on mode power, MP = Display Resolution (megapixels) and A = Viewable Screen Area (square centimetres)

An alternate calculation is used to calculate maximum On Mode power consumption for displays shipped with Automatic Brightness Control enabled by default:

$$\mathbf{PO1 = (0.8*Ph) + (0.2*Pl)}$$

Where Po1 is the average On Mode power consumption in watts, rounded to the nearest tenth of a watt, Ph is the On Mode power consumption in high ambient lighting conditions, and Pl is the On Mode power consumption in low ambient lighting conditions. The formula assumes the display will be in low ambient lighting conditions 20% of the time.

Table 23: Maximum sleep and off mode power for all computer monitors

Sleep mode	Off mode
≤ 2.0 W	≤ 1.0 W

For computer monitors using an external power supply, the external power supply shall comply with performance mark III requirements as per AS/NZS 4665

In addition to MEPS the AS/NZS will include power management criteria whereby computers and computer monitors, at the time of shipping, have maximum time to sleep mode activated.

[41] http://www.energystar.gov/ia/partners/product_specs/program_reqs/displays_spec.pdf

6 COST, BENEFIT AND OTHER IMPACTS OF THE PROPOSED MEPS OPTION

Summarising this section, principle factors include;

Costs

Increased cost to government and hence taxpayers to manage the program.

Cost of compliance to manufacturers and suppliers, passed on to consumers as incremental increases in cost of products.

Financial benefits

Reduced energy cost to consumers due to reduced energy consumption over the life of the product.

In the case where carbon pricing is included, reduced energy consumption reduces payments for carbon pricing.

Other impacts

Reduced energy consumption/production resulting in reduced GHG emissions and contribution to meeting Kyoto targets.

Reduced demand on electricity networks.

Where it differs from information elsewhere in this section, information and data that is specific to New Zealand is detailed in section 6.8.

6.1 COST TO THE TAXPAYER

The proposed mandatory MEPS program will impose costs on governments. Some of these are fixed and some vary from year to year.

Government costs comprise:

- Administration of the program by government officials (salaries and overheads, attendance at E3 Committee and Standards meetings, etc.);
- Cost of maintaining a registration and approval capability;
- Random check testing to protect the integrity of the program;
- Costs of producing leaflets and other consumer information; and
- Consultant costs for Standards development, market research, RIS, etc.

The government costs have been estimated as follows; they are similar to the allocations made for other products regulated by E3 Committee:

- Salary and overheads for officials administering the program: $50,000 per year;
- Check testing, research and other costs underpinning the program: $75,000 per year, half of it borne by the Commonwealth and the other half by other jurisdictions in proportion to their population, in accordance with long-standing, cost-sharing arrangements for E3 activities; and
- Printing and promotional activities at $25,000 per year.

Hence total government program costs are estimated to be $150,000 per annum and have been included in the *Australia* cost-benefit analyses.

New Zealand program costs are estimated at NZ$ 20,000 per annum.

6.2 BUSINESS COMPLIANCE COSTS

Compliance with the standard is the responsibility of the importer or local manufacturer of the product.

This RIS assumes that any increases in product design, construction, testing and registration costs will be passed on to customers and are included in incremental costs to consumers in the cost benefit analysis. The initial cost of testing is assumed to be borne by the manufacturers, either locally or overseas. Use of a NATA approved laboratory for computer testing is in the range of $500 to $1000 for a computer and circa $800 for a computer monitor. The cost of compliance–with the standard–is incremental to testing and registration costs, already borne by the manufacturer in compliance with other standards. These compliance costs will ultimately be amortised over the sales of the product, thus making the unit cost of compliance dependent upon the volume of sales expected.

Registration will be via a web site and as is the case of other programs there is no requirement for independent testing and suppliers will self certify conformance to MEPS and the energy rating level claimed. These requirements are no more onerous than existing safety and EMC requirements and as such should not impact such issues as time to market.

Only those products that comply with MEPS requirements and manufactured or imported on or after the implementation date will need to be registered

The Office of Best Practice Regulation's Business Cost Calculator specifies a checklist of compliance tasks/costs for analysis in a RIS. This RIS adopts the same methodology and the following items address the checklist.

Notification

Will businesses incur costs when they are required to report certain events?

> Businesses will be required to register each computer or computer monitor, or family of models, on a website. For example the current Australian registration cost per television or family of models is AUD$150. (NOTE: The implementation of the Victorian Government's *Electricity Safety (Equipment Efficiency) Regulations 2009* increased the registration cost to $284.90 (indexed) in that state for applications received from 1 May 2009).

Education

Will costs be incurred by business in keeping abreast of regulatory requirements?

> Business costs will be limited to the initial purchase, from the SAI-GLOBAL website, of the two parts of the relevant standards available as follows
>
> > Part 1 - comprising scope, definitions and test methods
>
> Part 2 – comprising the MEPS requirements.
>
> Typical costs for a two part standard is A$200
>
> Future amendments to standards are available free of charge from the SAI-Global web site to a purchaser of the original standard.

Permission

Are costs incurred in seeking to conduct an activity? No.

Purchase cost

Are businesses required to purchase materials or equipment?

> Manufacturers will be required to utilise components and designs to meet MEPS. Two options are available to businesses supplying computers. Testing for compliance or utilise a power supply at a higher efficiency level than the MEPS requirements.
>
> Testing can be in-house or via an independent testing company. Should manufacturers choose to do in-house compliance testing, they may need to purchase additional test equipment with the accuracy etc. specified in the standard.

Record keeping

Are businesses required to keep records up-to-date?

> As with all MEPS, businesses will be required to retain records for a period of five years after the last date of manufacture or import.

Enforcement

Will businesses incur costs when cooperating with audits or inspections?

> Costs would only be incurred due to non-compliance with the standard and are therefore are not part of *normal* business costs.

Publication and documentation

Will businesses incur costs when producing documents for third parties?

> It will be mandatory to display an energy performance label for computer monitors on retail display. E3 is currently investigating options for businesses that promote and sell products via the internet.

Procedural

Will businesses incur costs that are of a non-administrative nature?

> No

Other

Are there any other compliance costs associated with the regulatory proposal?

> As with any new electronic/electrical product, compliance with safety, EMC etc. standards is required.

6.2.1 Impact on Small Business

As with any other manufacturer or importer, they will be required to have the product tested for compliance or follow the *deemed-to-comply* route. Depending on the volume of products involved it may be more cost effective to use the deem-to-comply option.

The impact of the $150 to $280 registration cost of a product or family of products may be greater for small business if their sales volume is low; however, this is expected to be passed on to the end consumer after amortisation of the registration cost over anticipated sales.

6.3 Industry, Competition and Trade Issues

6.3.1 Industry

This section reviews the impacts of the proposal/s on suppliers. In the computer industry manufacturers, importers, distributors and retailers vary greatly in size, from trans-national corporations to small businesses. Clearly these groups have different capacities to respond to the costs that the proposed regulations will place on them. Product energy testing costs are more or less fixed for each model, so suppliers with many models will have higher costs, and will be at a further disadvantage if average sales per model are low. Similarly, if sales volumes are low, manufacturers may not have the purchasing power to get volume discounts, however this is the case for existing components. As with existing components, those suitable for compliant products will become available through normal supply chains.

Not all industry impacts are negative. Most energy efficiency regulations envisage an increase in average production costs due to increased quantities and/or higher quality of materials – although the envisaged price increases are rarely realised in practice. Price increases would increase product supplier revenues, but would have varying impacts on other sectors. As a result of the greater energy efficiency of the products, consumers will spend less on energy and this will decrease the sales revenue of energy suppliers below BAU. Consumers, however, will divert this spending elsewhere, which will increase the sales revenue of suppliers of other goods and services in the economy. (Impacts on energy suppliers are not usually analysed in detail since the energy consumption of the product in question usually represents a very small part of their market. For customer segments where energy costs are under-recovered, a reduction in energy sales could actually increase the profitability of the energy supplier.)

6.3.2 Trade

The following sections examine the costs and benefits of the MEPS options from the perspective of computer and computer monitor users. It is assumed that all compliance costs incurred by suppliers are eventually passed on to buyers in the normal course of business. Hence, for the purposes of cost-benefit analysis, the cost impact on computer and computer monitor suppliers as a group is neutral. There may however be some benefits for some suppliers by prohibiting the sale of inferior performing products.

Mandatory energy efficiency regulations apply to all products sold, whether locally manufactured and imported, and irrespective of country of origin. Nevertheless it is useful for decision-makers to know whether the proposals are likely to impact on the balance between local manufacture and imports e.g. by affecting one group of suppliers more than another.

Importers, manufacturers and suppliers will need to ensure that computers and computer monitors comply with the MEPS requirements. Businesses that already supply to countries utilising the ENERGY STAR® specifications or purchase from manufacturers of ENERGY STAR® compliant products will no doubt be in a better position to comply via the compliance testing option.

6.3.3 GATT

It is a requirement in the RIS phase to demonstrate that the proposed test standards are compatible with the relevant international or internationally accepted standards and are consistent with Australia's international obligations under the General Agreement on Tariffs and Trade (GATT) Technical Barriers to Trade (GTBT) Agreement. The relevant part of the *GTBT Technical Regulations and Standards* is Article 2: *Preparation, Adoption and Application of Technical Regulations by Central Government Bodies*.

It is a particular concern of the GTBT that where technical regulations are required and relevant international standards exist or their completion is imminent, members should use them, or the relevant parts of them, as a basis for their technical regulations. The test procedures for computers and computer monitors and conditions in the Australian Standard replicates the United States EPA ENERGY STAR® tests, which is in essence the de facto test procedure in the global market. There is also agreement between APP countries to develop harmonised test standards based upon the ENERGY STAR® test specifications and methods.

The GTBT urges GATT members to give positive consideration to accepting as equivalent the regulations of other Members, even if these regulations differ from their own, provided they are satisfied that these regulations adequately fulfil the objectives of their own regulations.

There will be scope for accepting the results of computer and computer monitor tests conducted in other countries under comparable standards. However, there is no scope for accepting a computer or computer monitor that may comply with MEPS in its country of origin (e.g. in the US or EU) unless it also complies with Australian and New Zealand MEPS levels. The GATT does not prevent countries from setting MEPS levels according to their own requirements, costs and benefits.

In summary, the proposed regulations are fully consistent with the GATT Technical Barriers to Trade Agreement, and follow international standards where possible.

6.3.4 TTMRA

The Trans-Tasman Mutual Recognition Agreement (TTMRA) states that any product that can be lawfully manufactured in or imported into either Australia or New Zealand may be lawfully sold in the other jurisdiction. If the two countries have different regulatory requirements for a given product, the less stringent requirement becomes the de facto level for both countries unless the one with the more stringent requirement obtains an exemption under TTMRA.

As the Australian and New Zealand appliance and equipment markets are closely integrated, TTMRA issues arise if one country proposes to implement a mandatory energy efficiency measure but the other does not, if the planned implementation dates are different, or even if the administrative approaches are different (for example, Australian governments may require products sold locally to be registered with regulators, whereas New Zealand may not, so changing administrative and compliance verification costs).

It is planned that New Zealand and Australia introduce MEPS concurrently; therefore TTMRA will not be an issue.

6.3.5 COMPETITION

The proposed regulation will prevent manufacturers and suppliers from importing for sale computers and computer monitors that do not meet the proposed minimum efficiency performance standard. This may constitutes a prima facie technical barrier to entry and a potential restriction on competition.

To ascertain whether the proposed MEPS would restrict competition first requires an analysis of the impact of the standard on the computer and computer monitor manufacturing sector.

MEPS will only apply to new stock of computers and computer monitors manufactured or imported on or after the implementation date and will result in some current models of computers and to some extent, some computer monitors being removed from the market. It is difficult to quantify the exact number of computer and computer monitor models that manufacturers will remove from the market. However, the US EPA analysis observed that high compliance with the MEPS power specifications for computers could be achieved simply by the use of more efficient power supplies. Therefore suppliers/manufacturers may be able to meet the power specifications of MEPS by utilising a more efficient power supply.

Suppliers/manufacturers in the white box computer market sector may be affected the most by the proposed regulation; however, due to the plethora of participants in this sector, it is impossible to gauge impact and the gap between current performance and compliance. As with the US EPA comments on compliance rates and power supply efficiency, the increased availability of compliant internal and external power supplies will ease the route to compliance.

Efficient power supply technology is readily accessible and not costly and would appear to not greatly affect the current level of competition in the computer manufacturing sector. The market is typified by original equipment manufacturers of power supplies, supplying to computer and computer monitor manufacturers to standard designs or custom packaging to suit particular manufacturers requirements. These manufacturers may need to absorb the increased costs of the power supply to maintain current levels of market share; however, the reduced profit margin could impact on the long-term viability of the firm to remain in the market. If manufacturers of low-cost products exit the market or shift production away from cheap product models due to the higher costs of power supplies and other components, then the level of competition within some of the market would be affected and ultimately impact negatively on consumers. However, as the proposed regulation would apply to all competitors, the incremental cost should be the same for all, thus allowing them to compete as usual. Industry supply capability is already geared to meet ENERGY STAR® V5.0 specifications that has been in place since July 2009.

In view of the low technical barriers and associated cost for the technological adoption required by current and potential manufacturers, the proposed standard is unlikely to affect the market. Reported incremental costs are relatively low and are expected to diminish due to increased demand and hence economies of scale.

6.4 Consumer costs and benefits

This section of the analysis utilises cost estimates from industry and published sources as part of the consultation process in preparation for the draft consultation RIS.

6.4.1 Desktop computers

Data for the impact of the proposed MEPS on consumer prices is somewhat limited. The Climate Savers Computing Initiative (CSCI) estimates the current incremental cost to be circa US$20 for a desktop computer, of which an estimated two thirds is the power supply. However they do state "*At high volumes, the cost premium with 80 percent or 90 percent power supplies are zero or very close to zero*." Data from a New Zealand computer supplier indicates an increase in current wholesale price of US$10 for an 80% efficient power supply, which then, allowing for profit, is similar to the CSCI estimate. Similarly the EuP study of computers and computer monitors estimated the price increment of an efficient power supply to be €9 (circa A$14.5), which is in close agreement with the other power supply estimates. In the following desktop computer analysis, two price increments are considered.

US$20 increment – 2009 cost.

US$6 – future cost with zero internal power supply price increment.

This is a "simple" analysis uses fixed tariff over the life of the product with a discount rate of 7%. The full analysis utilises forecast tariffs from 2011 to 2025 based upon Department of Treasury forecasts and includes impacts on heating and cooling systems for computers used in offices.

Improvement	Impact	Cost A$	Electricity tariff	Life Years	BAU Annual kWh	MEPS Annual kWh	Annual saving	BC ratio
Office Desktop								
MEPS US$20	54%	$ 30.77	$ 0.177	5.0	194	105	$ 15.81	2.1
MEPS US$6	54%	$ 9.23	$ 0.177	5.0	194	105	$ 15.81	7.0
Home Desktop								
MEPS US$20	52%	$ 30.77	$ 0.177	5.0	142	74	$ 12.04	1.6
MEPS US$6	52%	$ 9.23	$ 0.177	5.0	142	74	$ 12.04	5.3

6.4.2 Notebook computers

Many new notebook computers utilise high efficiency switch mode power supplies driven by the harmonised international test and performance specifications. Most major brand name models comply with the 84% requirement of the proposed MEPS for external power supplies. In the following notebook computer analysis, two price increments are considered.

US$10 increment – 2008 cost allowing US$4 for external power supply compliance and US$6 for other compliance factors.

US$6 – future cost with zero external power supply price increment.

This is a "simple" analysis using fixed tariff over the life of the product with a discount rate of 7%. The full analysis utilises forecast tariffs from 2011 to 2025 based upon Department of Treasury forecasts and includes impacts on heating and cooling systems for computers used in offices.

Improvement	Impact	Cost A$	Electricity tariff	Life Years	BAU Annual kWh	MEPS Annual kWh	Annual saving	BC ratio
Office notebook								
MEPS US$10	58%	$ 15.38	$ 0.177	5.0	97	56	$ 7.24	1.9
MEPS US$6	58%	$ 9.23	$ 0.177	5.0	97	56	$ 7.24	3.2
Home notebook								
MEPS US$10	70%	$ 15.38	$ 0.177	5.0	60	42	$ 3.18	
MEPS US$6	70%	$ 9.23	$ 0.177	5.0	60	42	$ 3.18	1.4

6.4.3 LCD Computer Monitors

LCD computer monitors on average are estimated to have an incremental cost of $5.15 to achieve the improvement.

This is a “simple” analysis using an undiscounted fixed tariff over the life of the product. The full analysis utilises forecast tariffs from 2011 to 2025 based upon Department of Treasury forecasts and includes impact on heating and cooling systems for computer monitors used in offices.

Improvement	Impact	Cost A$	Electricity Tariff	Life Years	BAU Annual kWh	MEPS Annual kWh	Annual saving	BC ratio
Office LCD								
MEPS	54%	$ 5.15	$ 0.177	5.0	105	57	$ 8.47	6.7
Home LCD								
MEPS	63%	$ 5.15	$ 0.177	5.0	51	32	$ 3.30	2.6

6.4.4 Cost of Forgoing Product Features

The design and some aspects of performance of computers and computer monitors are governed by standards and specifications such as electrical safety, interference and total harmonic distortion.

Current computers and computer monitors may exceed the minimum requirements of these standards and there is potential for manufacturers/importers to use alternative components to just meet, rather than exceed them, to save costs. However, these are not *features* that are driven by consumer choice and, irrespective of MEPS, the consumer will still have a computer or computer monitor that as a minimum will meet these standards.

6.4.5 Sensitivity/Distributional Impact

This section shows the impact on benefit cost ratios for consumers for energy savings less than the forecast MEPS savings. Two base scenarios of incremental costs are shown:

- the forecast initial cost increment at the introduction of MEPS

and

- forecast cost increment after MEPS have been in place for two years with the latter being the lower cost increment.

Each chart shows the impact of energy savings less than the base MEPS forecast savings at over the service life at a discount rate of 7% and fixed tariff over the service life of 17.7 Australian cents.

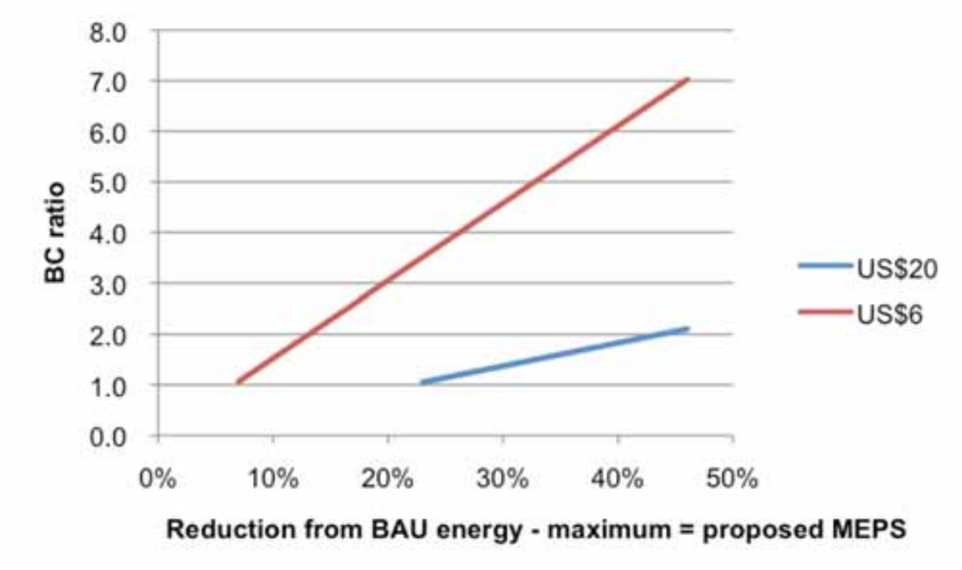

Figure 24: Office desktop benefit cost ratio vs. reduced energy savings

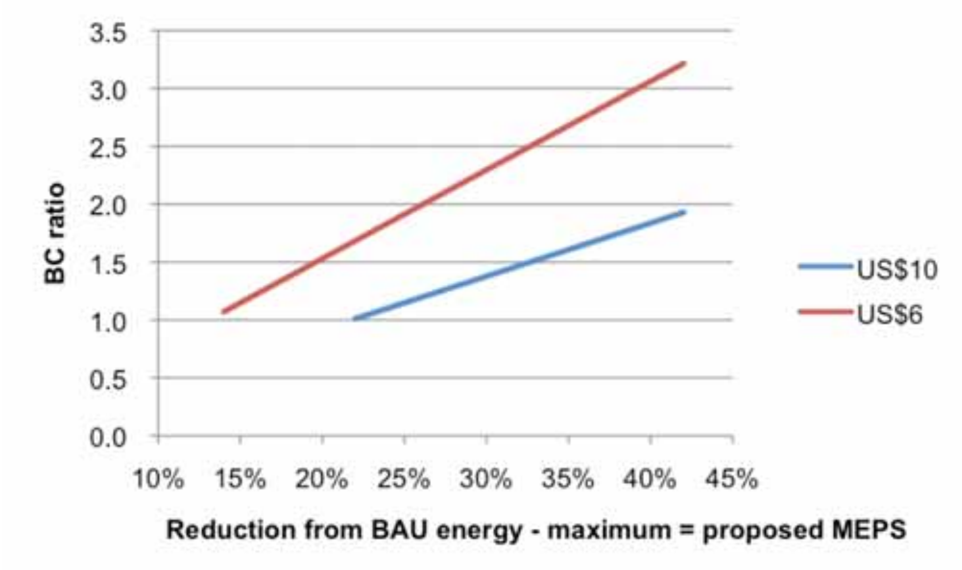

Figure 25: Office notebook computer benefit cost ratio vs. reduced energy savings

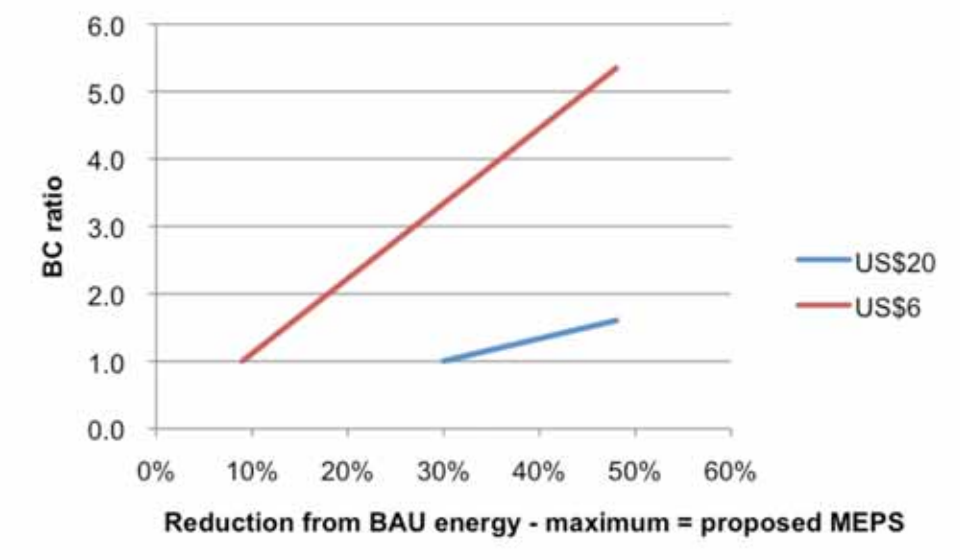

Figure 26: Home desktop computer benefit cost ratio vs. reduced energy savings

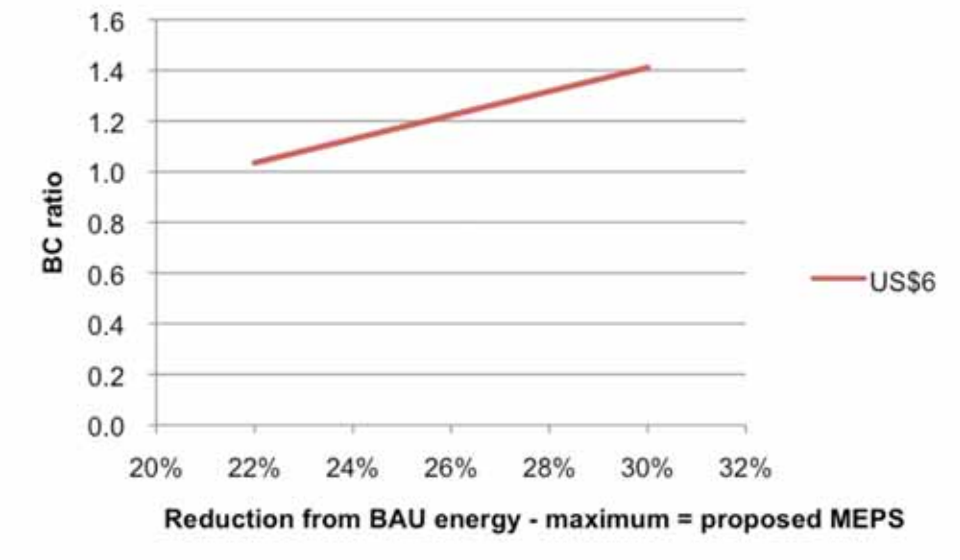

Figure 27: Home notebook benefit cost ratio vs. reduced energy savings

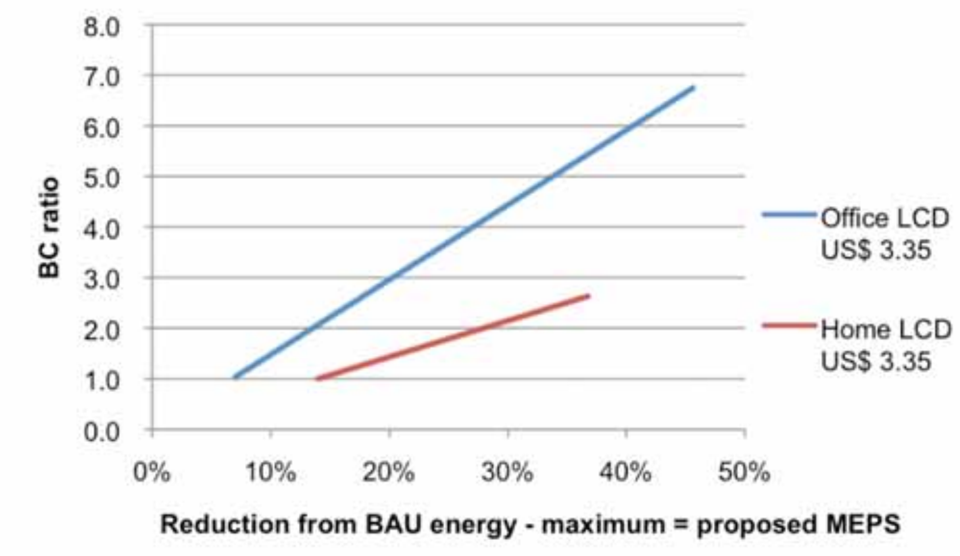

Figure 28: Office and home LCD benefit cost ratio vs. reduced energy savings

6.4.6 OTHER IMPACTS

Outside the costs and benefits to consumers, there are other costs benefits and impacts in other sectors of the community. Table 24 provides examples of impacts that result from reduced energy consumption.

Table 24: Examples of impacts in other community sectors

Sector	Impacts
Electricity retailers	Reduced sales of electricity and reduced profit. Lower operating costs. E.g. hedging contracts and exposure to high pool prices in periods of peak demand. Contribution to electricity reliability and security. Reduced need for greenhouse gas certificates.
Electricity transmission entities	Contribution to potential for deferral of transmission line upgrades.
Electricity generators	Reduced revenue and contribution to deferred capital expenditure. Reduced peak demand.
Federal Government	Lower energy sales results in lower GST collected. Reduced Government energy consumption provides reduced operating costs. Contribution to meeting the Kyoto Protocol target.
Business	Lower operating costs provide increased competitiveness and profits.

Addressing electricity retailers, any energy efficiency improvements lead to less energy supply and hence lower revenue/profits from the reduction in energy supply. The reduction in electricity retailers' revenue/profits also needs to be weighed up against possible benefits of reduced energy and peak demand and their effect on capital expenditure of building additional generation capacity particularly for the peak load period.

Benefits include:

- reduced network costs - through avoiding the costs of augmenting transmission and distribution networks;
- reduced electricity generation costs - through avoiding the costs of new generation capacity; and
- increased supply reliability - through reducing the number of interruptions.

Internal power supply efficiency and power management aspects of the proposed MEPS will have significant impact upon network loading as shown in

Table 25. The first section shows that utilising an 80% efficient power supply instead of a 65 to 70% efficient power supply will reduce network load by a computer by 12.5 to 18.7%. The second part of the table shows the impact of power management on examples of idle power for desktop computers i.e., when the computer automatically changes from idle to sleep mode. This of course applies to a single computer at a time and not whole stock, as not all will be in sleep mode at the same time.

Table 25: Impact of Power Supply Efficiency and Power Management on Network Load

	Current	MEPS	Load reduction
Power supply efficiency	65 to 70%	85% at 50% loading	17.6% to 23.5%
Idle power Watts		Sleep power Watts	Load reduction
50		4	92%
65		4	94%
95		4	96%

6.5 EXAMPLE OF THE MODELLING METHODOLOGY

When compared to the BAU case, the proposed MEPS must benefit Australian and New Zealand by improving the efficiency of energy use of computers and computer monitors over the long term. This improvement must more than offset any additional cost in purchasing the more energy efficient product.

Whilst detailed in APPENDIX 8, for each year in the period of 2011 to 2025, the modelling utilises forecast stock of each product (both retirements and market trends), estimated MEPS energy saving by product compared to BAU, forecast electricity tariffs and GHG emissions by jurisdiction. A simple example using office notebooks is shown in **Table 26** below but does not include program costs and carbon pricing.

Table 26 Office notebook example of modelling methodology

Stock Millions		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BAU		7.9	7.4	6.2	4.8	3.3	1.6					
2011 onwards			1.5	3.8	6.5	8.9	11.3	13.5	13.9	14.3	14.3	14.4
Total		7.9	8.9	9.9	11.3	12.2	12.9	13.5	13.9	14.3	14.3	14.4
Unit energy kWh												
BAU		97	97	96	94	94	94					
BAU improved		97	92	88	83	83	83	83	83	83	83	83
MEPS			53	53	53	53	53	53	53	53	53	53
Energy GWh												
BAU	BAU + improved	946	1052	1136	1219	1291	1333	1374	1414	1451	1459	1466
MEPS	BAU + MEPS	946	979	974	979	961	915	873	898	922	927	931
MEPS saving	BAU - MEPS		73	162	240	331	418	501	516	529	532	535
MEPS unit cost			$15	$12	$9	$9	$9	$9	$9	$9	$9	$9
MEPS sales Millions			1.5	2.3	2.7	2.4	2.4	3.7	2.7	3.1	2.5	2.4
Tariff $ per kWh		$0.17	$0.17	$0.18	$0.19	$0.21	$0.22	$0.23	$0.24	$0.25	$0.25	$0.26
Energy cost saving	MEPS saving x tariff Millions		$13	$29	$47	$70	$92	$114	$122	$130	$135	$141
MEPS cost	Sales x unit cost		23	28	25	23	22	34	25	29	23	22
Net benefit	Millions		-$10	$1	$22	$47	$70	$80	$98	$101	$112	$118
Emission factor		0.90	0.89	0.88	0.87	0.86	0.84	0.83	0.82	0.81	0.79	0.78
GHG savings kt	Energy saving x emission factor	0	65	142	208	283	353	417	423	427	423	418

6.6 IMPACT ON ENERGY USE AND GREENHOUSE GAS EMISSIONS

Since the MEPS criteria apply only to new products entering the market, it will be a number of years before the full impact of the measures are achieved. In the analysis all stock is assumed to have an average service life of five years. In comparing MEPS to BAU, the BAU case includes reductions in annual energy consumption due to natural product and operational improvements.

In 2020 the proposed MEPS criteria are estimated to reduce annual energy consumption by 2,699 GWh with cumulative savings to 2025 of 27,885 GWh. This is equivalent to reducing 2020 greenhouse emissions by 2.04 Mt CO_2-e and 22.63 Mt CO_2-e cumulatively to 2025. Note: emission savings are based upon projected household numbers and marginal emissions-intensity of electricity supply. (See Greenhouse Gas Emission Factors in APPENDIX 5).

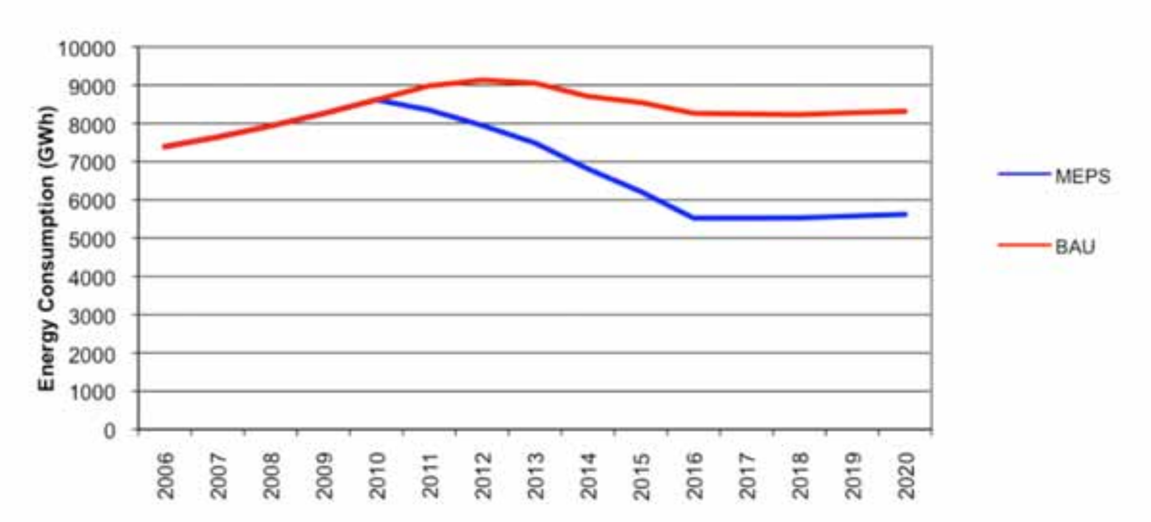

Figure 29: Australian energy consumption GWh - BAU and MEPS Scenarios

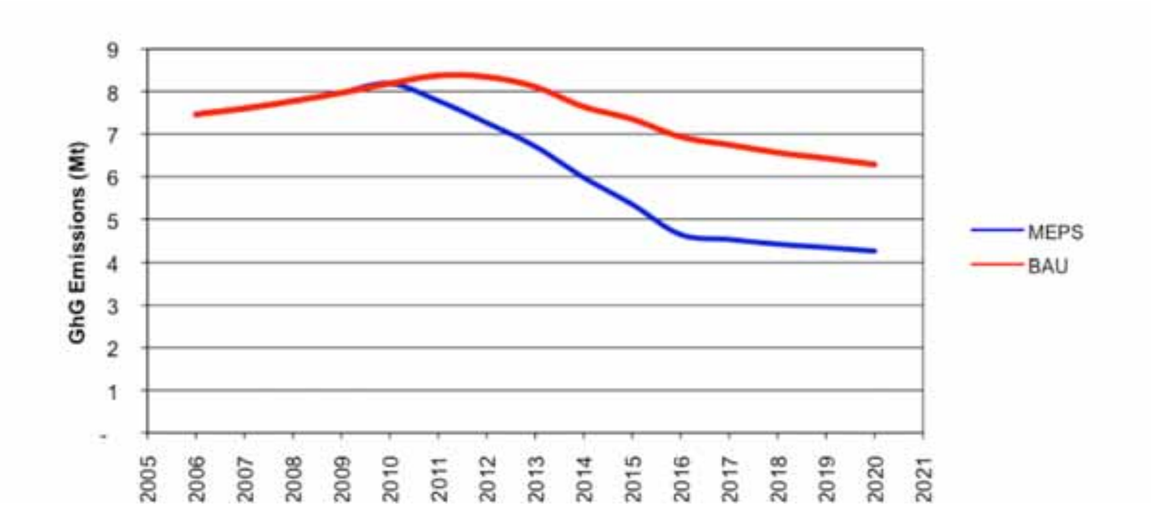

Figure 30: Australian GhG Emissions Mt - BAU and MEPS scenarios

6.7 AUSTRALIA - NATIONAL AND STATE COSTS AND BENEFITS

6.7.1 COMMUNITY AT LARGE ANALYSIS VALUED AT RETAIL PRICES

This section provides estimates of the national, state and territory benefits and costs valued at the domestic and commercial retail electricity tariffs for each state. The rationale for using retail prices here is that the economic value of the electricity saved is the reduction in consumers' expenditure on electricity. Table 27 shows the Net Present Value and Benefit Cost Ratios for Australia for a range of discount rates without any carbon value and Table 28 shows the same data including Department of Treasury price trajectories for carbon values as per APPENDIX 4. All State and Federal program costs are included. Incremental costs for MEPS compliant products are as per section 6.4, with initial costs at the high incremental cost, diminishing to the lower incremental cost over 2 years due to the increased availability of more efficient components.

Table 27: Australian financial analysis – no carbon value

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$7,014.4	$1,110.9	$5,903.5	6.31
3%	$5,219.4	$906.2	$4,313.2	5.76
7%	$3,617.6	$704.3	$2,913.2	5.14
10%	$2,800.6	$590.9	$2,209.7	4.74

Table 28: Australian financial analysis – with carbon value

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$7,266.1	$1,110.9	$6,155.2	6.54
3%	$5,589.2	$906.2	$4,683.0	6.17
7%	$3,745.8	$704.3	$3,041.4	5.32
10%	$2,819.9	$590.9	$2,228.9	4.77

Note – net benefits are evaluated to 2025 based upon an average 5 year service life for all products including those purchased in 2020.

Table 29 summarises the cost benefit ratio for each state at 7% discount rate. State program costs are included and are apportioned by household numbers in each state.

The main factor influencing the ratios is the baseline marginal energy tariffs for each State. The ratios are also influenced by the impact of cooling and heating loads on indirect energy.

Table 29: Summary for Benefit Cost Ratio by state/territory - 7% discount rate.

State	Benefit Cost Ratio No carbon value	Benefit Cost Ratio Carbon value A$ 10 per tonne
NSW	5.43	5.62
Vic	4.64	4.84
Qld	5.22	5.43
SA	6.54	6.73
WA	4.64	4.82
NT	4.81	5.00
Tas	4.21	4.24
ACT	3.91	4.08

Table 30 to Table 37 show the financial analysis for each state/territory for a range of discount rates with no carbon value.

Table 30: Financial Analysis – New South Wales

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$2,385.1	$357.2	$2,028.0	6.68

3%	$1,776.0	$291.5	$1,484.5	6.09
7%	$1,231.9	$226.7	$1,005.2	5.43
10%	$954.2	$190.3	$763.9	5.01

Table 31: Financial Analysis – Victoria

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$1,530.7	$268.3	$1,262.5	5.71
3%	$1,139.0	$218.9	$920.0	5.20
7%	$789.4	$170.3	$619.1	4.64
10%	$611.1	$142.9	$468.2	4.28

Table 32: Financial Analysis – Queensland

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$1,487.0	$231.5	$1,255.5	6.42
3%	$1,104.1	$188.5	$915.5	5.86
7%	$763.0	$146.2	$616.8	5.22
10%	$589.5	$122.5	$467.0	4.81

Table 33: Financial Analysis – South Australia

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$683.6	$85.1	$598.5	8.03
3%	$509.5	$69.5	$440.0	7.33
7%	$353.9	$54.1	$299.8	6.54
10%	$274.5	$45.5	$229.0	6.03

Table 34: Financial Analysis – Western Australia

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$651.0	$114.6	$536.4	5.68
3%	$484.6	$93.4	$391.2	5.19
7%	$336.1	$72.5	$263.6	4.64
10%	$260.3	$60.8	$199.5	4.28

Table 35:: Financial Analysis – Northern Territory

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$54.8	$9.3	$45.4	5.88
3%	$40.8	$7.6	$33.2	5.37
7%	$28.4	$5.9	$22.5	4.81
10%	$22.0	$5.0	$17.1	4.45

Table 36: Financial Analysis – Tasmania

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$137.3	$26.5	$110.8	5.18
3%	$102.3	$21.7	$80.7	4.72

7%	$71.1	$16.9	$54.2	4.21
10%	$55.1	$14.2	$40.9	3.89

Table 37: Financial Analysis – Australian Capital Territory

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$84.7	$17.6	$67.1	4.80
3%	$63.1	$14.4	$48.7	4.38
7%	$43.7	$11.2	$32.5	3.91
10%	$33.9	$9.4	$24.5	3.60

6.8 NEW ZEALAND - NATIONAL COSTS AND BENEFITS

6.8.1 INTRODUCTION

To avoid repetition, this summarises the analysis for New Zealand, only where it differs from the Australian analysis.

6.8.2 STOCK

As with the analysis for Australia, establishing accurate numbers of installed stock is difficult due to lack of direct data.

Statistics New Zealand data[42] for 2005 on the proportion of households with computers (71.6%) is in close correlation with ABS 2005 data for Australian households (70%)

The HEEP 10 year report [43] estimates an average of 0.85 computers per New Zealand household in 2005. Within Australia, from ABS data for 2005, it is estimated that there were 0.83 computers per household.

Therefore, it is reasonable to assume that New Zealand computer and computer monitor stock is in proportion with Australian and New Zealand household numbers and this has been utilised in New Zealand estimates.

6.8.3 ASSUMPTIONS

As above, the proportion of computers and computer monitors in the residential and non-residential sectors is the same as Australia.

The annual sales growth rate is the same as the Australian analysis.

Incremental costs are the same as the Australian analysis.

Indirect energy is based on the heating and cooling in Tasmania for the commercial sector. The calculation methodology is the same as used for the Australian modelling.

6.8.4 DATA

The household electricity tariff is NZ$ 0.2369 per kWh and the commercial tariff is NZ$ 0.1519 per kWh. [EECA 2007]

[42] Statistics New Zealand – Household use of information and communication technology - 2005
[43] Study Report SR 155 (2006) Energy use in New Zealand households

The marginal electricity system CO_2–e intensity coefficient is 0.6 kg/kWh to 2011 and reducing to 0.4 kg/kWh thereafter.

Emission savings are valued at NZ$ 22.36 per tonne CO_2-e

The exchange rate used is NZ$ 1.20 = A$ 1.00

Direct Government costs in New Zealand are estimated at NZ$ 20,000 per annum for check testing and limited local printing. All other costs are provided via E3 funding.

Summary data is reported at a 6% discount rate.

6.8.5 Energy and Greenhouse Gas Emissions

In 2020 the proposed MEPS criteria are estimated to reduce annual energy consumption by 412 GWh with cumulative savings to 2025 of 4,328 GWh. This is equivalent to reducing 2020 greenhouse emissions by 0.165 Mt CO_2-e and 1.75 Mt CO_2-e cumulatively to 2025. Note: emission savings are based upon projected household numbers and marginal emissions-intensity of electricity supply.

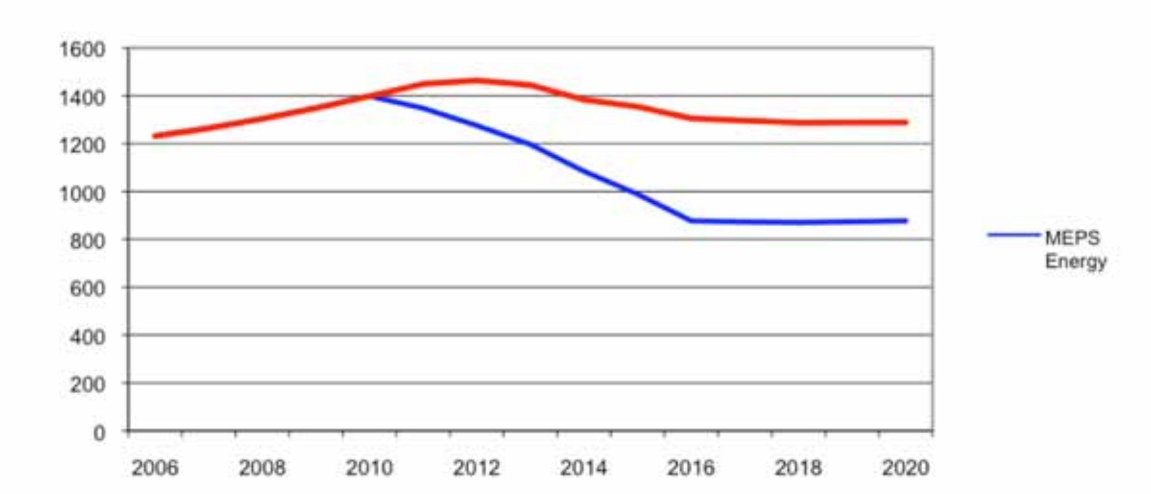

Figure 31: Energy Consumption - BAU and MEPS Scenarios

Figure 32: GHG Emissions BAU and MEPS scenarios – Mt

6.8.6 Summary Data

Table 38: New Zealand Financial Summary

Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$810.6	$245.1	$565.5	3.31
6%	$468.4	$165.6	$302.8	2.83
8%	$396.1	$146.8	$249.3	2.70
10%	$337.3	$130.8	$206.5	2.58

Note – benefits include NZ$22.36 per tonne

7 CONSULTATIONS

Consultation: a RIS must outline who has been or will be consulted, and who will be affected by the proposed action. On a case by case basis, this may involve consultation between departments, with interest groups, with other levels of government and with the community generally. (COAG 2004)

This section summarises presentations, publications, consultations and comments to date. It sets the theme of submissions, rather than detailing them completely, in preparation for subsequent stakeholder engagement to further refine any information gaps.

October 17, 2007
Publication of the fact sheet and technical report on computers and computer monitors on the energy rating web site.

October 18, 2007
Presentation providing an overview of the technical report at the AIIA ICT Sustainable Futures Forum in Melbourne.

October 31, 2007
Two meetings held, one an open E3 meeting for stakeholders and the other with representatives and industry members of the AIIA.

Summary of stakeholder views expressed in October 2007
There is general agreement with using the US ENERGY STAR® test specifications for computer monitors and computers in the interest of harmonisation/single global test method.

MEPS – no stated issues, apart from using voluntary targets as MEPS. It was pointed out that the proposed MEPS are two years away. ENERGY STAR® for computers will have been in place for over two years and studies showed that high compliance could be attained by utilising 80% efficient power supplies as opposed to circa 65% now. Also the ENERGY STAR® levels have been known for much longer because of the notification period provided. ENERGY STAR® for computer monitors will have been in place for some five years for Tier 1 and about three for Tier 2. Tier 1 (MEPS) is not difficult and many LCDs already meet Tier 2 (voluntary high efficiency)

Labelling was the major issue as follows:

- The need for an Australian label on global products.
- The need for comparative energy stars and data in the box.
- Where to put labels and size.
- Two stars on MEPS computers looks bad when consumers see more stars on fridges etc.

Industry representatives, in the E3 arranged meeting, raised the issue of registration delays being experienced for other products.

Timing – general request for the RIS to be accelerated to provide more time between the RIS completion and MEPS commencing.

December 19, 2007 – Non-directive group discussion on consumer information
A nondirective group discussion with a cross-section of twelve consumers was conducted by Winton Sustainable Research Strategies (WSRS) on 19 December 2007 in Melbourne, to explore the information needs of consumers when they are seeking to purchase various appliances including consumer electronics such as home entertainment systems, television sets and computers.

Summary of stakeholder views expressed in December 2007

- Computer purchase criteria are memory, speed, HDD capacity, brand, warranty.
- Computer energy, standby power, and costs of running are rarely considered.
- So much other information/specifications to consider first.
- Not aware or concerned about computer power.
- Assume little difference between same *size* models or different technologies.
- Information failure – similar to pre-MEPS for whitegoods.
- Consensus that they should be made aware of energy consumption prior to purchase.
- General agreement that labels would be appropriate.
- Information needs to be always available, not just short term information/education program.
- Basic information particularly the energy rating still needs to be displayed on the product or at least prominently displayed at the retail store.
- A centralised, credible and independent information source is appropriate - internet and/or shop-front based.
- Assumption that no label must mean the Government thinks they are OK.
- The best system is the simplest system. You can just compare four stars with one star so it's simple.

February 8, 2008 – Labelling Forum
The Equipment Energy Efficiency Committee, comprising officials from all Australian jurisdictions and New Zealand, convened a stakeholder forum to identify and debate issues relating to labelling of computers and computer monitors. 22 attendees, representing the full gamut of stakeholders, participated in this half-day event to contribute their thoughts.

Summary of stakeholder views expressed February 8, 2008

Australasian computer industry representatives had previously acknowledged their support for the greening of ICT and improving the energy efficiency of ICT equipment. They gave almost universal support to regulatory agencies for using the de-facto global standard, the US EPA ENERGY STAR® test method and performance requirements, as the basis for any future regulation in Australia and New Zealand. Indeed, regulatory agency officials reported that the idea of a unique Australian and New Zealand mandatory energy efficiency label was the only major issue where stakeholder opinions varied markedly.

The workshop was organised to share information about labelling and to explore options that might lead to agreement on this contentious aspect. Participants were told that this workshop was not a decision-making forum rather an opportunity to debate ideas with a view to encouraging submissions by stakeholders on labelling options.

All participants agreed that reliable, accurate comparative data that informed potential purchasers of the range of energy efficiencies available was a desirable outcome. Views then differed about how to give effect to this general objective.

Several user group representatives encouraged the use of internet based comparison tools, which seemed especially appropriate for computer and computer monitor purchasers. Others saw parallels with whitegoods labelling at least offering a model for consideration, especially considering the success over time in reducing energy demand.

Some industry representatives spoke against the concept of a mandatory label applied to every model. They cited the high turnover of computer and computer monitor models, the variation of efficiency within what might look to the uninitiated as similar models, and the large percentage of sales through non-retail outlets as creating real difficulties for a star rating label. Others pointed out that the large economies like the US and EU had not yet moved towards implementing a mandatory labelling scheme for any ICT equipment, although both the US and EU have announced legislation and plans, respectively, to do so. They cautioned against an economy the size of Australia taking on the responsibility of resolving all the currently unknown problems in creating the first such label.

The panel discussion encouraged most to air points of distinction. The workshop suggested that E3-Committee should consider:

- The implementation of the MEPS based on the current ENERGY STAR® standards (V4.0 for computers and V4.1 for computer monitors set in 2007).
- The target date of October 2009 had support from many though some industry advocates cautioned about expecting 100% compliance too quickly.
- The possibility of postponing the adoption of mandatory labels until more detail was available from labelling advocates was strongly put by some industry participants.
- The surveys of the Australian Computer Society and others showed a strong desire for accurate, fair and reliable energy efficiency information.
- Computers and computer monitors are high profile consumables and government representatives spoke of their desire to communicate efficiency matters as effectively as possible.
- Government agency staff spoke of establishing a voluntary labelling scheme but this received little support from industry.
- Industry representatives called on governments to support more efficient ICT equipment through green government procurement, through a

community education campaign that promotes the proposed labels on ICT equipment.
- Some stakeholders raised specific administrative and practical issues including :
- Computers and computer monitors already have a significant number of local and international approval markings etc., so where could the rating label go.
- The most significant objection appeared to be the use of a specific label for the Australian and New Zealand markets, on the basis that in the main these are products that *sit* in a warehouse then picked for the destination market. Some manufacturers advised the forum that, in the "picked for market" case, components such as power leads and plugs are "dropped in" to suit the destination market requirements. Similarly, some computers, particularly in on-line ordering are built to customer specifications from a range of standard options.
- It was suggested that government collaborate with the US and European Union with respect to a common label.
- Some stakeholders questioned the definition of a *baseline computer*, as performance and other options could introduce a wide variance in energy performance. Stakeholders were advised that MEPS and hence labelling would likely categorise computers into three distinct types (options/performance) for desktop style computers and two categories for notebooks.

By the conclusion of the workshop:

- Industry representatives as a whole could not commit to supporting a voluntary or mandatory label but agreed to provide considered views by the end of February 2008.
- Other stakeholders had a wider appreciation of industry views without necessarily supporting them.
- Stakeholders representing consumer views remained adamant that consumers want and will utilise performance labels and that their use in retail outlets has the potential to spill over to informing those who buy on-line or via non-retail procurement.
- Government officials will look to the trade associations to report on the practical action industry has commenced in support of their public efficiency commitments with a view to briefing Minister Garrett.

Regulatory agencies encouraged other stakeholders to also provide their considered labelling views by the end of February 2008. The industry association representatives agreed to act as the contact point for collating views and support for the preferred industry position.

February 20, 2008
Representatives of the Equipment Energy Efficiency Team of DCCEE met with members of the AIIA, comprising some representatives from manufacturers in Australia and New Zealand. The meeting addressed a series of questions posed by both parties, in particular requests for information from industry on their current status with ENERGY STAR® compliant computers, industry opinion with respect to utilising ENERGY STAR® test specifications and performance levels for MEPS. DCCEE representatives outlined Government policy and the rationale for introducing MEPS.

Summary of stakeholder views expressed February 20, 2008

Industry is supportive of utilising ENERGY STAR® test specifications, in the interests of international harmonisation and as a voluntary program. A range of comments were made by industry as follows.

- AIIA members do not believe that *demonstrable market failure* exists in the market place for computers and computer monitors.
- There might be aspects (of the market) that have not worked (to improve overall energy efficiency) but MEPS and mandatory labelling may not be the best mechanism.
- MEPS cannot be applied to the computers and computer monitors sold in Australian and New Zealand markets without creating market disruptions for manufacturers that will ultimately disadvantage consumers and create unfair competition between computer suppliers.
- Product complexity, and the costs of compliance and of doing business, are significant concerns. If regulators make the voluntary US EPA ENERGY STAR® current specifications (set in July 2007) for computers and computer monitors mandatory in July 2011, the complexity of various specifications of these products will mean that the implementation of MEPS will lead to:
    - Unsustainable costs of compliance;
    - A reduction of the number of products in the market;
    - Create a greater *gap* between branded and unbranded products;
    - A greater proliferation of unbranded products, as industry estimates that these products have approx 50 percent of the total market and there are issues of enforcement in the market place;
    - Unfair competition will be created for branded product suppliers due to the fact that unbranded product assemblers do not have similar regulatory compliance costs as branded products (energy efficiency, end of life/hazardous waste, EMC etc.); and
    - Consumers not taking energy efficiency considerations into account when purchasing computers and computer monitors, and if consumers are not aware then MEPS and labelling may not be necessarily address this problem while a consumer information awareness campaign might do so.

In response to these stakeholder consultation forums, DCCEE's position is that the analysis to date indicates market failure and the need to investigate market intervention. Consumer awareness programs alone may not transform the market sufficiently to address the problem and might have little success in changing consumer behaviour. There are other industry associations working in this area and suppliers who are not AIIA members, who may have differing views.

Schedule of Consultations undertaken with members of the Australian and international computer industry

30 October 2008
Attendance at AIIA luncheon in Melbourne for launch of Gershon Report; introductions to numerous members of AIIA board; meeting with Josh Millen (AIIA) for two hours.

1 December 2008
Discussions with AIIA on market data, refining available information on sales, technology trends, market segmentation, 'brand' strategies and positioning; understanding views of AIIA on potential for voluntary measures; and articulating options for them to consider for voluntary or complementary measures. Circulate discussion paper Discussion paper circulated to industry members outlining possible complementary measures and requesting further ideas and feedback on position on regulation, complementary measures, voluntary measures and energy efficiency in general.

20 January 2009
Meetings in Sydney with Fujitsu, IBM, DELL, Toshiba, Hewlett Packard, KPMG, and AIIA representatives to review December discussion paper, listen to industry ideas and positions.

21 January 2009
International video conference from Hewlett Packard Sydney headquarters with technical managers of product development and regulatory affairs in the US. Four HP participants from the US and two in Australia as well as AIIA representatives.
Meeting with Apple in Sydney HQ.

17 March 2009
Phone conference with DELL representatives from Australia, the US and SE Asia based in Shanghai. This call resulted in extensive material being sent by DELL in the US setting out DELL's strategies for product design for energy efficiency and their compliance with EPA ENERGY STAR® design guidelines.

23 April 2009
Presentation of proposed complementary measures at the Menzies hotel in Sydney to members of the ICT industry.

Stakeholder submission summary

<u>Industry</u>

Following the 8 February label forum, the AIIA made its submission on the proposed MEPS. Written submissions were also made by the following industry participants; Sony, IBM, Lenovo, Insite (NZ), Consumer Electronics Supplier Association, Hewlett Packard and Dell.

Where addressed, there is agreement that utilising the US ENERGY STAR® test methods is acceptable, particularly on the basis of harmonised test methods, i.e., support to alignment of the requirements to already existing international best practice guidelines.

Comments for submissions include:

- Product energy regulations should set limits that impact only the worst performing (least energy efficient) products in the market.
- In favour of a voluntary scheme that rewards high performing products in the market place (for example through government procurement practices) and

that is harmonised with the schemes currently in place elsewhere in the world, would provide a viable solution for implementing energy efficiency measures for computers and computer monitors in Australia and New Zealand. Industry recommends that governments should seek to reward high performing products through their public sector procurement process, thus stimulating the local market towards better energy performance.

- Disagreement that current voluntary programs have not worked and with the evidence of *market failure* and suggest that the Australian and New Zealand Governments should consider all options available to them beyond only regulatory approaches.
- ENERGY STAR® is a voluntary standard, a set of inspirational goals and targets at top level performance. ENERGY STAR® is a requirement of the US government purchases which allow manufacturers to drive volume. Newly deployed higher efficiency products have typically been more costly. This practice drives volume and allows the more efficient technology to ramp to volume and drives costs lower. No parallel exists today within the Australia or New Zealand governments.

  Note: With the publication the ‘Australian Government ICT Sustainability Plan 2010 -2015’ in August 2010 Australian Government agencies are required to purchase ICT equipment that complies with current versions of ENERGY STAR®
- The current proposal is likely to increase the cost of doing business in Australia and New Zealand for computing products, which in turn is likely to translate into additional cost to the consumer and the society as a whole in both countries. This cost should be carefully assessed as part of the regulatory process.
- The general industry position is that it is not in favour of mandating energy performance of computers in particular and not in favour of mandatory performance labelling or product registration. It has been suggested that voluntary registration on a web site may be a more viable solution to convey information to consumers.
- Should MEPS be introduced for computers, then labelling will have little impact as they will comply and there will be little difference in energy performance.
- The cost to industry to have factories produce Australian and New Zealand specific packaging and labelling is high, likewise to have to rework product locally to incorporate the proposed labelling is excessive. This places higher cost to industry that must be passed to consumers. Concern that white box suppliers would not be faced with similar constraints and there would be economic advantage to them. Considering that *white box* accounts for some 45% of market in computer sector this seems unfair. View that consumer should be aware that the product they are considering is ENERGY STAR® compliant or not. They can do Energy Efficiency comparisons on industry and supplier web sites. Most customers in the computer sector would be purchasing on features, functions and performance rather than energy efficiency.
- Desire to see tighter controls and measures for white box suppliers; would not like to see free rides for these members of the market.

Non-industry

Written submissions from non-industry stakeholders have been made by the following organisations: Good Environmental Choice Australia, Energy Efficiency and Conservation Authority (NZ), Christchurch City Council (NZ) and Sustainable Energy Victoria.

Conversely, non-industry consumer-oriented stakeholders are in favour of mandatory energy rating and provision of performance information in any manner that is likely to reach the consumer or procurer prior to the purchasing decision being made. This need not take the form of physical stickers, and ideally should not present a significant cost burden for compliance. There was also a suggestion for the introduction of other information provision means, such as mandatory labelling (without a rating) or the rating of individual components.

Having a rating system for computers and computer monitors, similar to other household appliances, will be of great benefit to the consumer. Manufacturers that produce products with a better rating would be keen to leverage that in their marketing. Energy ratings are used when making purchases of large appliances. With labels it is surprising to find similar products selling for similar cost with substantially different energy ratings.

There is support for a labelling approach as proposed. Ideally this would be supported by websites that would allow consumers to enter data about likely operating hours, time in sleep and off modes, etc that could be used to provide an estimate of annual energy use.

8 EVALUATION AND RECOMMENDATIONS

8.1 ASSESSMENT

8.1.1 REDUCE GREENHOUSE GAS EMISSIONS BELOW BUSINESS AS USUAL

Based on a service life of five years for all products, the majority of poor performing computers and computer monitors would be removed from the Australian and New Zealand markets over five years of operation of the proposed MEPS option.

It is expected that due to their voluntary nature, the other options will not reduce poorer performing products over the same time period, because the other options do not have the ability to cease sales of poorer performing computers and computer monitors in business as usual.

Due to its non-voluntary nature, the proposed mandatory MEPS option has the highest probability of reducing energy consumption and hence GHG emissions below business as usual.

8.1.2 ADDRESSING MARKET FAILURES

By requiring the improvement of computers and computer monitors in the market, the proposed mandatory MEPS will most effectively address market failures, and achieve a reduction in average lifetime costs of computers and computer monitors for consumers. All other options rely on voluntary mechanisms and therefore consumers may still not be aware of lifetime costs nor necessarily choose a product or implement power management to achieve lower lifetime cost.

The proposed mandatory MEPS option would clearly require suppliers of computers and computer monitors to cease supply of non-compliant products. This is not thought to involve negative impacts on suppliers as the volume of sales would not be affected as other market forces are driving the demand for computers and computer monitors. There will be an additional benefit in that manufacture of lower energy consuming components will add magnitudes of scale and hence reduce incremental costs of these components. The other options would have negligible impacts on components, unless the supplier had substantial market force.

8.1.3 SUMMARY OF COSTS AND BENEFITS

The following tables provide summary data for Australia and New Zealand on the costs and benefits for a range of discount rates, taken from sections 6.7.1 and 6.8.6

Table 39: Financial Analysis – Australia – no carbon value

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$7,014.4	$1,110.9	$5,903.5	6.31
3%	$5,219.4	$906.2	$4,313.2	5.76
7%	$3,617.6	$704.3	$2,913.2	5.14
10%	$2,800.6	$590.9	$2,209.7	4.74

Table 40: Financial Analysis – Australia – with carbon value

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$7,266.1	$1,110.9	$6,155.2	6.54
3%	$5,589.2	$906.2	$4,683.0	6.17
7%	$3,745.8	$704.3	$3,041.4	5.32
10%	$2,819.9	$590.9	$2,228.9	4.77

Table 41: Financial Analysis - New Zealand

Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$810.6	$245.1	$565.5	3.31
6%	$468.4	$165.6	$302.8	2.83
8%	$396.1	$146.8	$249.3	2.70
10%	$337.3	$130.8	$206.5	2.58

Note – benefits include NZ$22.36 per tonne

8.1.4 CONCLUSIONS

After consideration of the proposed mandatory MEPS and other options it is concluded that:

- The proposed mandatory MEPS option is likely to be effective in meeting all the stated policy objectives.
- None of the non-MEPS alternatives examined appear as effective in meeting all objectives. Some would be completely ineffective with regard to some objectives and some appear to be considerably more difficult or costly to implement and could possibly misinform consumers.
- Given that the proposal for MEPS has been in the public domain since October 2007, and the ENERGY STAR® V5.0 computer specification was implemented in July 2009 and the ENERGY STAR® display

specification V5.0 implemented in November 2009, the program could be implemented as early as 30 June 2011.

8.2 Recommendations

It is recommended that:

- States, territories and New Zealand implement mandatory MEPS for specific computers and computer monitors utilising a joint Australian and New Zealand Standard based upon US ENERGY STAR® test method and specification V5.0 for computers and V5.0 for computer monitors;
- Energy rating labelling is only recommended for computer monitors and not for computer systems;
- The mode of implementation be through amendment of the existing regulations governing appliance energy labelling and MEPS in New Zealand and in each state and territory, to add computers and computer monitors to the schedule of products for which MEPS are required;
- The regulations refer to AS/NZS that will be prepared and published based upon the above ENERGY STAR® test methods and performance specifications;
- MEPS to be based on the ENERGY STAR® V5.0 metrics for calculating the maximum allowed typical annual energy consumption (TEC) of computer types, mandatory enablement of "built in" PM functions and minimum power supply efficiency levels and on-power modes published in the relevant Australian and New Zealand Standard as soon as possible. MEPS only apply to new stock manufactured or imported on or after the implementation date;
- The amendments take effect not earlier than 30 June 2011.
- State, territory and the New Zealand governments should require registration of computers and computer monitors, so invoking an Australian and New Zealand Standard. The registration system should provide for individual products and *families* of products and deemed-to-comply products; and
- Governments agree to review computer and computer monitor MEPS and agree not to impose more stringent MEPS any earlier than July 2014 or not earlier than 12 months after revision for the ENERGY STAR® V5.0 (computers) and V5.0 (computer monitors) are published, whichever is the latter.

9 IMPLEMENTATION AND REVIEW

Review: there should be consideration of how the regulation will be monitored for amendment or removal. Increasingly, sunset provisions are regarded as an appropriate way of ensuring regulatory action remains justified in changing circumstances. (COAG 2004)

To ensure regulation remains relevant and effective over time it is important that all regulation be reviewed periodically. All governments have committed to reviewing annually existing regulations with a view to encouraging competition and efficiency, streamlining the regulatory environment, and reducing the regulatory burden on business arising from the stock of regulation.

Ensuring regulation remains relevant and effective may be achieved through planning for monitoring and review of regulation as part of the development of new regulatory proposals, or by incorporating sunset provisions or review requirements in legislative instruments.[44]

Computer and computer monitor MEPS would be implemented under the same state and territory regulations as household appliance labelling and MEPS, and so subject to the same sunset provisions, if any. Victoria and South Australia have general sunset provisions applying to their labelling/MEPS regulations as a whole, while NSW has sunset provisions applying to the inclusion of some (but not all) items scheduled.

Once the states and territories agree to mandatory requirements, their removal in any one jurisdiction would undermine the effect in all other jurisdictions, because of the Mutual Recognition agreements between the states and territories. Under the co-operative arrangements for the management of the Equipment Energy Efficiency Program, states advise and consult when the sunset of any of the provisions is impending. This gives the opportunity for revised cost-benefit analyses to be undertaken.

Australian Standards called up in state and territory labelling MEPS regulations are also subject to regular review. The arrangements between the Commonwealth, state and territory governments and Standards Australia provide that the revision of any Standards called up in energy labelling and MEPS regulations are subject to the approval of the governments.

E3 has adopted the principles that there should be a MEPS ‘stability period’, and that a cost-benefit analysis would be undertaken before any revisions are proposed. The earliest possible timing of any change to the MEPS regulations discussed in this RIS would therefore depend on date of their implementation. If they are implemented in July 2011, the earliest possible revision would be July 2014. However, it would be necessary to carry out a study well in advance of that time, so that adequate notice could be given to industry in the event that a change was justified.

[44] Council of Australian Governments (COAG), October 2007, *Best Practice Regulation: A Guide for Ministerial Councils And National Standard Setting Bodies*, Principle 6

APPENDIX 1 Australian Energy Efficiency Policy Background

The Australian Government's initial response to concerns about the environmental, economic and social impacts of global warming was set out in the Prime Minister's statement of 20 November 1997, *Safeguarding the Future: Australia's Response to Climate Change.* The Prime Minister noted that the Government was seeking *"…realistic, cost-effective reductions in key sectors where emissions are high or growing strongly, while also fairly spreading the burden of action across the economy."* He also stated that the Government is "*…prepared to ask industry to do more than they would otherwise be prepared to do, that is, go beyond a 'no regrets'*[45]*, minimum cost approach where this is sensible in order to achieve effective and meaningful outcomes."* This *no regrets* test was a key part of the guidelines adopted by the Council of Australian Governments (CoAG) in 1997 that any initiative proposed by the MCE, including standards and labelling measures under the Equipment Energy Efficiency Program, must meet.

In 1998 the Australian Government released *The National Greenhouse Strategy* (NGS) that was endorsed by the Australian Government and state and territory governments and committed them to an effective national greenhouse response. Progress under the NGS was reported to the CoAG. Many key elements of the NGS were implemented successfully, but, over time, the Australian Government identified a range of emerging climate change priorities that required attention at the federal government level. Similarly, there was acknowledgment that state and territory jurisdictional boundaries necessitated state/territory level climate change action plans and these were developed.

In 2004, the Australian Government released a new climate change strategy as articulated through its Energy White Paper, *Securing Australia's Future*, and the 2004/05 Environment Portfolio Budget. Some elements of the earlier NGS were included in the new strategy. As a critical element of the Australian Government's climate change strategy, the new energy policy represented the refinement of strategic themes pursued in relation to energy under the NGS, including energy market reform, the development of low-emissions and renewable technologies, and improvements to end-use energy efficiency.

Since that time, CoAG has remained the primary forum for progressing Australian, state and territory government collaboration on climate change issues requiring inter-jurisdictional attention. Significant progress has been made under the CoAG climate change agenda since CoAG's agreement in June 2005 to establish a new Senior Officials Group to consider ways to further improve investment certainty for business, encourage renewable energy and enhance cooperation in areas such as technology development, energy efficiency and adaptation. This work culminated in the January 2006 CoAG climate change action plan. In addition, climate change issues requiring national coordination have been managed through a number of inter-governmental ministerial councils including the Ministerial Council on Energy.

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[45] The Productivity Commission has defined "No regrets" policy options as measures that … *have net benefits (or at least no net cost) in addition to addressing the enhanced greenhouse effect. A more intuitive interpretation of 'no regrets' measures could be that they are actions which would still be considered worthwhile even in the absence of concerns about the potential adverse impact of global warming.* (PC 1997: page vii). This may involve imposing additional business costs on suppliers if the resulting more efficient products deliver a net benefit to the wider community.

The Australian Governments climate change strategy is the mechanism through which Australia will meet its international commitments as a party to the United Nations Framework Convention on Climate Change (UNFCCC). The Government has an overall target of limiting Australia's emissions in 2008-2012 to 108% of its 1990 emissions. This is a 30% reduction on the projected *business as usual* (BAU) outcomes in the absence of interventions.

Over 2006, the national policy debate over introducing a carbon price in Australia continued with the state and territory governments proposing an emissions trading scheme, and the Australian Government holding a nuclear energy enquiry and announcing its own emissions trading inquiry by the *Task Group on Emissions Trading*.

In 2007, emissions trading became a major new plank in the former Australian Government's response to climate change. The then Prime Minister, the Hon John Howard MP, announced in June 2007 that Australia would introduce a world-class domestic emissions trading system by 2012. Emissions trading will be the primary mechanism for achieving the long term emissions reduction goal, which will be set in 2008. It will have a strong economic foundation and take account of global developments while preserving the competitiveness of our trade exposed emissions intensive industries. Through emissions trading, the market will help Australia develop the most cost effective technologies for cutting greenhouse emissions.

Emissions trading will complement existing government actions to reduce GHG. These include:

- improving end-use energy efficiency;
- investing in the new low emissions technologies Australia and the world will need in the future, including renewable energy technologies and clean coal;
- supporting world-class scientific research to continue to build our understanding of climate change and its potential impacts, particularly on our region; and
- assisting regions and industries to adapt to the impacts of climate change.

An emissions trading scheme will build on the success of past and ongoing measures. These measures include the *2004 Energy White Paper*, *2004-05 Climate Change Strategy*, earlier measures such as *Measures for a Better Environment* and *Safeguarding the Future*, as well as new programs announced in 2006-07.

APPENDIX 2 Technology Factors - Opportunities

This appendix combines and summarises information from the following resources.

Efficientproducts.org and The European Union's Energy using Products (EuP) Lot 3 study on computers and computer monitors.

Efficientproducts.org web site link

http://www.efficientproducts.org/reports/computers/EfficientComputer_Brochure_FINAL.pdf

EuP Lot 3 web site link

http://extra.ivf.se/ecocomputer/downloads/Eup%20Lot%203%20Final%20Report%20070913%20published.pdf

The principal components within computers and computer monitors, such as the integrated circuits, printed circuit board layout and power electronics have scope for improvement in their design, operation, energy consumption and power demand. These are outlined under the following headings.

Processor technology and fabrication

Processors exist that can dynamically scale processor performance to current processing requirements, such as AMD's Cool 'n' Quiet®, Intel's Enhanced Intel SpeedStep®, and Via Technologies' StepAhead® features, resulting in lower energy consumption.

The use of silicon fabrication techniques ; decreasing leakage current, while still providing significant increases in the number of transistors, translating into greater processor performance.

Multi-core processors and adaptive frequency

In response to the need for higher end computing, which is now increasingly available at the consumer end of the market, computer manufacturers have introduced multi-core processors to deliver higher performance at lower cost. Traditionally manufacturers have increased the performance of computers by increasing the speed of the single processor. Multi-core processors allow manufacturers to increase performance, by utilising two or more processors on the same motherboard, rather than a single, faster processor. As energy consumption is proportional to the clock frequency energy consumption could be reduced by half in a dual core processor. Another benefit with multi core processors is the ability to shut down or reduce the clock frequency of one or more of the cores for specific tasks.

The lower processor energy consumption compared to a single processor approach will reduce heat and hence cooling requirements.

Printed circuit board design

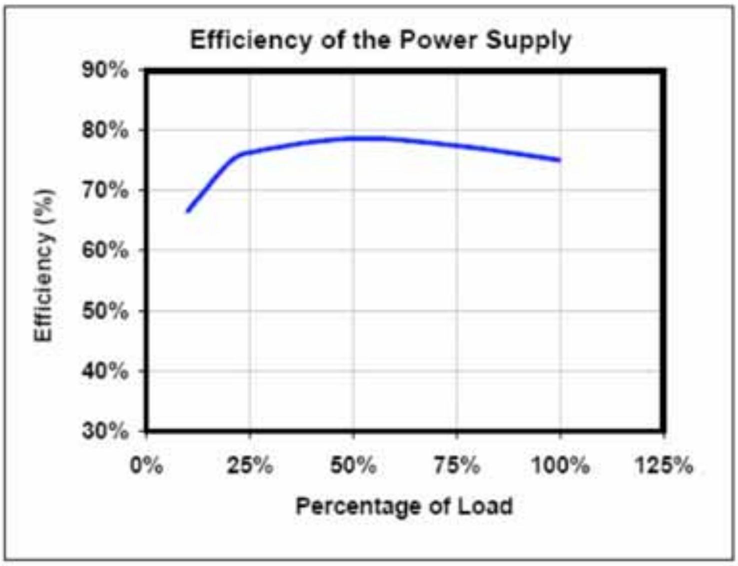
Tight placement of components on the motherboard; reducing I^2R losses that occur in the copper traces of the printed circuit board.

Supplying power to the processor through highly efficient voltage regulators, resulting in lower energy consumption.

The use of efficient point-of-load DC-DC converters optimised for individual loads on the motherboard.

Internal and external power supplies

Not only can power supply efficiency be improved, thus reducing waste energy, but also utilising a power supply with a suitable rating. In the figure below for an internal power supply, it can be seen that efficiency varies with loading. Selecting an inappropriately rated external power supply can result in more energy being wasted.



Memory (RAM) configurations

Most computers have multiple slots for RAM as supplied and for future expansion. Commonly, now, computers contain 1GB or more of RAM, which can be achieved with multiple low capacity modules or a single larger capacity module, which can impact upon power demand and hence energy. For example US tests indicate that a single 2GB module consumed 1 to 2 W less power than multiple smaller modules with no significant performance impact. This also provides users with the ability to increase memory capacity, at a later date, due to the availability of spare slots.

Ventilation/cooling fans

Reducing waste energy reduces the operation time and potentially rating of the ventilation fan, thus reducing non-computing energy consumption.

Higher efficiency fans will also reduce energy consumption when the fans are operating.

Hard Drives

The hybrid hard drive is a recent innovation that utilises a flash memory buffer to cache a user's most frequently used files, allowing the magnetic portion of the hard drive to spin down when the flash memory capacity is adequate for the current operation. According to US tests, hybrid hard drives, on average, use 5 to 6 W less power than traditional hard drives.

Another emerging technology is the flash memory-only hard drive, which eliminates moving parts altogether and should yield further energy savings. Typically this has been an expensive technology, but as evidenced by the tumbling prices of USB drives, flash memory has become much cheaper and holds good potential. E.g. a USB flash drive costing as much as $300 five years ago can now be purchased for under $20.

Low power hard disk drives have already been developed, such as the recently announced Fujitsu 500 Mb SATA HDD requires only 1.8 W for read and write operations.

Computer monitor power

Historically computer monitors for desktop computers derived their power from an outlet on the desktop case. The trend has been away from this technique such that the computer monitor plugs directly into a mains power outlet. Powering the computer monitor from the computer case, with appropriate internal switching, will allow the computer monitor to fully switch off the computer monitor when the computer is turned off, thus eliminating the need for the user to switch off the computer monitor.

LCD computer monitor backlighting

Historically LCD computer monitors have utilised fluorescent lamps as the backlighting technology. A more recent technology, first introduced around 2004, utilises LEDS rather than fluorescent lamps. This technology has two potential benefits – reduced energy consumption and/or better colour rendition.

In the notebook sector, LED backlit computer monitors are now being sold with lower energy consumption, but not necessarily with much better colour rendition.

In the desktop/stand-alone computer monitor sector, LED backlit screens have been introduced to the market, however this appears to be aimed at better colour rendition for graphic artists, scientists and other high end graphic display uses, rather than reduced energy consumption.

Computer monitor power supplies

As with computers, improving the efficiency of power supplies, voltage regulation DC-DC voltage conversion devices, component layout will reduce the energy consumption of computer monitors.

APPENDIX 3 Overseas Policies, Programs and Measures

As summarised in this section, many countries, accounting for the majority of the world's population, have introduced programs to address market failure in reducing or limiting the energy consumption of computers and computer monitors. Whilst these are mostly voluntary in nature, additional directives by some governments require that their agencies purchase compliant computers and computer monitors.

A number of governments and organisations are interceding to address market failures in the energy performance of computers and computer monitors. Significant worldwide activities are in place to analyse current and achievable power and energy performance, particularly in the European Union, the USA, the UK, Japan, China and Korea.

From the following summary tables it is evident that there are a number of measures, however the variety which strengthens the case to take an internationally harmonised approach to avoid further proliferation to the detriment of suppliers and consumers.

Within the international measures, the US ENERGY STAR® program is the most tested and practiced specification and is proposed as the best available model for standards and specifications in Australia and New Zealand.

COMPUTERS – ENERGY STAR®

By far the most comprehensive and influential programme is the US ENERGY STAR® programme. Implemented initially in 1999, the programme has expanded its energy efficiency parameters to the release of the most recent version, V5.0, in July 2009. The current version expanded the scope of the specification to target not only desktop and notebook/tablet computers, but also small scale servers, games consoles, workstations and integrated computers and thin client. With respect to computers, Australia and New Zealand's initial focus will be on desktop and notebook/tablet models. Full details are provided in:

http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Version5.0_Computer_Spec.pdf

The energy specification encompasses off (standby), sleep and idle modes, which is the state after the computer operating software has loaded and the computer is ready for use. ENERGY STAR® V5.0 also specifies that display and that power management for the computer and computer monitor must be enabled, with some exceptions, at shipment and minimum conversion efficiency of the internal power supply for desktop computers and for notebook computers compliant with the ENERGY STAR® specification for external power supplies (Performance mark V in AS/NZS4665). Internal power supplies are also required to have a power factor greater than 0.9 at 100% of rated output. Full details are provided in:

http://www.efficientpowersupplies.org/pages/Generalised_Internal_Power_Supply_Efficiency_Test_Protocol_R4.pdf

COMPUTER MONITORS – ENERGY STAR®

The US ENERGY STAR® programme for computer monitors is also the most comprehensive and influential programme on global suppliers. Initially the program targeted sleep and off mode powers and specified time to sleep mode after inactivity and various improvements have been made since then. In January 2006 the specification was expanded to include on mode power based upon screen resolution (V4.1), however analysis of data indicates that different sized screens can have the same resolution yet have significant differences in on mode power. To address this ENERGY STAR® have developed V5.1 to not only include computer monitors but also a range of other displays.

Table 42: ENERGY STAR® Computer monitor Specification V4.1

Tier	Date	Off	Sleep	Active
1	January 2005	< 2W	< 4W	(38 x MP) + 30 W
2	January 2006	< 1W	< 2W	If Megapixels (MP) < 1, then 23W If Megapixels (MP) ≥1, then (28 x MP) W

V5.1 is summarised as follows. The original ENERGY STAR® text refers to displays and inches. In the proposed MEPS the specification addresses computer monitors only, so the text has been amended to address this only.

Maximum on mode power

A computer monitor shall not exceed the maximum On Mode power consumption (PO or PO1) as calculated from the equations in Table 43. The maximum On Mode power consumption is expressed in watts and rounded to the nearest tenth of a watt.

Table 43 Maximum on mode power consumption

Computer monitor category	Maximum on mode power consumption (Watts)
Diagonal Screen Size < 76.2 centimetres Screen Resolution ≤ 1.1 MP	PO = 6*(MP) + 0.007752*(A) + 3
Diagonal Screen Size < 76.2 centimetres Screen Resolution > 1.1 MP	PO = 9*(MP) + 0.007752*(A) + 3
Diagonal Screen Size 76.2 to 152.4 centimetres All Screen Resolutions	PO = 0.04185*(A) + 8

Where Po = maximum on mode power consumption, MP = Display Resolution (megapixels) and A = Viewable Screen Area (square centimetres)

Maximum on mode power for computer monitors with automatic brightness control (ABC)

An alternate calculation is used to calculate maximum On Mode power consumption for computer monitors shipped with ABC enabled by default:

PO1 =(0.8*Ph)+(0.2*Pl)

where PO1 is the average On Mode power consumption in watts, rounded to the nearest tenth of a watt, Ph is the On Mode power consumption in high ambient lighting conditions, and Pi is the On Mode power consumption in low ambient lighting conditions. The formula assumes the display will be in low ambient lighting conditions 20% of the time.

Maximum sleep and off mode power

In sleep and off modes, the computer monitor power shall comply with the requirements of **Table 44**

Table 44 Maximum sleep and off mode power consumption

Mode	Maximum power consumption (Watts)
Sleep	≤ 2
Off	≤ 1

Full details are provided in:

http://www.energystar.gov/ia/partners/product_specs/program_reqs/displays_spec.pdf

COMPARISON OF COMPUTER AND COMPUTER MONITOR PROGRAMMES

Other programmes exist around the world but they are often based upon ENERGY STAR® or parts thereof.

Table 45: Computers - Summary of Programs and Initiatives

Country	Programme	Date	Type	Notes
European Union	Eco-label – the Flower	2005	Voluntary	PCs and notebooks – sleep 5W, Off 2W
EU	ENERGY STAR®	July 2009	Voluntary	Replica of US ENERGY STAR® 5.0
Global	TCO Label	2005	Voluntary	PCs – sleep 5W, off 2W Notebooks – sleep 4W, off 2W
The five Nordic countries	Nordic Eco-labelling. The swan	2005	Voluntary	PCs and notebooks – sleep 5W, Off 2W
Germany	Blue Angel	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
6 EU countries	Group for energy efficient appliances	2006	Voluntary	PC, notebook, desktop computers Sleep 5W Off 2W Idle 70W
China	CECP	2003	Voluntary	Sleep 10W, off 3W. Time to sleep = 30 minutes
Korea	KEMCO	2003	Voluntary	Default sleep time and maximum power [46]
Korea	KEMCO	2005-7	Voluntary	Energy Boy label if <1W sleep. External power supplies 0.5 – 0.75W
Korea	KEMCO	2009	Mandatory	External power supplies – ENERGY STAR® tier 1
Korea	KEMCO	2010	Mandatory	1 W warning or compliance label
Australia	Energy Allstars	2005	Voluntary	Notebook, desktop computers and workstations Sleep 1 5W Integrated computers Sleep 1 7W

[46] http://www.clasponline.org/programinfo.php?no=786

				Desktops and workstations Sleep 2 2W Notebooks Sleep 2 0.5 (AS/NZS4665) Integrated computers Sleep 2 3W
USA	Executive Order 13221/FEMP	2001	Recommended for Federal purchases	Standby/off only. Desktop ≤ 2W, Integrated computer ≤ 3W, Notebook ≤ 1W, Workstation ≤ 2W
USA	Energy Policy Act 2005	Sept. 2005	Requires federal agencies to buy either ENERGY STAR® products or products designated as energy efficient by the Federal Energy Management Program (FEMP).	
USA	Executive Order13423/FEMP	2007	Requires federal agencies to activate ENERGY STAR® 'sleep' features on computers and computer monitors and mandates that federal agencies buy EPEAT registered (ENERGY STAR®) products.	
Japan	Top Runner	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. I.e. a manufacturer can supply compliant and non compliant product as long as the weighted average meets the target for the classification. Top Runner also includes specifications for hard disk drives.	

Table 46: Computer monitors - Summary of Programs and Initiatives

Country	Programme	Date	Type	Off	Sleep	Active
USA and EU	ENERGY STAR® V5.0 for displays up to 30 inches	2009	Voluntary	1W	2W	Metric based on area and resolution for displays ≤ 30 inches
USA and EU	ENERGY STAR® V5.0 for displays between 30 and 60 inches	2010	Voluntary	1W	2W	Metric based on screen area for displays > 30 inches and < 60 inches
USA	ENERGY STAR®	2005	Voluntary	2W	4W	30 + (38 x MP) W
USA	ENERGY STAR®	2006	Voluntary	1W	2W	If Megapixels (MP) < 1, then 23W If MP ≥ 1, then 28 x MP
EU	ENERGY STAR®	2007	Voluntary	1W	2W	
Global	TCO Label	2006	Voluntary	1W	2W	
EU	Eco label the Flower	2005	Voluntary	1W	2W	
Germany	Blue Angel	2006	Voluntary	1W	2W	
6 EU countries	Group for energy efficient appliances	2006	Voluntary	1W	2W or 2.3W with USB	
Australia	Energy Allstars	2005	Voluntary	1W	2W	
China	CECP	2003	Voluntary	2W	4W	NA Default sleep time = 15 minutes
Korea	KEMCO	2004	Voluntary	2W	4W	NA
USA	Executive Order 13221/FEMP	2001	Recommended for Federal purchases	1W	NA	NA
USA	Energy Policy Act 2005	2005	Requires federal agencies to buy either ENERGY STAR® products or products designated as energy efficient by the Federal Energy Management Program (FEMP).			

USA	Executive Order13423/FEMP	2007	Requires federal agencies to activate ENERGY STAR® 'sleep' features on computers and computer monitors and mandates that federal agencies buy EPEAT registered (ENERGY STAR®) products.

Other broader environmental programmes exist, such as the Climate Savers Computing Initiative and Electronic Product Environmental Assessment Tool (EPEAT), which include compliance with prevailing ENERGY STAR® computer specifications as a minimum.

APPENDIX 4 Energy Tariffs and Carbon Value

New Zealand

Table 47: New Zealand Marginal Energy Tariffs, 2010 – NZ cents per kWh and Carbon value $NZ, 2010

c/kWh Household (day rate)	c/kWh Commercial	Carbon value NZ$ per tonne
23.69	15.19	22.36

Australia

Tariffs

The Australian tariffs have been derived based upon data prepared by George Wilkenfeld and Associates “Energy Price projections corresponding to Treasury CPRS-5 Scenario (ETS commencing 2011)”

In the table below it has been assumed that the percentage increase calculated for a 2011 introduction of CPRS from year to year remains as per the CPRS-5 Scenario, but deferred to commencement mid 2013.

Table 48: Australian Marginal Energy Tariffs, 2010 Australian cents per kWh

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
NSW	17.84	18.38	18.93	21.46	23.96	24.75	25.53	26.32	27.10	27.89	28.67	29.45	30.24	31.02	31.44	31.49
VIC	17.25	17.77	18.30	19.98	21.61	22.52	23.42	24.33	25.24	26.15	27.05	27.96	28.87	29.77	30.26	30.31
QLD	16.78	17.28	17.80	19.44	21.02	21.90	22.78	23.67	24.55	25.43	26.31	27.19	28.08	28.96	29.45	29.54
SA	23.69	24.40	25.13	27.31	29.36	30.50	31.65	32.79	33.93	35.08	36.22	37.36	38.51	39.65	40.22	40.20
WA	16.15	16.64	17.14	18.49	19.68	20.35	21.02	21.69	22.36	23.03	23.70	24.37	25.04	25.71	26.12	26.27
TAS	17.51	18.04	18.58	20.28	21.93	22.85	23.77	24.70	25.62	26.54	27.46	28.38	29.30	30.22	30.67	30.65
NT	17.51	18.04	18.58	19.88	20.95	21.55	22.15	22.75	23.35	23.95	24.55	25.15	25.75	26.35	26.68	26.73
ACT	14.62	15.05	15.51	17.17	18.79	19.51	20.24	20.96	21.68	22.40	23.12	23.84	24.56	25.29	25.67	25.71

Carbon value

The following table utilises trajectories provided by the Department of Treasury and is qualified by the following Treasury statement that accompanied the data.

"These carbon price trajectories are the international carbon prices in Australian dollars consistent with those used in the Australian Government's Australia's Low Pollution Future (ALPF) report, adjusted for revised exchange rate and CPI assumptions in the Budget 2010-11 released in May 2010. After the 2010-11 Budget Forward Estimates, inflation is estimated to average around 2.5% in line with the middle of the current monetary policy target range of 2% – 3% per annum."

Year	**2014-2015**	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**	**2024-2025**	**2025-2026**
A$ per tonne	30.7	33.2	35.6	38.2	41.0	44.0	47.5	51.4	55.7	59.9	64.9	69.3

For analysis by jurisdiction, the above values have been converted to a carbon value in cents per kWh based upon projected marginal emissions-intensity of electricity supply by jurisdiction in Greenhouse Gas Emission Factors and are shown in the following table.

Table 49: Australian carbon value, 2010 Australian cents per kWh

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
NSW	-	1.40	2.87	3.02	3.16	3.30	3.45	3.62	3.81	4.01	4.21	4.42	4.62
Vic	-	1.69	3.42	3.59	3.74	3.90	4.07	4.25	4.47	4.69	4.92	5.15	5.36
Qld	-	1.44	2.94	3.11	3.29	3.47	3.66	3.88	4.12	4.38	4.65	4.93	5.21
SA	-	1.42	2.92	3.11	3.30	3.50	3.71	3.95	4.22	4.51	4.81	5.12	5.44
WA	-	1.24	2.55	2.72	2.89	3.07	3.26	3.47	3.71	3.97	4.24	4.52	4.81
Tas	-	0.16	0.35	0.40	0.45	0.50	0.56	0.63	0.70	0.78	0.86	0.95	1.05
NT	-	1.24	2.58	2.78	2.99	3.21	3.45	3.71	4.01	4.34	4.68	5.05	5.43
ACT	-	1.40	2.87	3.02	3.16	3.30	3.45	3.62	3.81	4.01	4.21	4.42	4.62

Source – DCCEE spreadsheet calculating impact by jurisdiction and year.

APPENDIX 5 Greenhouse Gas Emission Factors

Table 50: Projected marginal emissions-intensity of electricity supply by Jurisdiction 2006-2020

Emission Factors	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NSW	0.938	0.928	0.918	0.908	0.898	0.884	0.870	0.857	0.843	0.829	0.805	0.782	0.758	0.734	0.710
VIC	1.289	1.259	1.229	1.199	1.169	1.135	1.101	1.068	1.034	1.000	0.970	0.940	0.909	0.879	0.848
Qld	0.996	0.982	0.967	0.953	0.939	0.921	0.903	0.885	0.868	0.850	0.833	0.817	0.800	0.783	0.767
SA	0.925	0.918	0.911	0.904	0.897	0.887	0.876	0.866	0.855	0.845	0.832	0.820	0.807	0.795	0.782
WA	0.795	0.789	0.783	0.777	0.771	0.763	0.754	0.746	0.737	0.729	0.718	0.708	0.698	0.688	0.677
NT	0.746	0.745	0.744	0.742	0.741	0.740	0.740	0.740	0.739	0.739	0.737	0.736	0.734	0.732	0.731
Tas	0.754	0.751	0.748	0.745	0.742	0.736	0.729	0.723	0.716	0.710	0.702	0.693	0.685	0.676	0.668
ACT	0.938	0.928	0.918	0.908	0.898	0.884	0.870	0.857	0.843	0.829	0.805	0.782	0.758	0.734	0.710
NZ	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

All values state-wide average kg CO_2-e per kWh delivered, taking into account transmission and distribution losses (combustion emissions only).

APPENDIX 6 Household and Population

Table 51: Household Numbers

Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Australian Total	New Zealand Total
2006	2643000	1975600	1583100	649000	806300	202800	67200	130300	8057300	1548000
2007	2681500	2005500	1622800	655900	823600	204900	68400	132300	8194900	1566200
2008	2719900	2035500	1663000	662800	840900	207000	69700	134300	8333100	1584600
2009	2758400	2065600	1703700	669700	858400	209200	70900	136200	8472100	1603100
2010	2797100	2095900	1745000	676600	876100	211300	72100	138200	8612300	1622000
2011	2836300	2126500	1787000	683500	894000	213400	73400	140100	8754200	1641000
2012	2875200	2156900	1829300	690200	911800	215400	74600	142000	8895400	1659000
2013	2913700	2187300	1871700	696900	929600	217300	75800	143900	9036200	1677200
2014	2952200	2217700	1914400	703500	947500	219200	77000	145800	9177300	1695600
2015	2990900	2248200	1957700	710100	965500	221100	78300	147700	9319500	1714200
2016	3029500	2278500	2001200	716500	983500	222900	79500	149600	9461200	1733000
2017	3067700	2308800	2044700	722800	1001400	224600	80700	151400	9602100	1749700
2018	3105300	2338600	2088100	728800	1019200	226100	81900	153200	9741200	1766500
2019	3142800	2368200	2131600	734800	1037100	227700	83100	155000	9880300	1783500
2020	3180200	2397800	2175300	740700	1054900	229200	84300	156800	10019200	1800700

Table 52: Population

Year	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Australian Total	New Zealand Total
2006	6869400	5071100	3999500	1543500	2032800	476500	205200	332500	20530500	4109000
2007	6923760	5112480	4066920	1547700	2058620	476820	207560	334860	20728720	4136400
2008	6978120	5153860	4134340	1551900	2084440	477140	209920	337220	20926940	4164000
2009	7032480	5195240	4201760	1556100	2110260	477460	212280	339580	21125160	4191800
2010	7086840	5236620	4269180	1560300	2136080	477780	214640	341940	21323380	4219800
2011	7141200	5278000	4336600	1564500	2161900	478100	217000	344300	21521600	4248000
2012	7192080	5316560	4402720	1567640	2186840	477960	219320	346440	21709560	4273900
2013	7242960	5355120	4468840	1570780	2211780	477820	221640	348580	21897520	4299900
2014	7293840	5393680	4534960	1573920	2236720	477680	223960	350720	22085480	4326100
2015	7344720	5432240	4601080	1577060	2261660	477540	226280	352860	22273440	4352500
2016	7395600	5470800	4667200	1580200	2286600	477400	228600	355000	22461400	4379000
2017	7444040	5507600	4732360	1582560	2310860	476840	230960	356980	22642200	4404100
2018	7492480	5544400	4797520	1584920	2335120	476280	233320	358960	22823000	4429300
2019	7540920	5581200	4862680	1587280	2359380	475720	235680	360940	23003800	4454700
2020	7589360	5618000	4927840	1589640	2383640	475160	238040	362920	23184600	4480200

APPENDIX 7 Annual Benefit and Cost Data – not discounted.

NOTE – Australian data in these tables do not include carbon value, which if included increases the net benefit and hence benefit cost ratio.

NSW		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	2747.3	2860.3	2974.3	3015.9	2982.9	2861.5	2801.6	2702.0	2689.8	2678.4	2687.3	2694.0
Energy with program	GWh/yr	2747.3	2860.3	2764.3	2625.2	2467.2	2237.7	2036.8	1805.3	1801.0	1798.9	1809.4	1819.9
Energy Savings	GWh/yr	0.0	0.0	209.9	390.7	515.7	623.8	764.8	896.7	888.8	879.5	877.9	874.1
Energy Cost Savings	$M	0.0	0.0	38.6	74.0	110.6	149.5	189.3	229.0	233.9	238.4	244.8	250.6
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	185.6	340.1	441.8	525.8	634.2	722.3	694.8	666.5	644.3	620.8
Additional MEPS/prog cost	$M	0.0	0.0	48.6	55.3	35.0	23.5	27.3	47.7	33.9	34.7	23.8	27.4
Net Benefit	$M	0.0	0.0	-10.0	18.7	75.7	126.0	162.0	181.2	200.0	203.6	221.0	223.2
Vic		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	1892.5	1969.9	2048.6	2077.4	2056.2	1974.1	1936.0	1869.3	1862.5	1856.1	1863.3	1868.8
Energy with program	GWh/yr	1892.5	1969.9	1904.5	1809.1	1701.6	1545.5	1410.1	1252.4	1250.7	1250.5	1258.8	1267.0
Energy Savings	GWh/yr	0.0	0.0	144.1	268.2	354.5	428.7	525.8	617.0	611.8	605.6	604.5	601.8
Energy Cost Savings	$M	0.0	0.0	25.6	49.1	70.9	92.6	118.4	144.5	148.9	152.8	158.1	162.8
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	163.6	295.5	378.6	443.3	526.1	598.5	574.9	550.6	531.3	510.6
Additional MEPS/prog cost	$M	0.0	0.0	36.4	41.4	26.2	17.6	20.5	35.9	25.5	26.1	18.0	20.6
Net Benefit	$M	0.0	0.0	-10.8	7.7	44.6	75.0	97.9	108.6	123.4	126.7	140.1	142.2
Qld		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	1738.9	1829.1	1921.1	1967.4	1964.6	1902.4	1879.6	1829.1	1837.2	1845.5	1867.7	1888.3
Energy with program	GWh/yr	1738.9	1829.1	1785.4	1712.3	1624.7	1487.3	1365.8	1221.2	1229.1	1238.4	1256.4	1274.3
Energy Savings	GWh/yr	0.0	0.0	135.7	255.1	339.9	415.1	513.8	608.0	608.1	607.1	611.3	614.0
Energy Cost Savings	$M	0.0	0.0	23.5	45.4	66.1	87.3	112.5	138.5	143.9	149.0	155.5	161.6
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	125.0	230.4	300.9	360.2	436.6	506.5	496.5	485.6	478.9	470.8
Additional MEPS/prog cost	$M	0.0	0.0	30.3	34.8	22.2	15.1	17.7	31.3	22.4	23.2	16.0	18.6
Net Benefit	$M	0.0	0.0	-6.9	10.6	43.8	72.2	94.8	107.3	121.5	125.9	139.4	143.0

SA		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	648.5	672.5	696.6	703.5	693.3	662.6	646.6	621.3	616.2	611.2	610.9	610.1
Energy with program	GWh/yr	648.5	672.5	647.4	612.4	573.5	518.4	470.4	415.5	413.0	410.9	411.8	412.6
Energy Savings	GWh/yr	0.0	0.0	49.1	91.0	119.8	144.3	176.2	205.8	203.2	200.3	199.1	197.5
Energy Cost Savings	$M	0.0	0.0	12.0	22.9	32.7	42.4	53.8	65.1	66.6	68.0	69.8	71.5
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	43.5	79.8	103.7	123.4	148.8	171.3	166.6	161.7	158.3	154.5
Additional MEPS/prog cost	$M	0.0	0.0	11.8	13.3	8.4	5.6	6.5	11.3	8.0	8.2	5.6	6.4
Net Benefit	$M	0.0	0.0	0.2	9.6	24.3	36.7	47.2	53.8	58.6	59.8	64.3	65.1
WA		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	858.3	899.5	941.2	960.3	955.5	922.1	908.0	880.7	881.5	882.5	890.3	897.1
Energy with program	GWh/yr	858.3	899.5	874.8	835.9	790.3	721.0	660.1	588.3	590.1	592.7	599.4	605.9
Energy Savings	GWh/yr	0.0	0.0	66.4	124.4	165.2	201.0	247.9	292.3	291.4	289.9	290.9	291.2
Energy Cost Savings	$M	0.0	0.0	11.1	21.3	30.5	39.6	50.5	61.5	63.2	64.8	67.0	69.0
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	50.7	93.8	123.2	148.2	180.6	210.0	206.3	202.3	200.1	197.3
Additional MEPS/prog cost	$M	0.0	0.0	15.2	17.4	11.1	7.5	8.8	15.4	11.0	11.3	7.8	9.0
Net Benefit	$M	0.0	0.0	-4.2	3.9	19.5	32.1	41.7	46.0	52.2	53.5	59.2	60.0
NT		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	70.7	73.8	77.1	78.4	77.7	74.7	73.5	71.0	70.9	70.7	71.2	71.5
Energy with program	GWh/yr	70.7	73.8	71.6	68.2	64.3	58.5	53.4	47.4	47.4	47.5	47.9	48.3
Energy Savings	GWh/yr	0.0	0.0	5.4	10.2	13.4	16.3	20.1	23.6	23.4	23.2	23.2	23.2
Energy Cost Savings	$M	0.0	0.0	1.0	1.9	2.7	3.4	4.3	5.2	5.3	5.4	5.6	5.7
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	4.0	7.5	9.9	12.0	14.2	16.5	16.2	15.9	15.7	15.5
Additional MEPS/prog cost	$M	0.0	0.0	1.3	1.4	0.9	0.6	0.7	1.3	0.9	0.9	0.6	0.7
Net Benefit	$M	0.0	0.0	-0.3	0.5	1.8	2.8	3.6	4.0	4.4	4.5	4.9	5.0

Tas		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	176.0	182.2	188.5	190.2	187.2	178.9	174.7	168.0	166.4	164.9	164.6	164.1
Energy with program	GWh/yr	176.0	182.2	175.3	165.7	155.1	140.2	127.5	112.9	112.1	111.5	111.6	111.7
Energy Savings	GWh/yr	0.0	0.0	13.2	24.5	32.2	38.7	47.2	55.1	54.3	53.4	53.0	52.4
Energy Cost Savings	$M	0.0	0.0	2.4	4.5	6.5	8.5	10.8	13.1	13.4	13.7	14.1	14.4
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	9.7	17.8	23.3	27.7	34.9	40.6	40.0	39.2	38.8	38.3
Additional MEPS/prog cost	$M	0.0	0.0	3.7	4.2	2.6	1.8	2.0	3.5	2.5	2.5	1.7	2.0
Net Benefit	$M	0.0	0.0	-1.3	0.4	3.9	6.7	8.8	9.6	10.9	11.1	12.3	12.4
ACT		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	122.9	127.9	132.9	134.7	133.2	127.8	125.3	120.9	120.3	119.8	120.1	120.4
Energy with program	GWh/yr	122.9	127.9	123.6	117.3	110.2	100.1	91.3	81.0	80.8	80.7	81.2	81.7
Energy Savings	GWh/yr	0.0	0.0	9.3	17.4	23.0	27.7	34.0	39.9	39.5	39.0	38.9	38.7
Energy Cost Savings	$M	0.0	0.0	1.4	2.7	3.9	5.2	6.6	8.1	8.3	8.5	8.7	9.0
Carbon value	$M		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	8.3	15.1	19.7	23.4	28.2	32.1	30.9	29.6	28.6	27.5
Additional MEPS/prog cost	$M	0.0	0.0	2.4	2.7	1.7	1.2	1.3	2.4	1.7	1.7	1.2	1.4
Net Benefit	$M	0.0	0.0	-1.0	0.0	2.2	4.1	5.3	5.7	6.6	6.7	7.5	7.6
Australia		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	8255.2	8615.3	8980.3	9127.7	9050.6	8704.2	8545.2	8262.3	8244.9	8229.1	8275.4	8314.4
Energy with program	GWh/yr	8255.2	8615.3	8347.0	7946.1	7486.9	6808.7	6215.4	5524.0	5524.3	5531.2	5576.4	5621.4
Energy Savings	GWh/yr	0.0	0.0	633.3	1181.6	1563.7	1895.5	2329.8	2738.3	2720.5	2698.0	2698.9	2693.0
Energy Cost Savings	$M	0.0	0.0	115.5	221.8	324.0	428.4	546.1	665.0	683.5	700.6	723.5	744.6
Carbon pricing	$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Saved	kt CO2-e	0.0	0.0	590.4	1080.0	1401.0	1663.9	2003.7	2297.9	2226.2	2151.4	2095.9	2035.3
Additional MEPS/prog cost	$M	0.0	0.1	149.7	170.6	108.2	72.9	84.9	148.9	105.9	108.8	74.9	86.1
Net Benefit	$M	0.0	0.0	-34.2	51.3	215.8	355.6	461.3	516.2	577.7	591.9	648.7	658.5

NZ using NZ$	0	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	1348.9	1398.9	1449.8	1464.5	1445.2	1383.8	1354.8	1305.8	1296.6	1288.1	1289.2	1289.3
Energy with program	GWh/yr	1348.9	1398.9	1348.2	1276.1	1196.8	1084.6	988.8	877.5	873.4	870.8	874.1	877.6
Energy Savings	GWh/yr	0.0	0.0	101.6	188.4	248.5	299.2	366.0	428.3	423.1	417.3	415.1	411.7
Energy Cost Savings	$M	0.0	0.0	18.7	33.7	44.6	53.5	65.4	76.6	75.5	74.4	73.8	72.9
Carbon value	0	0.0	0.0	1.4	1.7	2.2	2.7	3.3	3.8	3.8	3.7	3.7	3.7
Energy + carbon	0	0.0	0.0	20.1	35.4	46.9	56.1	68.7	80.4	79.3	78.1	77.5	76.6
Emissions Saved	kt CO2-e	0.0	0.0	61.0	75.4	99.4	119.7	146.4	171.3	169.2	166.9	166.0	164.7
Additional MEPS/prog cost	$M	0.0	0.0	33.7	38.2	24.1	16.1	18.7	32.7	23.1	23.7	16.2	18.6
Net Benefit	$M	0.0	0.0	-13.6	-2.8	22.8	40.0	49.9	47.7	56.2	54.4	61.3	58.0

APPENDIX 8 Computer and computer monitor RIS model

Introduction

This Appendix describes the assumptions, estimates, data sources and methodology for the data presented in the Consultation Regulatory Impact Statement: Proposed MEPS for Computers and Computer Monitor i.e. the costs, benefits and other impacts of the proposal.

A simple model was developed using data from a "desktop" survey for the presentation of "order of magnitude" results at the AIIA Sustainable Futures Forum in Melbourne in October 2007. This original data was based upon two scenarios - high growth and conservative market growth. This data indicated that these products were candidates for more refined and accurate analysis.

Subsequently, the model has been refined to perform complex calculations to calculate and compare costs, benefits and other impacts of the BAU and MEPS forecasts. This refined model utilises input/comments from industry stakeholders and expansion and refinement of the factors that influence energy consumption.

Key parameters

Growth/decline of product stock, lifetime of products for the quantity of replacement products and incremental cost of MEPS compliant products. This also affects CO_2-e and energy cost savings for products acquired up to 2020 and remaining in use post 2020.

Stock of each product (BAU and MEPS) in the residential and office sectors, split by jurisdiction i.e. state, territory and New Zealand to 2020 then declining from 2021 as products are retired from service.

Baseline "direct" energy consumption and "natural" improvement in energy performance of BAU products due to increased use of power management and technological changes.

"Direct" energy consumption of MEPS compliant products.

Electricity tariffs and CO_2-e factors by jurisdiction.

Incremental cost of MEPS compliant products from 2011 to 2020.

Program costs to 2020, such as administration, check testing and publications.

Discount rates for Australia and New Zealand benefits and costs.

"Indirect energy" – the impact on heating and cooling energy in temperature controlled environments.

Bullet point summary

- For BAU and MEPS, using product life and sales growth/decline forecast, calculate old and new stock in each year.
- For each product split quantities of old and new into residential and non-residential sectors for each jurisdiction.
- For BAU and MEPS, multiply the product quantities (old and new) by their annual energy for each sector within each jurisdiction.
- For each jurisdiction add/subtract the calculated indirect energy to the non-residential sector direct energy.

- Emissions - multiply energy, for BAU and MEPS cases, by emission factors for each jurisdiction. Note – This streams to 2025, as product purchased between 2016 and 2020, whilst diminishing due to retirements, still reduces emissions post 2020.
- Energy cost savings - multiply energy, for BAU and MEPS cases, by tariffs for each jurisdiction. As per emissions, savings stream to 2025. Note – NZ benefits include carbon pricing based upon emissions avoided.
- MEPS cost for each year – multiply MEPS sales by the forecast incremental product costs for each year. Add to this program costs for each jurisdiction.
- For the Australian analysis including carbon value, multiply MEPS energy savings by the calculated value per kWh in each jurisdiction by the energy saved in each jurisdiction.
- Calculate NPV of costs and benefits to 2025 using 7% for Australia and 6% for New Zealand.

Methodology and data

Baseline stock and forecasts

The key element in any energy analysis is to establish the base stock of products and agreement on forecasts of future stock levels, product mix and lifetime.

The base year for the initial review was 2006. This was based upon Australian Bureau of Statistics data for residential computer use and data for ICT use in business and compared to historical data from the International Telecommunications Union.

Australian Bureau of Statistics (ABS) data, as shown in Figure 33, indicated continued growth in household access to computers and the internet. This data only addresses households with computer access, not the total number of computers. I.e. some households have more than one computer. ABS data from 2005 indicates there were some 6.45 million computers in Australian households.

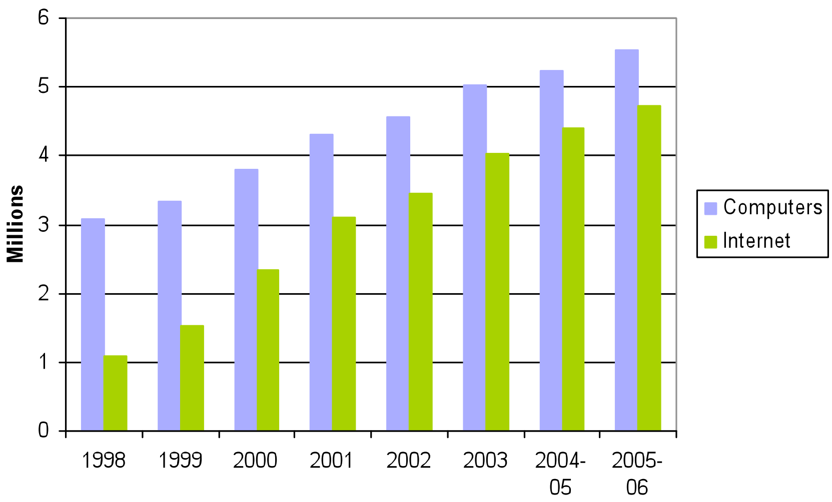


Figure 33: ABS household data for computers and internet access - Australia

First run estimates were made to forecast stock and product mix in the residential and office sectors to 2014 using the conservative and high growth scenarios, based upon historical ABS data and published sales data from IDC.

These forecasts were discussed with James McAdam, then General Manager - Strategy and Policy in the AIIA, who advised that the base estimate should be 24 Million computers in Australia split 1/3rd in the residential and the balance in non-residential (office, government etc.). Subsequently, via stakeholder forums, meetings and other communications, the stock forecast and product mix has been set as per the following chart which in product volume is relatively similar to the initial conservative scenario, but extended to 2020. Principal input to this came from Josh Millen (AIIA) in December 2008, particularly with respect to forecast product mix and later verbal agreement from Sean Casey (Intel) in May 2009 that the forecasts were in close agreement to the Intel forecasts. A key point in the following charts is increasing use of notebooks (NB) and netbooks at the expense of desktop (DT) computers. Even more profound is the dominance of LCD computer monitor technology over CRT computer monitors in virtually all but a few specialised applications, such as the medical sector.

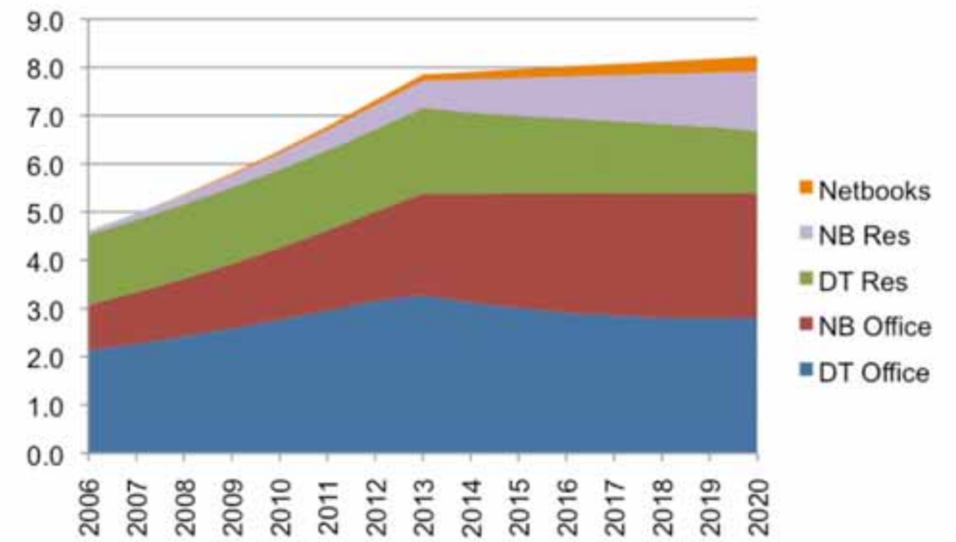


Figure 34: Australian computer stock forecast - millions

Figure 35: Australian computer monitor stock forecast - millions

Data from Statistics New Zealand[47] is limited to 2001 and 2006, however the 2006 penetration is similar to Australia as shown in Table 53 and, as such, New Zealand product stock is in proportion to the Australian stock and mix.

Table 53: Household computer and internet penetration, Australia and New Zealand

Country	Internet 2001	Computers 2001	Internet 2006	Computers 2006
New Zealand	37%	45%	64.5%	71.6%
Australia	31%	51%	59%	68%

Distribution of products by jurisdiction

To model energy, emissions, costs and benefits it is necessary to estimate the distribution of products by jurisdiction. As data on ICT use by jurisdiction is not available, the model breaks down the total estimated stock by product mix based upon the households in each jurisdiction. It is also assumes that the ratio of residential to non-residential usage is the same for all jurisdictions.

Unit energy consumption – BAU and MEPS

There have been many studies of computer and computer monitors over the last decade in many countries. The most comprehensive is the Lot 3 study conducted under the auspices of the European Union's Energy using Products (EuP) Directive. This study reviewed past reports from around the world and reports a high level of informed stakeholder input. In summary, the Lot 3 study estimated the annual energy consumption of computers and computer monitors for their BAU case and the expected savings that could be achieved by improving power supply efficiency and enabling power management. This data is used in the model as the average base data for BAU and MEPS improvements.

Table 54: Average base annual energy by product and sector – kWh per year

Product	Residential	Office
Desktop	141.7	194.1
Notebook	59.8	97.3
Netbook	15.0	15.0
LCD	50.8	106.0
CRT	189.0	100.8

Improvements to base annual energy data

The EuP Lot 3 study included analysis of potential energy savings due to improving power supply efficiency to 80% and the impact of enabling power management. These impacts are shown in Figure 36 and the model utilises these power management and 80% power supply efficiency reductions for the MEPS case.

[47] http://www.stats.govt.nz/NR/rdonlyres/BA872497-4B85-4386-8395-3ACBEBDA7C4A/0/householduseofict2006hotp.pdf

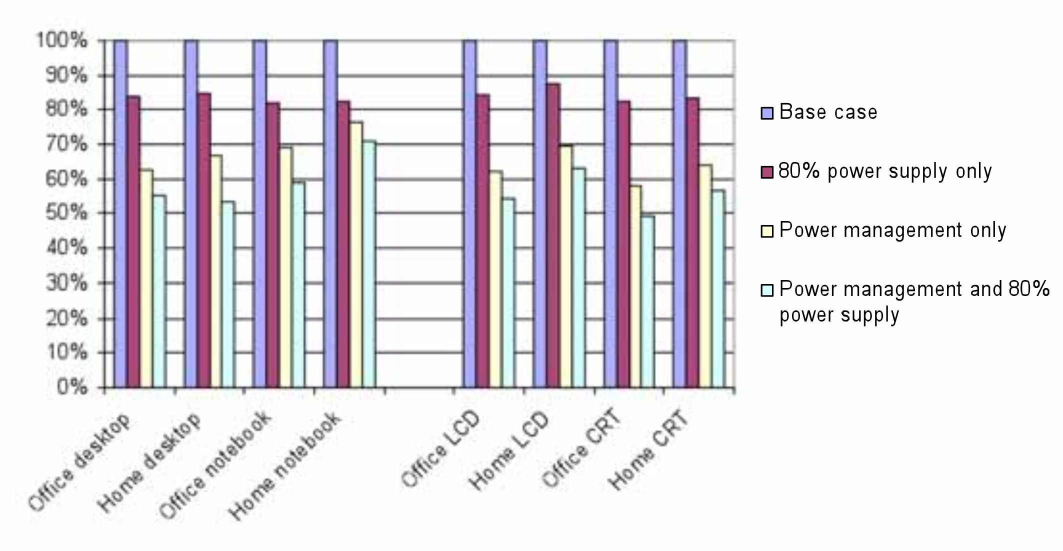


Figure 36: EuP Lot 3 impact of power supply efficiency and power management

For BAU products, the model recognises and incorporates reductions in energy consumption, as an average to all products, that would occur even in the absence of intervention due to both supplier and consumer action. In the office sector this is assumed to be 5% in 2011 then peaking at 17% in 2014 through to 2020. In the residential sector, this is assumed to be 2% in 2012, then peaking at 8% in 2014 through to 2020.

Direct energy calculation

Direct energy is the simple multiplication of the quantity of the product (BAU, MEPS, and improved BAU) by the annual energy for that product in each year of its service life. It is in this calculation stock growth or decline, the service life and hence retirement and replacement affects energy consumption in any year, due to removing poorer performing product and replacing it with MEPS or improved BAU product. The model splits annual energy into residential and non-residential in each jurisdiction. Through discussion with AIIA and Intel service life is set at 5 years, which covers initial owner and subsequent owner(s) of second hand products.

Indirect energy

The method used was first used in the EPS RIS and subsequently the TV RIS.

Indirect energy gains and losses arise from the impact of energy consuming products in spaces utilising heating and cooling products. The heating and cooling loads depend upon the external ambient temperature in the each region, the design of the building and the sources of heat within the building, such as appliances, processes, humans etc. and the thermostat setting.

To estimate indirect energy, data was sourced by capital city on the basis of energy consumed in office buildings from the following link:

www.greenhouse.gov.au/lgmodules/wep/buldings/training/training4.html

This was used to estimate heating, cooling and neural time percentages. It was also assumed that heating and cooling uses reverse cycle technology, thus reducing the energy required to manage the temperature. E.g. if 1 kWh of heat is emitted, then at a COP of 3, the indirect energy is 0.33 kWh required to remove that heat. The converse applies in heating months, where the heat emitted is beneficial and hence reduces indirect energy demand.

Within the residential sector, it would be very difficult to model when computers are used and whether or not this was in a heating, cooling or neutral periods. As such, indirect energy has been applied to the non-residential stock estimates only. Whilst not all offices and households will have reverse cycle heating/cooling system, this is most likely compensated for by not applying indirect to the residential sector. In calculating the indirect energy it has been assumed that 93% of annual energy is consumed during hours when heating, cooling or neutral is in progress.

For the New Zealand case, the indirect effect is based upon Hobart data and again only applies to the non-residential sector.

Greenhouse gas emissions

GHG emissions are calculated from the direct plus indirect energy for each state, which is then multiplied by the standard RIS emission factors for each jurisdiction and year. GHG reductions are calculated to 2025, as products purchased from 2016 to 2020 will reduce emissions during their 5 year service life.

Energy cost benefits

Energy by year in the residential and non residential sectors are multiplied by the tariffs in each jurisdiction.

Energy cost savings are calculated to 2025, as products purchased from 2016 to 2020 will reduce energy costs during their 5 year service life.

For the Australian case where two cost benefit analysis have been done, one without carbon price and one which includes carbon value of A$10 per tonne, the value per kWh saved by the program are added to the benefit to the community at large.

Cost and benefit analysis.

This is done using the NPV function in Excel and use 7% discount rate for Australia and 6% for New Zealand.

Incremental product and program costs run from 2010 to 2020.

Benefits run from 2010 to 2025.

At EECA’s request, the NZ benefits include carbon pricing at NZ$22.36 per tonne.

APPENDIX 9 Indirect Energy Calculations

Indirect energy gains and losses arise from the impact of energy consuming products in spaces utilising heating and cooling products. In this RIS, this has been applied only to heating and cooling loads in the non-residential sector only. The heating and cooling loads depend upon the external ambient temperature in the each region, the design of the building and the sources of heat within the building, such as appliances, processes, humans etc. and the thermostat setting.

To estimate indirect energy, data has been sourced by capital city on the basis of energy consumed in office buildings. [DEW 2006] Referring to; Columns A and B have been estimated from the DEW chart for office energy use [DEW 2006]. The units are MJ /m^2 per annum; however, the units are not of interest, as the data has been used to estimate the annual heating and cooling energy, as shown in columns C and D respectively. To estimate the annual heating and cooling time percentages an allowance for a neutral period where neither heating nor cooling is required has been made, as shown in column E.

The heating and cooling time percentages are calculated by proportioning the data in columns C and D for the non-neutral time percentage. The annual heating benefit is calculated in column H is calculated by dividing the percentage of heating time required by the heating COP of 3.0. This COP is based upon the E3 report on heat pumps from http://www.energyrating.gov.au/library/pubs/200417-mepsheatpumps.pdf Similarly annual cooling load is calculated by dividing the percentage of cooling time required by the cooling COP of 2.45. This COP is based upon the average COP for air conditioners in the range of 10 to 65kW from http://www.energyrating.gov.au/library/pubs/ris-ac2001.pdf

The net indirect additional load is calculated by deducting the heat saved from the cool added.

In calculating the indirect energy it has been assumed that 93% of annual energy is consumed during hours where air-conditioning is utilised.

For the New Zealand case, the indirect addition is based upon Hobart data.

COP. Refrigerative air conditioners and heat pumps use a technique called the vapour compression cycle to *move* energy in the form of heat from one space to another. This is generally a very efficient process and the amount of heat moved is typically 2 to 3 times the energy required to run the compressor system. This ratio is called the Coefficient of Performance (COP). The system uses a refrigerant (which exists as a gas at low pressure and as a liquid under compression) which is compressed and liquefied, allowed to cool in a condenser, and then allowed to expand to become a gas in an evaporator (the expansion is accompanied by a strong cooling effect). In this operation the condenser becomes warm and the evaporator becomes cold as the heat is moved from the evaporator to the condenser. The principle is the same as used in a normal refrigerator which *moves* heat from the inside of refrigerator to the outside. In the case of an air conditioner, when in cooling mode the heat is removed from the room being cooled and pushed outside through the refrigeration system. Similarly, if the unit can operate in *reverse* (so called heating mode or reverse cycle), the process runs backwards and the energy is collected from outside and moved inside to the room being heated.

Table 55: Indirect Energy Data

Column	A	B	C	D	E	F	G	H	I	J
	Heating E	Cooling E	Heat in A x COP	Cool out B x COP	Neutral period	% time heating	% time cooling	Heat saved	Cool added	Net indirect addition
Sydney	2	31	6.0	76.0	20%	6%	74%	0.02	0.30	28%
Melbourne	5.5	15	16.5	36.8	20%	25%	55%	0.08	0.23	14%
Brisbane	0	27	0.0	66.2	20%	0%	80%	0.00	0.33	33%
Adelaide	3	20	9.0	49.0	20%	12%	68%	0.04	0.28	23%
Perth	1.5	28	4.5	68.6	20%	5%	75%	0.02	0.31	29%
Darwin	0	47	0.0	115.2	30%	0%	70%	0.00	0.29	29%
Hobart	8.8	9.5	26.4	23.3	20%	43%	37%	0.14	0.15	1%
Canberra	7.5	17	22.5	41.7	20%	28%	52%	0.09	0.21	12%

APPENDIX 10 Market Failure Additional Information

International Energy Agency

"While there is a general presumption amongst economists that markets respond to price signals, there is also substantial evidence that, at least for some markets and end-uses, market failures exist that limit the effect of price signals. The result is that energy usage persists at levels higher than economic theory would otherwise suggest.

The broad trend to global liberalisation of energy markets has raised the question of whether market prices, in and of themselves, are sufficient to serve the goals of energy and environmental policymakers. If barriers to the efficient end-use of energy are causing market failures of significant magnitude, policymakers may need to supplement market price signals with other policy measures."

1 Principal–agent barriers

   "Based on classical concepts of agency theory and asymmetric information, the principal-agent problem occurs when one party (the agent) makes decisions affecting the end-use energy efficiency in a given market, and different party (the principal) bears the consequences of those decisions."

2 Information cost barriers

   "Energy efficiency at the end-use level is an aggregate function of many small decisions. .... In many cases, the decision-maker in these small investments lacks the information or expertise to make to make a decision that would maximise both energy efficiency and economic efficiency. ……. In this sense, the information costs associated attached to end-use efficiency decisions can lead to market failure."

3 Externality cost barriers

   "Economists acknowledge that when the nominal market price for energy does not reflect its full cost to society as a whole, market failures can result. Environmental impacts, health impacts and other "externality costs" are widely recognised as imposing indirect costs on society for the direct use of energy."

International Activities

<u>IEA submission to G8</u>

"In IEA countries, mandatory programmes should be expanded to the end-use equipment not currently covered. Priority should be given to the areas of lighting, home entertainment and ICT equipment, and to mass-produced commercial and industrial electrical equipment. In framing MEPS and mandatory labels for types of equipment which are responsible for significant electrical consumption, requirements should cover active mode and low-power modes where appropriate." [48]

<u>IEA World Energy Outlook - 2007</u>

[48] http://www.iea.org/textbase/papers/2007/Appliances_Ellis.pdf

“Government action must focus on curbing the rapid growth in CO_2 emissions from coal-fired power stations – the primary cause of the surge in global emissions in the last few years.

Energy efficiency and conservation will need to play a central role in curbing soaring electricity demand and reducing inputs to generation.”

APPENDIX 11 International Studies

The International Energy Agency (IEA)

Extracts from the IEA submission to G8 - 2007

Mandatory programmes should be expanded to the end-use equipment not currently covered. Priority should be given to the areas of … and ICT equipment.

In framing MEPS and mandatory labels …. requirements should cover active mode and low-power modes where appropriate.[49]

IEA World Energy Outlook – 2007

"Energy efficiency and conservation will need to play a central role in curbing soaring electricity demand and reducing inputs to generation."

G8 – 2007 declaration

The G8 Summit and IEA Ministers endorsed the recommendations of the IEA submission.

Market mechanisms, such as … performance based regulation … and consumer labelling … and have the potential to deliver economic incentives to the private sector.

European Union – Energy using Products Lot 3 computers and computer monitors

The Energy using Products (EuP) Lot 3 report for computers and computer monitors recommend mandatory MEPS–aligned to US ENERGY STAR® specifications–to reduce energy consumption to achievable levels, which are lower than those that prevail or are forecast to prevail in the market place.

The EuP study indicates the step reductions that can be achieved by increasing power supply efficiency to 80%, enabling power management only and the case if both are implemented. These are relatively simple measures that will provide significant reductions in energy consumption from the base (BAU) case. Figure 37 summarises potential savings to their base case analysis again indicating a significant gap between BAU and available technological and operational improvements.

[49] http://www.iea.org/papers/2007/Appliances_Ellis.pdf

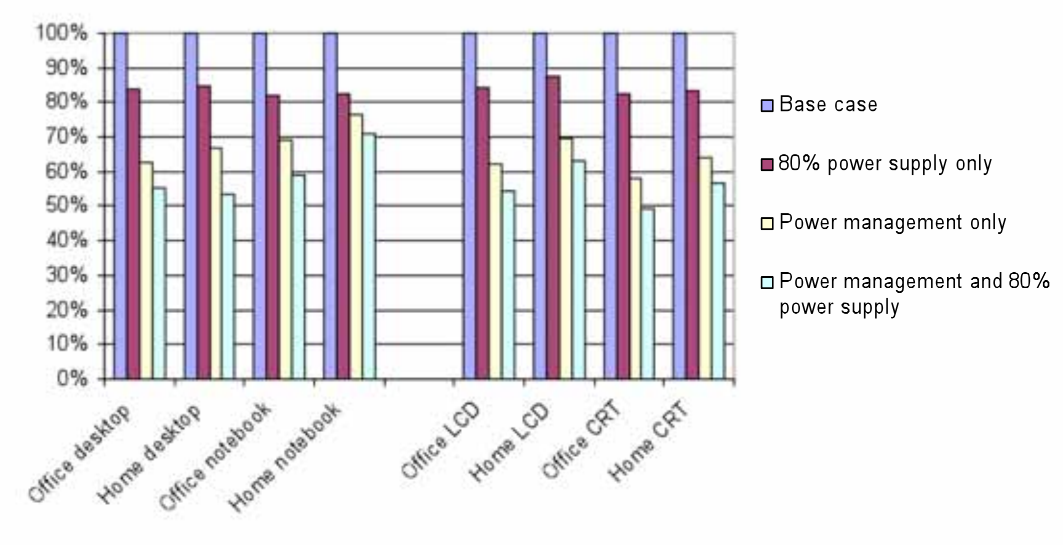


Figure 37: Impact of Improvements on Energy Consumption

European Commission

In July 2009 the European Commission signed an agreement with US EPA, adopting the ENERGY STAR® computer specification V5.0 in the European Union as a voluntary labelling measure. Similarly, the EC adopted the ENERGY STAR® display specification V5.0 as a voluntary labelling measure in October 2009. In 2008, the EC flagged its intention to vote on mandatory labelling of computers and computer monitors in 2009, however this appears to have been delayed with no further information readily available on the current status.

US Federal Directive

Executive Order13423 directs federal agencies to purchase ENERGY STAR® compliant product which includes computers and computer monitors.

US Energy Bill 2007

The 2007 Energy Bill requires the Federal Trade Commission to develop energy consumption labelling programmes for computers and computer monitors within 18 months of setting a test standard.

US Environmental Protection Agency – ENERGY STAR®

The EPA has monitored and specified the energy performance of computers and computer monitors since 1992 via its ENERGY STAR® program. Over time the scope and stringency of their requirements has increased based upon available technology. Ongoing testing has identified that more efficient computers and computer monitors are available than those meeting earlier specifications. The EPA target is to increase the percentage of computers using energy-saving measures to 40% by 2010, 60% by 2012, and 80% by 2014.

In August 2006, the US EPA published energy performance data from test results on 141 PCs and 89 notebooks from six manufacturers in three operational modes to gauge compliance levels with their V4.0 power specifications by operational mode.[50] The summary of the EPA results analysis is shown in Table 56 and indicates high compliance for sleep and off modes, whilst also showing that idle mode compliance was achievable.

Table 56: US EPA Computer V4.0 Compliance Data

	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%	

The EPA claim that compliance rate for idle mode (on, but not in active use) could double, simply by using more efficient internal power supplies. Current power supplies are typically 65 to 70% efficient at idle power levels. More efficient and comparably priced 80% power supplies are already available and used by some manufacturers.[51] The EPA analysis reported that 39% of the computer dataset utilised power supplies at 80% plus efficiency, and that this could be the determining factor influencing power level compliance.

The EPA data shows that not only low energy computers are available, but that a very significant quantity consumed much more energy, thus indicating wide disparities in the power consumption of similarly categorised computers. The idle power spread is shown in Figure 38 utilising the ENERGY STAR® computer categories A, B and C.[52]

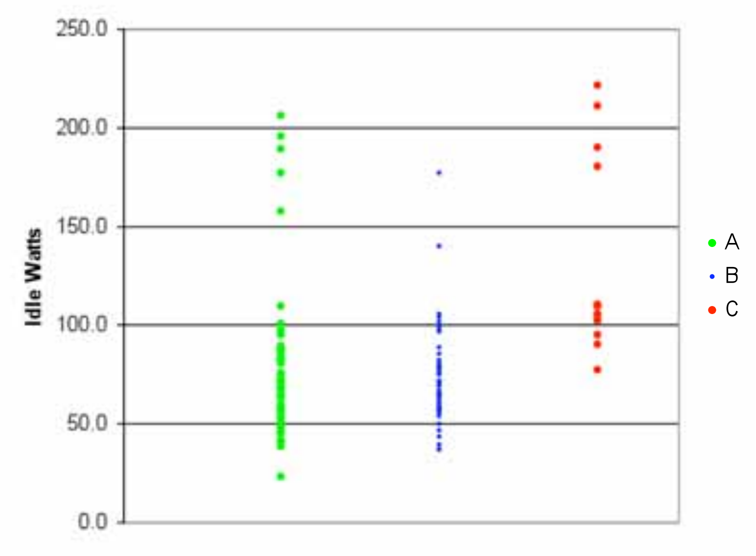


Figure 38: EPA Test Results - Computer Idle Power by Category

[50] ENERGY STAR Computer Levels Update 082606
[51] http://www.powerpulse.net:80/story.php?storyID=17523&source=1
[52] Further details in Appendix 1 – ENERGY STAR Program Requirement for computers, pp. 36 – 37.

Based upon their market analysis, EPA tools[53] estimate that energy savings between 25% and 59% are readily achievable, depending upon computer selection, user operation and power management compared to 'standard' (BAU) computers, thus confirming a large gap between BAU and available technology. This is highly significant considering the US market is skewed towards more efficient products due to a Federal purchasing directive which specifies the use of ENERGY STAR® products.

Climate Savers Computing Initiative (CSCI)

This ICT industry driven initiative recognises and highlights the fact that computers consume much more energy than they should.

"*In a typical desktop PC, nearly half the power coming out of the wall is wasted and never reaches the processor, memory, disks or other components. In a typical desktop PC, nearly half the power coming out of the wall is wasted and never reaches the processor, memory, disks or other components."*

"In addition, there is a significant opportunity to reduce overall energy consumption by putting systems into a lower power-consuming state when they are inactive for long periods of time. Even though most of today's desktop PCs are capable of automatically transitioning to a sleep or hibernate state when inactive, about 90% of systems have this functionality disabled."

Participants commit initially to achieving US ENERGY STAR® performance specifications followed by incremental improvements over time in power supply performance, thus acknowledging that performance gaps (market failure) exist in the market place.

"the technology is there, the cost is very low, and it will pay for itself over the life of the machine."

UK Market Transformation Programme – Computer Tests and Conclusions

"This spread in consumption highlights the need for a label that can push product manufacturers to move towards more efficient designs.

[53] http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/Calc_computers.xls

APPENDIX 12 Industry initiatives

Proposed Voluntary Measures:

1. Quick Wins in Existing Stocks of Equipment: Promoting established industry led programs aimed at capturing energy savings from existing equipment, pursue wide spread and comprehensive adoption of the Quick Wins tactics across Federal and State government agencies, and demonstrate cost savings through case studies of some major ICT users.
2. Develop Sustainable ICT E-learning Modules: Sponsor a free e-learning package for universities and professional bodies to train ICT professionals in sustainability. Modules are significant tools for promotion of Quick Wins opportunities and actions. Focus the content on energy efficiency and draw on case studies of real world energy saving projects.
3. Energy AllStars - Promote Highest Efficiency Equipment: Establishing an exemplary performance benchmark for best of breed equipment and promote this class of equipment to large ICT users. Build and promote an Energy AllStars website that supports registration of equipment for MEPS and higher performance AllStars categories and is useful to procurement processes.
4. Efficiency by Numbers - Audit ICT Energy Use Annually: Develop software tools for measuring and reporting energy use to reveal exceptions, patterns of energy use and ways of reducing consumption. Develop standards for annual reporting of ICT energy use that comply with organisational reporting requirements to relevant programs.

(1) Improving Equipment Performance - Quick Wins with Climate Savers and Computers off Australia

This program is initially aimed at Government agencies and larger corporate users with the purpose of enrolling them in existing industry led programs aimed at ensuring that all available energy management features are enabled on computer equipment, and that external power supplies are Mark IV compliant.

It is estimated that some significant short term energy savings could be captured in the early years of such a campaign, although the attributable savings decline quite quickly after the first three years because of the rate at which the stock of equipment is turned over to be replaced with equipment in which such features are become standard.

Estimates of the energy savings and resulting greenhouse abatement that could be achieved under this program are based on what are considered to be possibly optimistic assumptions that:

- 30% of the existing stock of equipment in the economy is in government hands;
- Approximately 1/5 of that government equipment is already optimised;
- Quick Wins results in improvements to 20% of the remaining stock every year;

- The effect of enabling energy management options across this stock of equipment delivers a average 30% improvement in the efficiency of that equipment.

Thus as a result of the Quick Wins campaign in government around the country as much as 4.8% of all stock is optimised (20% of government equipment that is not optimised already) improving performance of that stock by 30%. This has the net effect of improving the efficiency of the entire stock of computer equipment in Australia by approximately 1.4% from 2010 to 2014.

It is further assumed that from 2011 roughly similar improvements are achieved by programs in large industry delivering a further 1.4% per annum net improvement to the efficiency of the existing stock of equipment. Finally the effects of the campaign to optimise Government and industry ICT equipment draws in some of the residential and small business users as well and we assume a contribution at a rate of roughly half the rate that government and industry take action to enable energy management, equivalent to 0.07% improvement in the stock of equipment per annum from 2010 to 2014.

However these gains are only made against a BAU case for the life of the equipment. Assuming that ICT stock turns over completely every 6 years, and noting that some of that equipment will already have power management enabled in 2010, the actual improvements in efficiency before the 2010 stock is replaced by new equipment is estimated to save 583.2 GWh between 2010 and 2016, a quite significant saving of energy costs worth approximately $58.2 million (assuming an electricity cost of $0.10c/kWh).

This significant cost saving to Government, industry and the community is potentially achievable by employing programs that are already being operated by industry, and to which Government's may make a relatively modest contribution to expand the reach of the activities.

This energy saving is equivalent to emissions abatement of approximately 583kT CO_2. It should be noted that because this measures is focussed on equipment that is already in the market prior to any introduction of MEPS, even if MEPS were to be introduced, these savings could still be made, even with MEPS coming into force.

(2) Improving Information and Developing Skills - Develop Mini-E ICT Learning Modules

This project will develop interesting, short, effective e-learning modules to assist promote the objectives and the practices required to achieve the goals of the Quick Wins project. The modules will also generally promote the savings available via energy efficiency and identify and promote new tools for ICT managers and professionals to manage energy efficiency in their network architecture, security and maintenance regimes.

Modules will also aim to use case studies and international 'best practice' examples to promote awareness of the role, and the potential of ICT technologies transformational role in achieving a low carbon economy, and the opportunities for both quick wins and long-term solutions on energy efficiency.

These training and education modules would also be used to educate the professional ICT market on the implications and details of any MEPS requirements for computers and computer monitors, and the value expected from energy savings resulting from purchases of MEPS compliant equipment and from any higher efficiency standards. The module may include some tailored projects for different sectors.

Once developed these e-learning modules could be distributed through the existing industry led efficiency programs such as Computers Off and Climate Savers, as well as via the Quick Wins program. One of these e-learning modules would be developed to promote the ICT Audit Framework (see below) and appropriate tools.

There is no additional abatement calculated for this project as it is an initiative in direct support of the Quick Wins program.

(3) Improving Information and Driving Adoption of High Efficiency Equipment - Energy All Stars

This project will create and promote a high efficiency equipment category, the Energy AllStars, which is promoted as the exemplar of energy efficiency in ICT equipment and procurement. The Energy AllStars performance benchmarks will be higher than the proposed MEPS levels. It is proposed that to qualify for Energy AllStars equipment must comply with at least Climate Savers Bronze level performance, with both Silver and Gold class equipment also promoted as Energy AllStars best of breed equipment.

The project will establish the Energy AllStars brand, education and marketing assets and an Energy AllStars website. The Energy AllStars website will be promoted to all levels of Government as the preferred source of information for procurement of ICT equipment. The objective of the project is to entrench a culture in government and larger institutions procurement processes of purchasing exemplary energy efficient equipment as being a standard requirement. Active participation by government in procuring Energy AllStars equipment will assist drive emerging trends in efficiency and reward brands that make the effort to go beyond the minimum requirements.

For the purposes of calculating abatement it is assumed that 20% of all Government equipment purchases from 2011 to 2020 (which is approx 6.6% of all new equipment per annum) is sourced from an Energy AllStars equipment category equivalent to at least CS Silver, delivering an additional improvement in performance of 20% as compared to the stock they might otherwise have purchased. This improved performance would be equivalent to improvement of all stock of equipment by 1.3% per annum. Investment in Energy AllStars equipment of about half that level are estimated for industry from 2012 to 2020 resulting in aggregate annual efficiency gains from 2012 of approximately 1.95% across all equipment. No significant additional abatement is estimated from the home or SME market sector as a result of this measure.

As a result however it is estimated that the Energy AllStars program could potentially deliver aggregate energy savings of as much as 6,600 GWh over the period from 2011 to 2020. At an assumed average electricity price for the period of $0.10c/kWh these energy savings could deliver total energy cost savings of $660 million over the 10 year period. If such a level of investment and energy savings were realised from this voluntary program it would deliver aggregate greenhouse emissions abatement of approximately 6.6 Mt over the period 2010 to 2020, however with the greater proportion of that saving occurring towards the end of the period.

The Energy All Stars website would also perform other communication functions including being a platform for the distribution of the ICT E-Learning modules discussed above. Should MEPS be introduced the Energy AllStars can be the portal that the ICT industry use for registration of compliant equipment.

One of the intended outcomes of the website development will be a standard format to display energy efficiency data and performance of ICT equipment suitable for both consumers and corporate users.

(4) Improving Information and Developing Skills - Efficiency by Numbers, Counting Current and Audit ICT Energy Use Annually

The objective of this project is to develop an audit tool and easy audit model for ICT managers to measure and report energy use in ICT systems and networks. This ICT Energy Audit Framework will include metrics that allow for comparisons of performance across various parameters.

Well designed tools and common reporting frameworks that allow regular and accurate reporting of ICT energy use and facilitate internal reporting of ICT energy use in government and large organisations will become standard features for ICT managers. Familiarity with such tools will also encourage ICT managers to model, measure and validate the impact of MEPS and Energy AllStars equipment on ICT energy use over time.

An annual ICT energy audit protocol for participating agencies will facilitate comparisons of performance over time and across agencies. The tools may also include plug load metering systems to allow ICT managers to actually monitor energy use in individual pieces of equipment and peripherals to inform their audit procedures.

No additional abatement has been calculated for this measure as the skills and tools contemplated for promotion would form part of the E-Learning Modules discussed above and support the outcomes of the Quick Wins program.