Second Consultation Regulatory Impact Statement:

Proposed Minimum Energy Performance Standards for External Power Supplies

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

December 2007
Report 2007/07

This Regulatory Impact Statement was prepared for the Equipment Energy Efficiency Committee, which reports to the Ministerial Council on Energy. The MCE determines end-use equipment energy efficiency regulatory proposals involving all Australian Governments (Commonwealth, State and Territory) and the New Zealand Government.

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Executive Summary

This is a revised regulatory impact statement (RIS) proposing the introduction of common minimum energy performance standards (MEPS) in Australia and New Zealand for an energy using product know as an external power supply (EPS).

An initial Consultation RIS was released in March 2007 (available at http://www.energyrating.gov.au/library/details200702-ris-eps.html) Stakeholder submissions called for changes to that proposal and this revision, taking account of those stakeholder submissions, represents the latest proposed recommendations of energy efficiency regulators to the Ministerial Council on Energy.

The problem

In Australia, external power supplies' standby energy and conversion losses consumed an estimated 845 GWh of direct and indirect electricity in 2004 and consequently an estimated 885 thousand tonnes CO_2 equivalent greenhouse gases that year, representing 0.45% of Australia's total greenhouse gas emissions attributed to electricity generation. In New Zealand the external power supplies standby energy and conversion losses consumed an estimated 153 GWh of direct and indirect electricity in 2004 and consequently an estimated 107 thousand tonnes CO_2 equivalent greenhouse gases that year, representing 0.40% of New Zealand's total greenhouse gas emissions attributed to electricity generation. Due to market failures within the Australian and New Zealand EPS market, the level of energy efficiency is lower and standby energy consumption of these products is higher than the economically optimal level. Studies in the US, EU and China show that this is an international problem.

For the majority of appliances, with the exception of portable appliances such as laptops and mobile phones, consumers are generally not aware that the appliance utilises an external power supply. The external power supply is "bundled" with the end use appliance and consumers have no choice but to purchase the bundle. Consumers do not generally choose external power supplies; the appliance supplier selects the EPS, generally where cost, rather than energy efficiency, is the driving factor. There is little incentive for manufacturers to consider energy efficiency or life cycle costs after the appliance is sold. Consumers select appliances for their own specifications, rather than the performance of its power supply, (with the possible exception of an expectation that it will function with the supply voltage and frequency in the country or countries where it will be used).

Given that capital costs and energy efficiencies for external power supplies are not available to consumers (to even the most motivated), it is not possible for them to evaluate life cycle costs as part of the selection process. Whilst consumers continue to purchase in these market circumstances, there is little need for manufacturers, importers and suppliers to change.

In the case of appliances powered by external power supplies, there are a myriad of applications and within each application an extensive range of manufacturers and models to choose from. In many cases, it is unlikely that the appliance itself will be considered in its own right for energy efficiency programs. Addressing the performance of external power supplies will go some way to reducing the greenhouse gas emissions associated with these appliances.

The objective

The primary objective is to bring about a reduction in energy consumption and greenhouse gas emissions, from the use of specific types of external power supplies, to below the levels they are otherwise projected to reach under a business as usual scenario, through improving their energy efficiency and standby energy losses.

The proposal

Since the efficiency and standby energy losses of external power supplies is a major factor in the overall energy consumption of many products in the Office Equipment and Home Entertainment categories, initiatives to improve the performance of external power supplies are an important component of the Australian and New Zealand greenhouse gas reduction strategies. In terms of establishing and measuring performance criteria, it is likely to be considerably easier to target power supplies in general, rather than the product with which they are associated. This is particularly the case for computers, since each computer may be supplied or later modified in different configurations, with a range of variables influencing their energy consumption.

The proposed measure involves introducing mandatory MEPS for external power supply units, with nominal 230 Vac mains supply input and a single output at extra low voltage (ELV), either a.c. or d.c., and a maximum output of 250 W or 250 VA, from October 2008, that would stipulate in government legislation the minimum level of energy efficiency these products would need to meet in order to be sold on the Australian and New Zealand market. The proposal will either lead importers of EPS and/or devices including EPS to upgrade those EPS that currently do not meet these standards, substitute them with compliant product or remove them from sale.

Assessment

Two annual sales growth scenarios have been analysed:

- a conservative 5% each year for all external power supply wattage bands
- a higher sales growth scenario, particularly for higher wattage band external power supplies, as used with laptops and LCD monitors, based upon industry forecasts, estimated from Darnell's Global Forecast 2005 to 2010 chart, as follows:

Wattage band	Annual sales growth
< 5	5.9%
5 to 10	6.8%
11 to 20	8%
21 to 50	8%
51 plus	11.2%

<u>Australia</u>

The following table summarises the analyses for Australia for the period 2007 to 2025. The data presented is based upon Net Present Value calculations at a discount rate of 7.5%. This discount rate is preferred by the Office of Best Practice Review.

The summary is presented for two cases. The first table shows summary data valued at retail electricity prices and the second table shows the data valued at the avoidable cost of electricity (arguably a better measure of the true benefit to the national economy).

Summary data 2007 to 2025 7.5% Discount Rate – at retail electricity prices

	5% sales growth	High sales growth
Energy saved	8,536 GWh	11,459 GWh
CO2 – e saved	7.8 Mt	10.4 Mt
Total Benefit	A$ 485.9 Million	A$ 639.0 Million
Investment	A$ 205.9 Million	A$ 256.8 Million
Benefit cost ratio	2.36	2.49

Even at a higher discount rate of 10%, for the 5% and high sales growth rates, benefit cost ratios are positive at 2.15 and 2.26 respectively.

Summary data 2007 to 2025 7.5% Discount Rate – at the avoidable cost of electricity

	5% sales growth	High sales growth
Energy saved	8,536 GWh	11,459 GWh
CO2 – e saved	7.8 Mt	10.4 Mt
Total Benefit	A$ 367.7 Million	A$ 488.3 Million
Investment	A$ 205.9 Million	A$ 256.8 Million
Benefit cost ratio	1.79	1.90

New Zealand

The following table summarises the analyses for New Zealand for the period 2007 to 2025. The data presented is based upon Net Present Value calculations at a discount rate of 5% as set by the Energy Efficiency and Conservation Authority.

Summary data 2007 to 2025 5% Discount Rate at retail electricity prices

	5% sales growth	High sales growth
Energy saved	1,534 GWh	2,059 GWh
CO2 – e saved	1.07 Mt	1.44 Mt
Total Benefit	NZ$ 156.7 Million	NZ$ 274 Million
Investment	NZ$ 48.6Million	NZ$ 61.0 Million
Benefit cost ratio	3.2	3.4

At the individual application level, the mix of benefits and costs depends on current external power supply technology in use and usage patterns. The analyses indicate that, in most cases, consumers will benefit from the proposed regulation. New Zealand's benefit cost ratio differs from the Australian average due to the lower space cooling energy requirements in New Zealand and higher marginal electricity tariffs.

Other Options

When government and industry first came to debate options in 2003, options other than regulation were considered for achieving the objective including:

- voluntary efficiency standards;
- levies and emissions trading;
- a certification program;
- dis-endorsement labelling;
- mandatory product labelling.

Voluntary efficiency standards rely on equipment suppliers being effectively encouraged to meet certain minimum energy efficiency levels voluntarily, i.e. in the absence of regulation. As there are few commercial incentives for doing so, it is unlikely that suppliers would willingly make these changes without significant Government incentives. Stakeholder feedback was that "brand name" suppliers may participate, but others would not, thus affecting their competitiveness and encouraging the use of poorer performing products.

Levy options are not currently 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.

The Australian Government has announced that a domestic emissions trading system (ETS) will be implemented no later than 2012. In September 2007, the New Zealand Government announced an in-principle decision to use an Emissions Trading Scheme as its core price-based measure to reduce greenhouse gas emissions and enhance forest carbon sinks.

The Government proposes to implement the scheme from 2008, with various sectors phased in over the years to 2013. This could eventually lead to the full cost of greenhouse gas emissions impacts being reflected in energy prices, but it is unlikely that an ETS alone and the energy price rises that might flow from it in the future would quickly lead to consumers being concerned about the energy efficiency of small pieces of equipment such as external power supplies. Moreover, consumers would still lack information on the energy usage of the external power supplies even if they did become more concerned.

Certification is unlikely to succeed as the purchase of an external power supply is “incidental” to the primary product being purchased.

Dis-endorsement labelling has the potential to encourage consumers to purchase appliances that have higher total energy consumption, as the product may be an energy waster, even with an efficient power supply. Dis-endorsement labelling is also outside the scope of the international MOU on harmonizing testing and performance marking, which would make Australia and New Zealand a special case for these globally traded products.

Mandatory energy labelling requires the application and display of a comparative energy performance label on products and packaging. As with dis-endorsement labelling, it is likely to cause confusion to consumers, as it is the power supply, not necessarily the product, that is the energy waster. The result is that we conclude that the impact of the other options for Australia and New Zealand would be negligible in comparison to the BAU case.

In 2004 the Australian Greenhouse Office agreed to work with the US EPA ENERGY STAR Program, California Electricity Commission and China Certification Center for Energy Conservation Products (CECP) to agree upon harmonised test methods and energy performance marking of external power supplies. All these government agencies agreed to work towards common testing methods, product markings to declare efficiency levels and eventually aligned energy performance standards. This RIS contains a proposal for Australia and New Zealand that falls within that broad agreement.

Stakeholder proposals and the E3 response to modify the draft regulatory proposals

Recent submissions advocating change to the initial Consultation RIS fell into five general categories:

- Delay - The need for more time for suppliers to source compliant product before the regulation commences
- Technical – As identified in the published draft RIS, some stakeholders reiterated that some AC-AC EPS could not meet both no load and energy efficiency requirements.
- Efficiency declaration - A call to avoid imposing the costs of multiple input voltage testing on Australasian suppliers.
- Registration - A call to use an existing company registration for EMC rather than develop a new scheme that in effect requires every EPS marketed by a company to be registered with state, territory and New Zealand efficiency agencies.
- Family of models definition - Concerns that this potentially has big cost implications for testing and was raised as an issue. An amendment to the standard is proposed to provide a clearer definition of “family of models”.

Some stakeholders requested more time before the commencement of the regulation than 1 April 2008. Two arguments were used by advocates seeking a delay to the regulatory commencement until not earlier than in April 2009 (18 months after the original target of October 2007 and 12 months later than proposed in the first Consultation RIS). The more compelling came from suppliers stating they were having difficulty finding original equipment manufacturers who could supply complying EPS. Several trade associations also argued that a commencement date that was less than 12 months notice gave too short a formal notice period to suppliers of the proposed regulatory change.

The Equipment Energy Efficiency committee accepts the merit of both these arguments. It also believes that it should protect the commercial investments made by those companies who have entered into binding supply contracts based on the original proposed commencement date and in keeping faith with other governments similarly working to improve EPS efficiency.

This RIS proposes, as a compromise, a commencement date of 1 October 2008. This is 15 months after regulation commenced in California while responding to calls from companies unsure that complying product will be available to them and provides an additional six months suppliers to source compliant product. The US ENERGY STAR web site lists 1,344 performance mark III or IV EPS registered for use at 230 Vac, 50 Hz, with output power ranging from 1.13W to 220 Watts and there are a number of suppliers already wanting to register compliant product in Australia/ New Zealand. The E3 Committee has committed to conduct a market survey prior to the commencement of regulation to measure the availability of compliant product and present the results at a stakeholder forum in the first half of 2008.

Other stakeholders highlighted the difficulty of some AC-AC EPS simultaneously meeting no-load and efficiency MEPS. Regulators agreed that the requirement for AC-AC meeting the no-load criteria will be removed from the regulation. This has negligible impact on emissions and economic calculations as the bulk of AC-AC powered products do not operate in a no-load state. It also removes the technical and supply difficulties associated with meeting the original requirement.

Some suppliers pushed that a requirement for testing at 115 Vac for the 230 Vac Australian and New Zealand markets was an unwarranted cost. Regulators originally requested suppliers to declare EPS efficiency for both systems as a compliance tool. The declaration would have facilitated comparisons between North American and Australasian regulatory schemes. There are however additional costs to industry for obtaining such test data and the Californian scheme does not require a declaration at 220-240 Vac efficiency. In response, E3 will recommend amending the standard to remove testing and marking requirement for 115 Vac. Instructions on how to test for 115 Vac will remain in the standard for those who want to export these products from Australia and New Zealand to 115 Vac markets. Exporters must note that other jurisdictions may require that AC-AC external power supplies meet the no load requirements that apply to AC-DC external power supplies.

Performance marking will be mandatory. The performance mark, within the standard, will be amended to allow compliance marking at 230 Vac only.

A further argument presented by stakeholders related to developing an effective registration scheme. While all existing products regulated for MEPS require product regulation, the EPS industry advocated a different model to lower registration costs to them and, they claimed, enhance the existing scheme by reducing existing delays in registering products. They advocated E3 use the Commonwealth scheme operated by the Australian Communications and Media Authority (ACMA) where all companies marketing EPS are already “registered”. The E3 committee agreed to explore this option with ACMA and to examine an equivalent registration system if the ACMA scheme cannot be accessed. Results of discussions held with ACMA regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or ‘families’ of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.

Stakeholders also questioned the current definition of family of models in the standard. It is proposed to amend the standard to utilise the US ENERGY STAR definition of family of models as it provides greater clarity, and was developed in response to specifications that have been in place longer than the Australian and New Zealand experience. It is also proposed to adopt the

US ENERGY STAR testing and performance level requirements for “family of model” external power supplies which will reduce the amount of time required to test these models. The time saving will depend upon the number of DC output voltages that the EPS is capable of supplying.

Recommendations (draft)

It is recommended that:

- States, Territories and New Zealand implement mandatory minimum energy performance standards for external power supplies utilising the joint Australian and New Zealand Standard AS/NZS 4665 and the proposed amendments contained within this RIS
- 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 external power supplies to the schedule of products for which minimum energy performance standards are required.
- The regulations refer to Australian and New Zealand Standard AS/NZS 4665.1 - Performance of External Power Supplies – establishing the Test Method by which EPS are measured for energy efficiency purposes
- The regulations refer to Australian and New Zealand Standard AS/NZS 4665.1 - Performance of External Power Supplies – establishing the Energy Performance Mark as a mandatory compliance marking requirement for EPS sold in our market.
- The regulations refer to Australian and New Zealand Standard AS/NZS4665.2 – Performance of External Power Supplies – establishing the minimum energy performance standards to apply to all types of EPS
- The amendments take effect not earlier than 1 October 2008.
- State, Territory and the New Zealand governments should require registration of external power supplies, so invoking the Australian and New Zealand Standard AS/NZS 4665.2. The registration system should be for individual products or ‘families’ of products. Note, a working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.
- Governments agree to review EPS MEPS and agree not to impose more stringent MEPS any earlier than October 2011.

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GLOSSARY AND ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACMA	Australian Communications and Media Authority
ADL	Arthur D. Little
AGO	Australian Greenhouse Office
AS/NZS	Australian Standards and New Zealand Standards
BAU	Business as usual
CDV	Committee Draft for Vote
CEC	California Energy Commission
CECP	China Certification Centre for Energy Conservation Projects
CESA	Consumer Electronics Suppliers Association (Australia)
CO_2-e	Carbon dioxide equivalent units
COAG	Council of Australian Governments
COP	Coefficient Of Performance
DEW	Department of Environment and Water Resources
DoE	Department of Energy (USA)
EC	European Commission
EECA	Energy Efficiency and Conservation Authority – New Zealand
E3	Equipment Energy Efficiency Program (formerly NAEEEP)
EPA	Environment Protection Agency (USA)
EPS	External Power Supply
EU	European Union
E3 Committee	Equipment Energy Efficiency Committee (formerly NAEEEC)
GATT	General Agreement on Tariffs and Trade Agreement
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)
NAEEEP	National Appliance Equipment and Energy Efficiency Program (now (E3)
NPV	Net Present Value
NRDC	Natural Resources Defense Council
NZ	New Zealand
PI	Power Integrations
PSMA	Power Supply Manufacturers Association (USA)
PSW	Power Supply Workshop
RIS	Regulatory Impact Statement
SME	Small to Medium Enterprise – a business with 1 – 19 people
SMPS	Switch Mode Power Supply
SNZ	Standards New Zealand
TTMRA	Trans Tasman Mutual Recognition Agreement

1 SCOPE

1.1 Revised Consultation Regulatory Impact Statement

This revised Consultation Regulatory Impact Statement (RIS) has been prepared to demonstrate the benefits of regulating mandatory energy performance standards for this type of energy-using equipment.

A RIS is required whenever new or more stringent mandatory 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 emissions savings made over the lifetime of the product.

This document is a second Consultation RIS prepared to justify regulation. It responds to stakeholder submissions and meetings pertaining to the first Consultation RIS, document 2007/02 (available at http://www.energyrating.gov.au/library/details200702-ris-eps.html). The submissions and comments which caused this revision are set out in Section 6.

This document repeats much of the information contained in the initial consultation draft though it updates material with later data and provides a possible compromise to calls from some stakeholders who seek a delay in the regulatory proposals. This format was chosen to enable interested stakeholders to have a single, self-contained document rather than expecting readers to review the initial and this second Consultation RIS. This format should assist in understanding the compromises offered in this document to the various arguments made by individuals and companies in response to the first proposal.

1.2 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.

Australia's Response to Climate Change

The development of Australia's climate change policies has followed a consistent policy direction for more than 15 years or since the *National Greenhouse Response Strategy* was released producing bi-partisan support for Australia-wide energy efficiency measures. APPENDIX 2 records some of the more important stages in that development.

Most recently, in July 2007, the Prime Minister released *Australia's Climate Change Policy – our economy, our environment, our future*. 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 greenhouse gas 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 greenhouse gas emissions. They can also deliver a net financial gain for firms and consumers. The scale of these savings, both in emissions and outlays, is often underestimated. For example, in June 2007 the IEA published energy efficiency recommendations which, if adopted globally by 2030, would save 5,700 million tonnes of CO2 – the equivalent of the United States total emissions in 2004. (IEA, Energy Efficiency Policy Recommendations to the G8 2007 Summit, Heiligendamm, June 2007, p 2) … The MEPS programme 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)*

New Zealand's Response to Climate

New Zealand climate change policies have a similar history of long-term support by government. New Zealand ratified the Kyoto Protocol in 2002, and has committed to reducing its greenhouse gas 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).

In October 2007 the New Zealand Minister of Energy released the New Zealand Energy Efficiency and Conservation Strategy (NZEECS), which proposes ways to promote energy efficiency, energy conservation and the use of renewable sources of energy. It includes measures to reduce electricity demand, address energy use in transport, buildings and industry, and promote greater consideration of sustainable energy in the development of land, settlements and energy production. The strategy is available at http://www.eeca.govt.nz/eeca-library/eeca-reports/neecs/repor t/nzeecs-07.pdf

The New Zealand Energy Efficiency and Conservation Strategy (NZEECS) is a key part of the government's response to meeting its energy, climate change, sustainability and economic transformation goals. It has been written as a companion document to, and will give effect to a number of the objectives set out in, the New Zealand Energy Strategy (NZES).

The introduction of minimum energy performance standards and labelling for household appliances continues to form part of New Zealand's climate change strategy, as part of implementing the National Energy Efficiency and Conservation Strategy (NZEECS).

The MCE Moves beyond "No Regrets" Energy Efficiency Measures

In October 2006, the Ministerial Council on Energy (MCE) of Australian federal, state and territory and New Zealand government energy ministers 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.

IEA Sees Improving Energy Efficiency as Top Priority

Australian and New Zealand policy is in accord with international endeavours in this field.

> *"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.

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.

Equipment Energy Efficiency Program

In Australia, regulatory intervention in the market for energy-using products was first introduced with mandatory appliance energy labelling by the NSW and Victorian Governments in 1986. Between 1986 and 1999 most state and territory governments introduced legislation to make energy labelling mandatory, and agreed to co-ordinate labelling and minimum energy performance standards (MEPS) decision making through the MCE. New Zealand has participated in monitoring the Australian program for more than a decade and has been a partner in decision-making for several years. Regulatory interventions have consistently met the requirements to demonstrate the actual benefit increasing energy efficiency standards, which address market failure relating to life-time energy cost information for appliances and equipment.

The proposed regulation is an element of the Equipment Energy Efficiency Program (E3), formerly known as National Appliance and Equipment Energy Efficiency Program (NAEEEP). E3 embraces a wide range of measures aimed at increasing the energy efficiency of products used in the residential, commercial and manufacturing sectors in Australia and New Zealand. E3 is an initiative of the MCE comprising 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 and is ultimately responsible to the MCE.
- 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 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.

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 resulting work plans for possible regulation but external power supplies were specifically nominated for regulatory impact assessment.

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 greenhouse gas 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) and by holding meetings. Regulation of external power supplies have been a topic of discussion with key industry leaders for many years.

1.3 Policies and Measures related to External Power Supplies

Until 2003, NAEEEC had not focused on power supplies as a separate product category, but had been developing policies applying to end-use appliances, including their power supplies. These policies are outlined below.

1.3.1 ENERGY STAR

Australia is an international ENERGY STAR partner for some office and home entertainment equipment, specifically:

- Computers and 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 latest criteria for monitors and imaging technologies include criteria for active mode.

1.3.2 Standby Power Plan

In 2003 and 2004, NAEEEC published a series of Standby Profiles, indicating the Government's plans for a range of appliances, some of which are packaged with external power supplies. 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.

Also in 2003, and in order 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). It is also planned to add separate parts to the standard with test procedures specific to individual products.

The rationale for targeting external power supplies is as follows, extracted from the NAEEEC report MEA 2004.

"Since the efficiency of power supplies is a major factor in the overall energy consumption of many products in the Office Equipment and Home Entertainment categories, initiatives to improve the performance of power supplies are an important component of a greenhouse strategy. In terms of establishing and measuring performance criteria, it is likely to be considerably easier to target power supplies in general, rather than the appliance with which they are associated. This is particularly the case for computers, since each computer may be retailed in different configurations, with a range of variables influencing their energy consumption.

In the development of Australian greenhouse gas reduction programs, power supplies themselves have not been considered a high priority; however with the growing international focus on power supplies, there is the opportunity to establish harmonised standards amongst the major trading countries. From the end of 2003, Australia has therefore pushed for the adoption of internationally accepted test methods for power supplies.

1.4 External Power Supplies

Australian and international studies have identified that external power supplies are candidate products for intervention to address market failure. The results of these studies are documented in the NAEEC report "Analysis of Potential for Minimum Energy Performance Standards – External Power Supplies" [MEA 2004] and are referenced within this report where applicable.

This RIS studies the impact of proposed mandatory MEPS for external power supply units, with a nominal 230 Va.c. mains supply input and a single output at extra low voltage (ELV), either a.c. or d.c., and a maximum output of 250 W or 250 VA.

The energy consumed by an external power supply is defined as the energy lost by the power supply whilst converting mains electricity to the voltage and current required by the appliance being powered and the no load energy consumed by the power supply when the appliance is off or unplugged from the external power supply.

Whilst battery chargers are external power supplies, they have additional controls and functions over and above that of an external power supply and operation and energy consumption will be different to a device that is "simply" an external power supply. Due to their different operating characteristics, battery chargers with the batteries or battery pack attached directly to the EPS and EPS with a battery chemistry or type selector switch and a 'state of charge' indicator light or meter are excluded from this Consultation RIS.

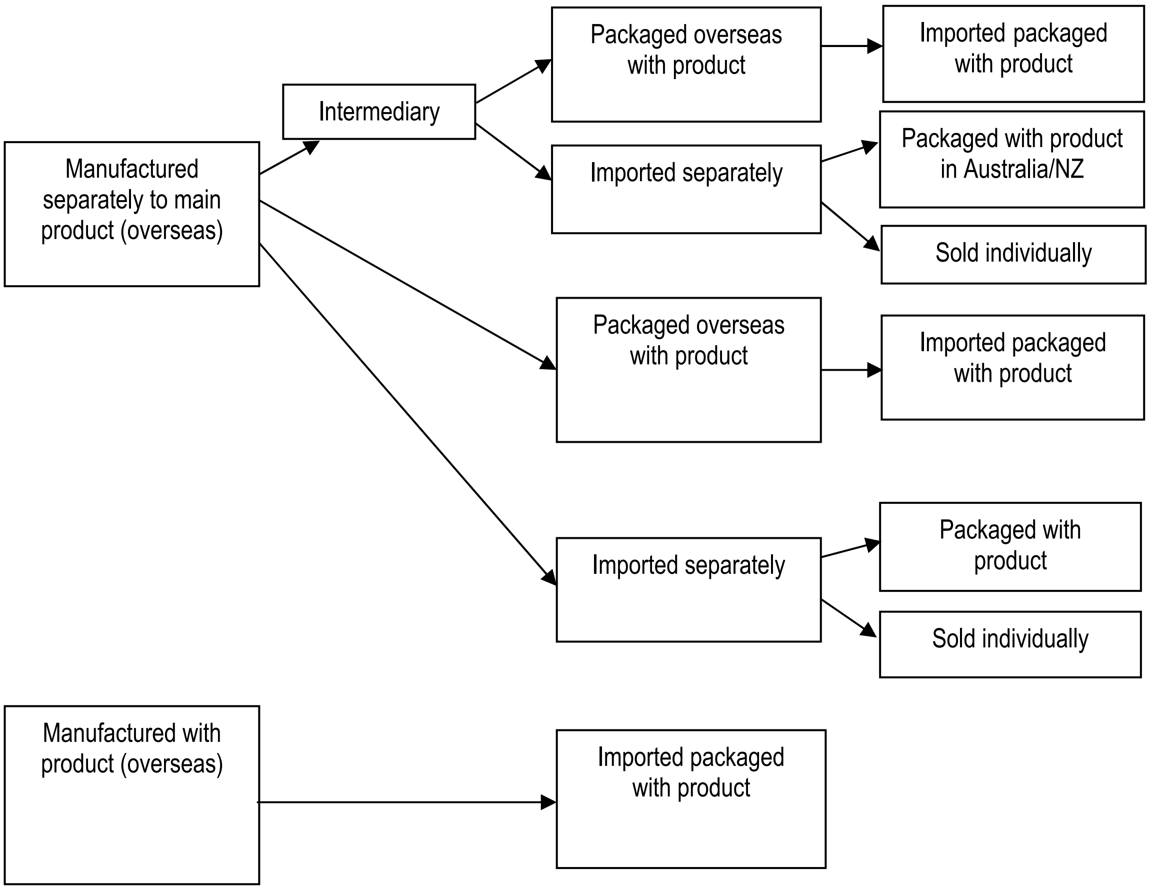
1.5 The External Power Supply Market

The vast majority of external power supplies sold in Australia and New Zealand are manufactured overseas, however small quantities are manufactured in Australia and New Zealand, usually for special purposes or to fulfil orders for quantities too small to warrant an overseas order. Generally however, the cost of manufacturing external power supplies locally is prohibitive (up to four times as much as in China). [MEA 2004]

Since Australian and New Zealand approval safety standards are stringent and the Australian and New Zealand market is relatively small, there are only a limited number of overseas factories that manufacture external power supplies specifically for the Australian and New Zealand market. Consequently the majority of purchasers buy standard external power supplies. While the majority of external power supplies are made in China, some are manufactured in other south-east Asian countries such as Taiwan, Korea, Malaysia and Indonesia.

Companies either source external power supplies directly from the overseas factories or via intermediary companies. Intermediary companies can either arrange for the external power supplies to be packaged with appliances overseas or else they can be imported separately into Australia and then sold for packaging with appliances in Australia or New Zealand. See Figure 1 below for a diagram of the supply chain in Australia and New Zealand.

Figure 1 Chain of supply for external power supplies



It should be noted that the industry includes other participants including power supply designers, application designers and original design manufacturers.

Industry sources suggest that there are at least 6.4 million external power supplies imported into Australia each year. The New Zealand market is analysed in Section 8. Over 3.8 million of these alone are imported with mobile phones[1], while the other major applications include telecommunications equipment (cordless phones, modems, answering machines), laptop computers, alarm systems, portable tools, rechargeable toys and for individual sale (spare parts or special purposes).

Given the myriad of appliances requiring external power supplies and the difficulty in tracing external power supplies that are packaged with appliances from overseas, the actual number imported each year is likely to be much higher. One large importer of external power supplies suggests that there is likely to be between 10-15 million units sold in Australia per year (either locally made or imported).

[1] All mobile phones are manufactured overseas. Mobile phone imports have averaged 3.8 million over the last three years, and every phone imported has a charger (external power supply) in the box. This figure is probably an underestimate because some phone users buy extra power supplies as accessories for their phones.

Table 1 shows the estimated Australia wide ownership by application in 2004, split into residential and non- residential stock estimates based upon data from MEA 2004

Table 1 Estimated ownership by application and sector

Application	Estimated Residential stock	Estimated non-Residential Stock	Sales 2004	Total Stock 2004
Laptops	170,000	1,530,000	590,000	1,700,000
Mobile Phones	7,800,000	5,200,000	3,800,000	13,000,000
Computer Monitors (LCD)	18,000	162,000	125,000	180,000
Modems Residential	3,900,000		650,000	3,900,000
Modems Business		2,500,000	500,000	2,500,000
Printers	2,740,500	304,500	525,000	3,045,000
Scanner & MFDs	926,100	102,900	184,766	1,029,000
Battery Chargers	3,562,500	187,500	937,500	3,750,000
Home Audio	3,570,000		425,000	3,570,000
Answering Machines	2,850,000	150,000	500,000	3,000,000
Cordless Phones	3,562,500	187,500	625,000	3,750,000
Games consoles	1,875,000		312,500	1,875,000
Hospital		729,000	182,250	729,000
Cash registers		100,000	25,000	100,000
Barcode and magnetic strip readers,		150,000	37,500	150,000
Networking	130,000	1,170,000	260,000	1,300,000
Sundry Other	5,400,000	600,000	1,200,000	6,000,000
Total	36,504,60000	13,073,400	10,879,516	49,578,000

2 THE PROBLEM

Climate change is a serious global challenge, requiring an effective global response (IPCC 2007).

The United Nations Framework Convention on Climate Change (UNFCCC) was agreed in 1992 and came into force in 1994. It places much of the responsibility for taking action to limit greenhouse gas emissions on the developed countries, which are collectively referred to as Annex 1 countries, including Australia and New Zealand. Annex 1 countries are required to report each year on the total quantity of their greenhouse gas emissions and on the actions they are taking to limit those emissions.

The Kyoto Protocol to the UNFCCC was agreed in December 1997, and came into force in 2005. The Australian Government has decided not to ratify the Protocol as it does not require all countries to act – only developed countries were required to reduce their emissions. Nevertheless, the Australian Government committed to meet its Kyoto target of 108% of 1990 emissions, on average, over 2008 to 2012.

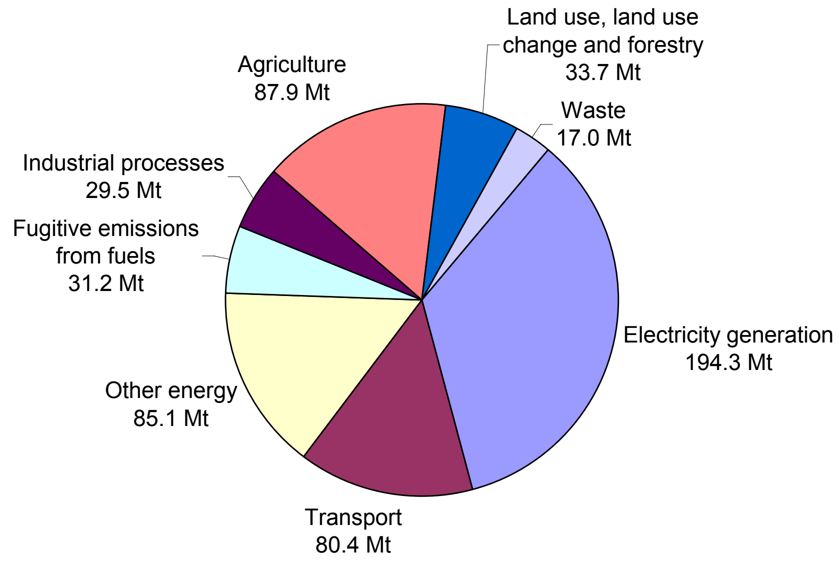
New Zealand ratified the Kyoto Protocol on 19 December 2002, and has committed to reducing its greenhouse gas emissions back to 1990 levels, on average, over 2008 to 2012 or to take responsibility for any emissions above this level if it cannot meet this target.

The introduction of minimum energy performance standards for inefficient energy-consuming equipment continues to form part of Australia's and New Zealand's climate change strategies as described in Section 1.2.

2.1 Energy and Greenhouse Gas Emissions

Figure 2 shows estimated Australian greenhouse gas emissions by sector for 2005. The estimated total greenhouse gas emissions for 2005 are 559.1 million tonnes of CO2-e (NGGI 2005). The electricity generation sector represents the greatest contribution to Australia's greenhouse gas emissions, as illustrated in Figure 2.

Figure 2 Australian Greenhouse Gas Emissions by Sector 2005 Mt $C0_2$-e [NGGI 2005]



The largest contribution to stationary energy emissions comes from the generation of electricity (69.5%). 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 greenhouse gas reduction strategy.

In the case of appliances powered by external power supplies, there are a myriad of applications and within each application an extensive range of manufacturers and models to choose from. In many cases, it is unlikely that the appliance itself will be considered in its own right for energy efficiency programs. Addressing the performance of external power supplies will go some way to reducing the greenhouse gas emissions associated with these appliances.

2.2 Contribution of External Power Supplies to Energy Use and Emissions

The energy consumption of external power supplies can be broadly categorised into two modes:

- Active mode - energy used by the appliance and energy lost as heat in the conversion process.
- No load mode, where the appliance is plugged in to mains electricity supply but switched off or unattached from the appliance being powered.

Across the entire product sector, it is estimated that no load mode accounts for some 16% of all energy consumption [MEA 2004] and conversion efficiency 43% of wasted energy (no load plus heat loss).

Approximately 41% of wasted energy due to external power supplies arises from low wattage (up to 10 Watts) applications. These applications use approximately 64% of all external power supplies manufactured and are typified by low efficiency, low cost external power supplies. Higher efficiency power supplies are available, however low uptake inhibits economies of scale.

There are also *indirect* energy losses and gains associated with the heat from external power supplies. 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 reduces the heating energy load.

From APPENDIX 5 it is estimated that annual greenhouse gas emissions, in 2004, resulting from wasted energy and indirect energy from products powered by external power supplies was approximately 885 kt CO_2-e and is forecast to rise in subsequent years due to the increased uptake of consumer electronics, and the growing demand for laptops and larger LCD monitors [PSMA 2004].

This waste energy due to external power supplies represents 0.45% of electricity generation.

The data from APPENDIX 5 has been combined with household data (Population and Household Numbers) to estimate wasted energy consumption and greenhouse gas emissions by State and sector. It is assumed that the quantity of “non residential” external power supplies is proportional to the number of households in each State.

Table 2 shows the estimated breakdown of wasted energy and greenhouse gas emissions by State and sector and includes energy gains and losses by State, based upon estimates of appliances used and usage patterns in air-conditioned spaces, as detailed in APPENDIX 14.

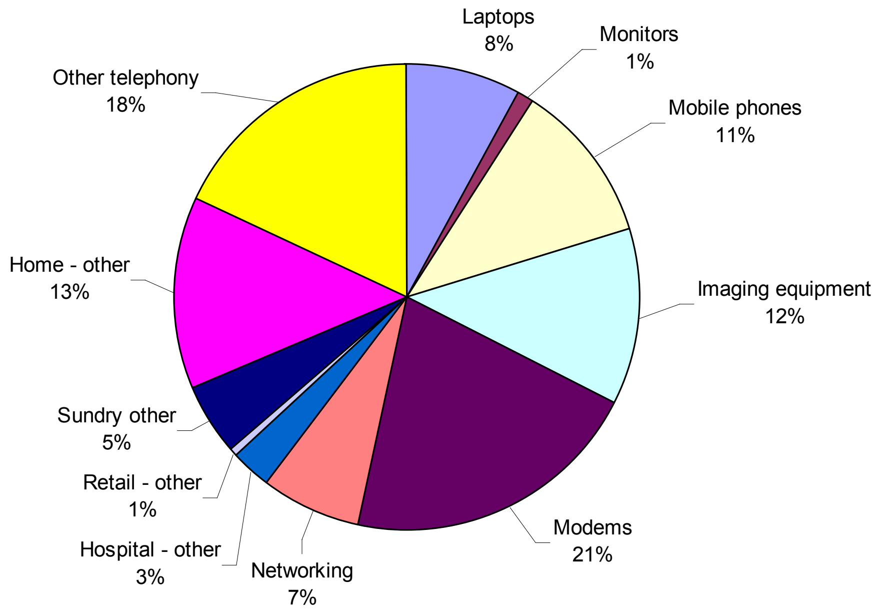
Table 2 Wasted energy and related greenhouse gas emissions by State - 2004

State	Residential GWh pa	Non Residential GWh pa	Total GWh pa	GHG Factor	Residential kt CO_2-e	Non Residential kt CO2-e	Total kt CO_2-e
NSW	163.5	118.3	281.9	1.027	167.9	121.5	289.5
VIC	120.3	80.2	200.5	1.128	135.7	90.5	226.2
QLD	95.3	70.5	165.8	0.991	94.4	69.9	164.3
SA	40.1	28.2	68.3	1.167	46.8	33.0	79.8
WA	50.5	36.7	87.3	1.029	52.0	37.8	89.8
NT	12.4	7.5	19.9	0.757	9.4	5.7	15.1
Tas	4.7	3.5	8.2	0.769	3.6	2.7	6.3
ACT	8.2	5.4	13.6	1.027	8.4	5.5	13.9
Total	495.0	350.4	845.4		518.2	366.5	884.8

Within the non-residential sector waste energy of 350.4 GWh, indirect energy is estimated to be 57 GWh.

Figure 3 shows the estimated breakdown of external power supply direct and indirect wasted energy, by application, in Australia.

Figure 3 Standby and Conversion Loss Energy Consumption by End-Use Appliance



Within this waste energy, sub 10 Watt external power supplies account for 41% of total wasted energy. Table 3 shows the contribution of these external power supplies.

Table 3 Percentage of total wasted energy for sub 10 Watt appliances

Appliance	Percentage of total waste energy
Sundry Other	4.8%
Barcode and magnetic strip readers	0.2%
Mobile Phones	11.3%
Cordless Phones	9.9%
Answering Machines	8.3%
Sundry Battery Chargers	2.6%
Games consoles	3.8%
Networking	4.8%

2.3 External Power Supply Technology and Energy Efficiency

2.3.1 External Power Supply Technology

External power supplies are electrical devices that convert mains AC voltage to lower voltage AC or DC to enable low voltage appliances to operate from a mains power source.

The majority of external power supplies are used with small appliances, such as portable or rechargeable devices including mobile phones, cordless phones, game machines, digital cameras etc. They are manufactured in a variety of sizes depending upon the required power rating and the conversion technology employed. Typically, they are a “black box” adaptor that plugs directly into a wall mains power outlet, or for higher rated power outputs, are contained in a box with an in-line power cord. Increasingly, office equipment suppliers are utilising external power supplies rather than internal power supplies, as they allow a standard appliance to be manufactured for the world market, with the power supply being selected for the voltage and frequency of the destination market. [PSW 2002].

The simplest and most widely used type of power supply is a linear power supply. A typical linear power supply utilises a small step-down magnetic transformer to reduce voltage, and often a diode rectifier and filter capacitor to convert AC to DC. It generally has one or more fixed output voltages. They are usually manufactured to connect to a single mains voltage and frequency (e.g. 230V, 50Hz in Australia). In general, they are bulky relative to their power rating, cheap to manufacture and relatively inefficient.

The other form of power supply is the ‘switch mode’ or ‘switching’ type. Here the mains AC is rectified directly to produce high-voltage DC, which is then used to power an efficient high frequency DC-DC converter and uses a smaller and lighter step down transformer than used in linear power supplies. Because of its higher efficiency, this type of power supply tends to be considerably smaller and lighter than linear types. This type of circuit is now available as an integrated circuit for lower power applications. [PI 2004]

Because switch mode power supplies are smaller and produce less heat than linear power supplies, they are more often used internally in appliances. Linear technology is more commonly used in external power supplies but switch mode types are common for higher power applications (such as laptops and LCD monitors). Switch mode types have the advantage of being able to accept a wide range of input voltages and frequencies (e.g. typically 100V to 250V and 50 or 60 Hz) and so are well suited for supply with consumer appliances that are traded globally. Typically higher power switch mode power supplies comprise a “box” with a hard wired AC or DC output lead with AC or DC plug. The AC cable plugs into the unit to allow suppliers to use market specific AC plugs, whilst retaining a standard power supply.

Some appliances, such as household burglar alarms, require low voltage AC (rather than DC) power which is typically supplied by a linear power supply comprising a small step-down transformer without DC rectification.

Many battery chargers use another type of power supply, which is similar to a regulated DC adaptor. They also have additional circuitry to vary the output current depending on the terminal voltage of the battery being charged. Battery chargers may be either linear or switch mode in design. Excluded from the proposed MEPS are battery chargers with the batteries or battery pack attached directly to the EPS or if the EPS has a battery chemistry or type selector switch and a ‘state of charge’ indicator light or meter. Additional information on technology is contained in APPENDIX 3

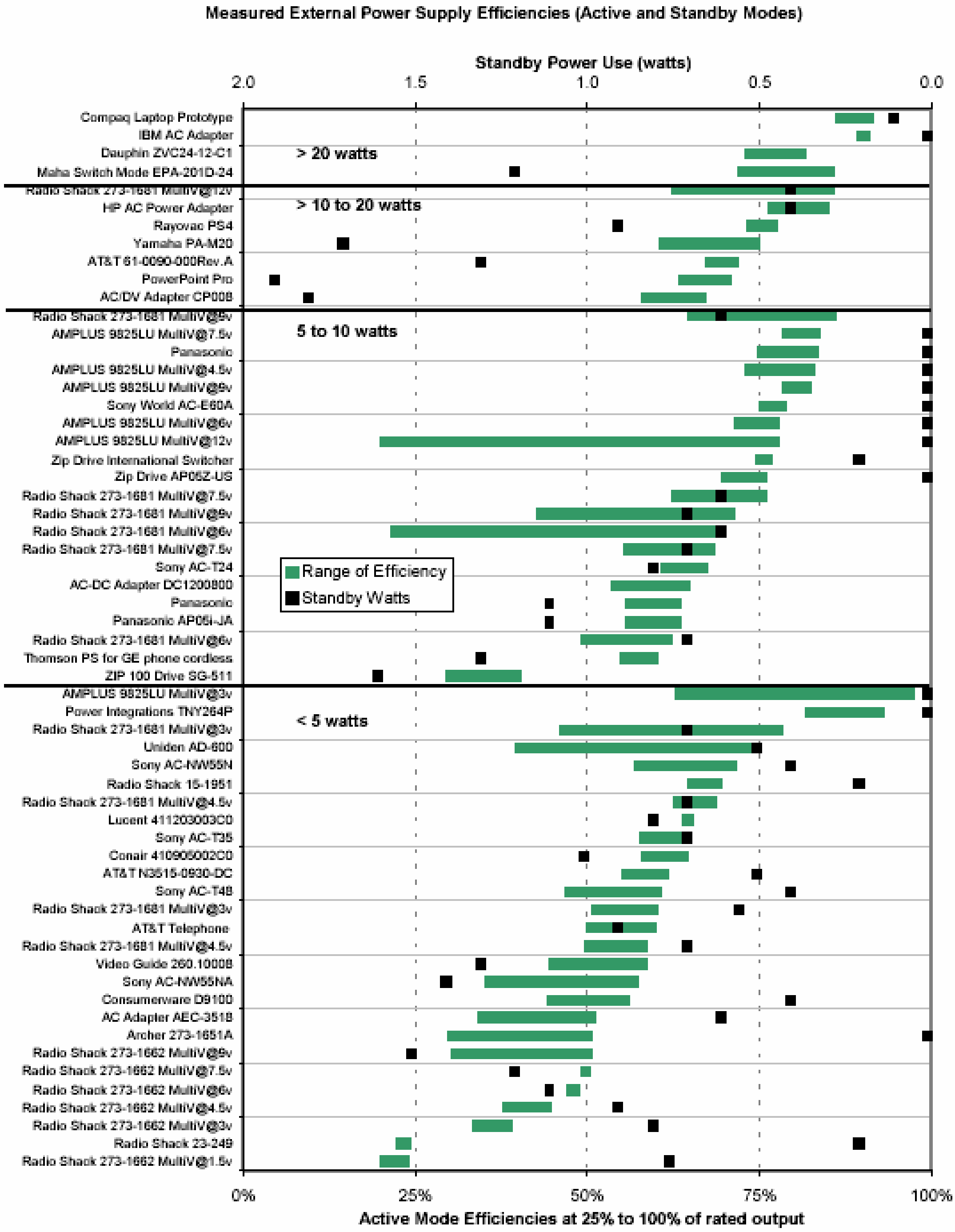
2.3.2 Energy Efficiency Levels

Figure 4 shows the measured performance of a range of external power supplies. The no-load power consumption is plotted in black dots, while the green bars indicate the efficiency at 25%, 50%, 75%, and 100% of rated load (hence presented as a range) [NRDC 2002].

It is noteworthy that active mode efficiency and no-load power use are fairly independent of each other, indicating that it is possible to design for one objective without achieving the other.

The typical efficiency range of linear power supplies in active mode is from 25% to 60%, while switch mode power supplies range in operating efficiency from 50 to 90%. [MEA 2004]

Figure 4 External Power Supply Efficiencies (USA)

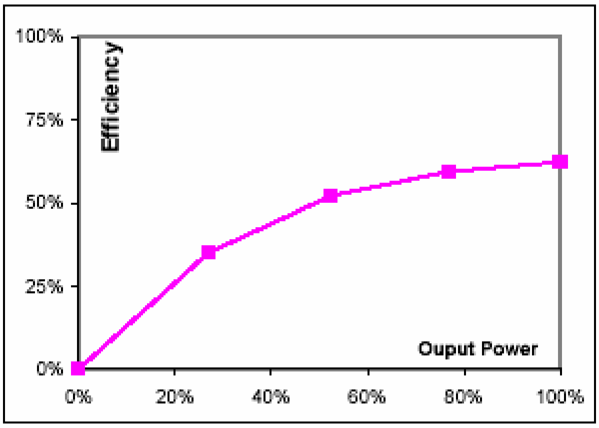


As demonstrated in Figure 4, the efficiency of most power supplies varies as loading increases. Most power supplies show higher efficiencies with more load, and in some appliances this characteristic is very pronounced (see

Figure 5). [MEA 2004]

The range of efficiency test results in Figure 4 for each model were measured at 25%, 50%, 75% and 100% of rated loads. Hence, in order to gain an indication of the true performance of a power supply, it is important that they are tested under a range of loading conditions.

Figure 5: Active Efficiency of Tested Power Supply (Australian)



This issue is significant since many end-use devices spend a considerable amount of time under part load conditions. For example, a laptop computer in standby mode may be loading the power supply at only 5% - 10% of its capacity. Even when in use, a laptop power supply may operate at 50% loading or less. Tests on one of the authors' laptop yielded the results shown in Table 4.

Table 4 Laptop power in various operating modes

Laptop Mode	AC Power	Percentage of DC EPS Rating
Active	47 – 55 W	72 – 85 %
Monitor off	20.2 W	31 %
Hard drive Off	11.6 W	18 %
Standby	1.6 W	2.5 %
Off/hibernate	0.8 W	1.2 %

2.3.3 External Power Supply Testing

In 2004 the Australian Greenhouse Office entered into a Memorandum of Understanding with the US EPA ENERGY STAR Program, California Electricity Commission and China Certification Center for Energy Conservation Products (CECP) to agree upon harmonised test methods and energy performance marking of external power supplies.

Utilising these harmonised methods and markings, Australian Standards published AS/NZS 4665.1 in November 2005 detailing the test method for external power supplies and AS/NZS 4665.2 performance requirements for external power supply efficiency and standby energy consumption. The standard will be amended to remove the requirement for AC-AC EPS to meet the no-load conditions.

Again based upon international harmonization, AS/NZ 62301 provides the methodology for testing standby energy consumption of products, which also applies to products powered by external power supplies.

2.4 Assessment of Market Deficiencies and Failures

For the majority of appliances, with the exception of portable appliances such as laptops and mobile phones, consumers are generally not aware that the appliance utilises an external power supply. The external power supply is “bundled” with the end use appliance by the manufacturer/supplier and consumers have no choice but to purchase the bundle. External power supply selection is made by the appliance supplier, where cost, rather than energy efficiency, is the driving factor. There is no incentive for manufacturers to consider energy efficiency or life cycle costs after the appliance is sold. Consumers select appliances for their own specifications, rather than the performance of its power supply, with the exception that it will function with the supply voltage and frequency in the country or countries where it will be used.

Given that capital costs and energy efficiencies for external power supplies are not available to consumers, it is not possible for them to evaluate life cycle costs as part of the selection process. Whilst consumers continue to purchase appliances as they are, there is no need for manufacturers, importers and suppliers to change the offer.

For the majority of products, with the exception of portable appliances, consumers are not aware that an appliance is powered via an external power supply. In most cases, it is not identifiable that the appliance is powered via an external power supply. During the preparation of this Consultation RIS, extensive research was carried out via web searches on suppliers and manufacturers web sites for brochures and technical specifications. This revealed that for many appliances, it was difficult to identify that an appliance was powered by an external power supply. In terms of availability of data for end consumers, the review for a range of products on Australian and international web sites showed technical information is generally limited to the supply voltage and frequency range only for the product package.

In the portable appliance sector of the market, such as laptop computers and mobile phones, the drivers are quite different. Consumer needs for low weight, compact size and the ability to use it in a wide range of supply voltages and frequencies around the world, forces the use of lighter switch mode power supplies. Typically these are higher cost appliances, however in the case of mobile phones, where external power supplies can be a more significant percentage of total price for lower option phones, consumer demands and phone supplier initiatives have produced the required economies of scale for the introduction of more efficient switch mode power supplies. Again, there is no incentive for manufacturers with respect to energy efficiency or life cycle costs after the appliance is sold, so in the main the level of energy efficiency is lower and standby energy consumption of these products is higher than the economically optimal level.

Whilst dating from 2002, a US power supply workshop [PSW 2002], including internal power supplies, provides relevant information on deficiencies and drivers from three manufacturer panellists from the office equipment and consumer product sectors.

- Energy efficiency is not on the top of the list when purchasing power supplies.
- Cost is the number one priority when purchasing power supplies for their product.
- Other factors are safety, size, reliability and availability.
- Compliance with ENERGY STAR and temperature rise influenced power supply decisions.
- Total cost considerations are from the supplier’s viewpoint, not the consumer’s.
- At that stage, efficient power supplies were not as readily available as desired/required.
- The challenge is cost.
- Reducing laptop size and weight is driving the need for more efficient and hence lighter and smaller external power supplies in the laptop sector.

3 OBJECTIVES OF THE REGULATION

3.1 Objectives

The objective is to bring about reductions in Australia's greenhouse gas 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. The energy performance improvements of external power supplies will also provide reductions in greenhouse gas emissions for appliances that are unlikely to be the subject of energy efficiency programs in the foreseeable future.

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

Manufacturers, suppliers and importers require uniform (harmonised) test methods and performance rating for these globally traded products. Via a Memorandum of Understanding between the US, China, the European Union and Australia, an international test method and standard performance markings have been developed, thus providing clear and comprehensive test methods and markings that are internationally recognised.

4 PROPOSED REGULATION AND ALTERNATIVES

4.1 Status Quo (BAU)

The section outlines the status quo position which is used as the base case for comparative analysis with the regulatory and non-regulatory options in Section 5.

Total wasted energy consumption, direct and indirect, from external power supplies for 2006 is estimated to be approximately 960 GWh, equivalent to annual greenhouse emissions of 988 kt CO_2-e.

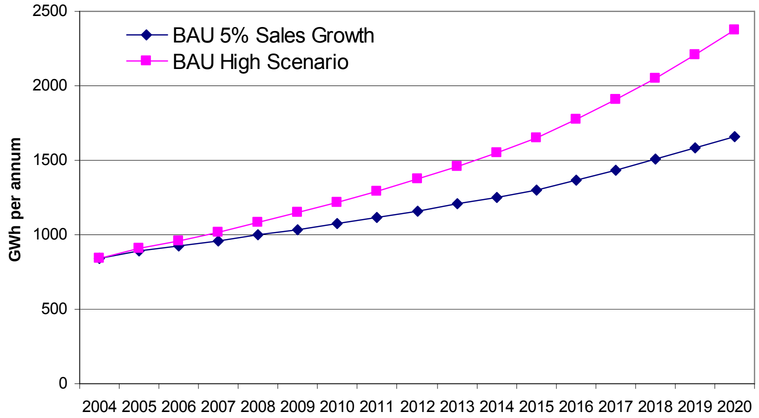
Based on the collected data and assumptions about the average efficiency of the EPS stock and standby energy, annual energy consumption for two projected sales growth scenarios are shown in Figure 6. The BAU 5% Sales Growth is a relatively conservative increase of 5% in sales per annum. The BAU High Scenario is based upon sales growth forecasts shown in Table 5 from 2005 to 2010 [PMSA 2005] and extrapolated to 2020. There will be some natural improvement in efficiency, but there is little, perhaps no, change in low power, highly price sensitive end of the market.

Table 5 High Scenario Sales Growth

Power Range (W)	0 to 5	5 to 10	11 to 20	21 to 50	51 to 100
Annual sales growth	5.20%	6.60%	12.50%	8.00%	12.00%

As shown in Figure 6, wasted energy consumption for appliances powered by external power supplies are conservatively forecast to increase by 80% between 2006 and 2020. In the higher sales growth scenario, wasted annual energy consumption is forecast to increase by 147% between 2006 and 2020.

Figure 6 BAU Wasted Energy Consumption 5% and High Growth



4.2 Overseas Policies, Programs and Measures

While several countries throughout the world have introduced measures for minimizing the power consumption of electrical appliances which use power supplies, at this stage only the European Commission, some European countries and Korea have introduced initiatives relating specifically to external power supplies. Table 6 provides a summary of current and near future programs. Additional details are included in APPENDIX 6

Table 6 Summary of Overseas Policies and Measures

Organisation	Region	Mandatory or Voluntary	Effective date	Minimum active energy efficiency	Maximum no load power
ENERGY STAR	US	Voluntary	Jan 1, 2005	0 to ≤1 watt ≥ 0.49 * Pno 1 to ≤ 49 watts ≥ [0.09 * Ln (Pno)] + 0.49 > 49 watts ≥ 0.84	0 to < 10 watts ≤ 0.5 watts 10 to ≤ 250 watts ≤ 0.75 watts
CECP	China	Voluntary	Jan 1, 2005	As per ENERGY STAR	As per ENERGY STAR
EU Code of Conduct	Europe	Voluntary	Jan 1, 2007	As per ENERGY STAR, except only 90% of signatories' EPS models must comply.	As per active energy efficiency.
Korea	Korea	Mandatory for Government. Otherwise voluntary	Nov 1, 2004		0 to 100VA ≤ 0.8 watts
California Energy Commission (CEC)	US	Mandatory	Jan 1, 2007	As per ENERGY STAR with exceptions: • At 115 Vac only • Medical use power supplies excluded.	As per ENERGY STAR with active energy exceptions
Canadian Standards	Canada			Under development, likely to harmonise with ENERGY STAR.	
Arizona	US	Mandatory	Jan 1, 2008	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.

Massachusetts	US	Mandatory	Jan 1, 2007	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.
New York	US	Mandatory	Jan 1, 2007	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.
Oregon	US	Mandatory	Jan 1, 2007	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.
Rhode Island	US	Mandatory	Jan 1, 2007	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.
Washington	US	Mandatory	Jan 1, 2007	As per ENERGY STAR, likely to adopt CEC exceptions.	As per active energy efficiency.
US Executive Order 13221	US	Mandatory for federal purchases		No limit	< 1 Watt or lowest available if > 1 Watt.
Energy Policy Act 2005	US	Mandatory for federal purchases		Federal agencies must purchase ENERGY STAR qualified products.	As per ENERGY STAR
Dept. of Energy	US	Analysis phase		In "determination analysis" phase	As per California

4.3 Voluntary Efficiency Standards

Voluntary efficiency standards is an option that relies on equipment suppliers and/or manufacturers being effectively encouraged to meet certain minimum energy efficiency levels voluntarily, i.e. in the absence of regulation.

There are two major international examples of voluntary efficiency standards – US ENERGY STAR and the European Union Code of Conduct (EU CoC) for external power supplies. In both cases, the test method and marking are as per the harmonised standards.

European Union Code of Conduct

The EU CoC was established in June 2000 and by 2005, 21 companies had become signatories to the CoC. Whilst the program has been successful with the signatories, there is still a plethora of companies who are not participants. The results for 2005 were provided by seven of the 21 signatories, with 127 models reported with 92% complying with the no load and efficiency criteria. Note that efficiency is only measured at rated output, which is simpler to achieve compared the US ENERGY STAR criteria with efficiency averaged from 25 to 100% loading.

The present Code of Conduct has been very successful in some end-use equipment such as notebook computers and mobile telephones, and less successful in other such as kitchen tools, consumer electronics, etc. Many inefficient power supplies are still supplied with appliances, particularly games and home telephony. [EC 2006] It is also notable that the current CoC requires that a minimum of 90% of a signatory's models, not sales, must comply, which therefore permits the remaining 10% of models to be non compliant.

In its Action Plan for Energy Efficiency [EC 2006 – 1] the European Commission has included external power supplies as one of two highest priority products for MEPS and labelling by the end of the first quarter of 2008.

US ENERGY STAR

The US ENERGY STAR voluntary program came into force on 1st January 2005 after several years of testing and development of efficiency and standby levels.

Many external power supply manufacturers have embraced the program and compliant external power supplies are available across the power range. The ENERGY STAR Partner List of

Qualified Manufacturers currently lists 56 companies from around the world, with 690 qualified external power supplies from 0.15 to 220 Watts. Integrated circuit manufacturers have also designed and manufacture integrated circuits to enable the manufacture of compliant external power supplies.

Appliance suppliers have not responded in the same manner as power supply manufacturers. The ENERGY STAR Partner List for End Use Products (appliance manufacturers/suppliers) has eight companies, with 90 qualified end use products, compared to the 21 signatories to the EU CoC.

California's move towards mandating ENERGY STAR levels provides further evidence that appliance manufacturers have not responded voluntarily, in the same manner, as many external power supply manufacturers. Industry association submissions to the Californian Energy Commission, regarding the impending legislation in California, highlights that many appliance suppliers do not have ENERGY STAR compliant external power supplies. The submissions also request a significant delay in the commencement date to allow them to <u>start</u> the development process. [CEC 2006]

Success of this option relies on equipment suppliers being effectively encouraged to meet certain minimum energy efficiency levels voluntarily, i.e. in the absence of regulation. This may require suppliers to decrease their model ranges to eliminate less efficient models, or to upgrade these models to meet the voluntary efficiency standards. As there are few commercial incentives for doing so, it is unlikely that suppliers would willingly make these changes without significant government incentives. Also they will be disadvantaged by suppliers that do not participate, who then may be able to sell their appliances at a price advantage.

Whilst the two voluntary programs cited have merit, the participation to date by appliance manufacturers indicates that this option will have little effect in many product sectors.

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 external power supplies 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 cheaper, and poorer performing, products. This type of program can work in a market where consumers are looking for efficient products, but given that the purchase of an external power supply is "incidental" to the primary appliance being purchased.

Australian industry associations' opinion is that only the "brand name" companies may participate and 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 higher and the benefits lower than the MEPS option and is not considered to be the best option to meet the objectives.

4.5 Dis-endorsement Label

The principle of a dis-endorsement label is to highlight that a product is an energy waster. This type of labelling is most suited to a complete product in one package, for example an instantaneous water heater, refrigerator etc. In the case of appliances powered by external power supplies, the dis-endorsement label would only apply to the power supply, rather than the appliance being powered. The appliance itself may be energy efficient, however a dis-endorsement label has the potential to incorrectly infer that the appliance being powered is an energy waster. I.e. the wrong message may be sent to the consumer and potentially have a negative impact on business and consumers.

For example, if there are two appliances A and B that perform the same function, but have different appliance power consumption and different external power supply efficiencies. Comparing them in Table 7, appliance A has a more efficient power supply, but because its own power rating is higher than appliance B, it consumes more energy than appliance B with the less efficient power supply. However, labelling appliance B as having a less efficient power supply, may influence the consumer to purchase appliance A, rather than the lower overall energy consuming appliance B.

Table 7 Energy Labelling Potential Mis-information

Appliance	Appliance Power	EPS efficiency	Power to EPS
A	30 W	60%	50 W
B	20 W	50%	40 W

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 government would be the same as 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 place.

Dis-endorsement labelling is also outside the scope of the international MOU on harmonizing testing and performance marking, which would make Australia a special case for these globally traded products.

4.6 Levies and Emissions Trading

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

Equipment Levy

The equipment levy involves imposing a levy upon inefficient EPSs 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 EPS efficiency (i.e. the levy is 'revenue-positive').
- The proceeds are used to subsidise the costs of more efficient EPSs so that any cost differentials between these and inefficient EPSs 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.

Electricity Levy

At present, the electricity prices faced by consumers reflect – 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 greenhouse gas 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 Federal Government MRET program and New South Wales' NGAC programs, some cost of greenhouse gas emissions are imposed.

At present, electricity prices are sufficiently low that few consumers consider the cost of the electricity required by appliances when the consumer is making decisions regarding the purchase of the appliance. This is especially true for the purchase of small appliances or pieces of equipment such as EPSs. One policy option would be to introduce a levy on the price of electricity to reflect the cost of greenhouse gas 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 efficient EPSs.

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. However, none of these projects currently relate to the use or efficiency of EPSs.

Australia's Emissions Trading Scheme On 3 June 2007, the Prime Minister announced that Australia will implement a domestic emissions trading system (ETS) beginning no later than 2012, and that the Government will set a national emissions target in 2008.

The Australian Government's Mandatory Renewable Energy Target (MRET) program and New South Wales' Greenhouse Gas Reduction Scheme (GGAS) are examples of programs that have imposed some of the costs of greenhouse gas emission impacts on energy suppliers, which will have flow-on effects on retail energy prices. However, the implementation of a "cap and trade" greenhouse gas ETS, such as that announced in June 2007, could lead to the full cost of the greenhouse gas 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 EPSs cannot be determined until the Government has decided operational details of the ETS and until modelling of future electricity prices is 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);*

New Zealand's Emissions Trading Scheme

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

The Government proposes to implement the scheme from 2008, with various sectors phased in over the years to 2013. It is proposed that the first sector included will be 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 Maori will inform subsequent decisions on the design of the scheme and the ultimate form of legislation required to implement the scheme.

The scheme is one of a range of policies and measures to reduce domestic greenhouse gas emissions and contribute to sustainable outcomes for New Zealand. Together such measures are intended to bring New Zealand's net emissions below business-as-usual 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 greenhouse gas emissions (e.g. investment in energy efficiency and renewable energy generation). This will be achieved by making the price of greenhouse gas emissions a factor in the decisions of both producers and consumers.

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/framework-emissions-trading-summary-sep07/index.html.

Conclusions

The two levy options proposed are not currently 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.

The introduction of an emissions trading scheme is Australian Government policy, but it is unclear if an ETS alone would impact on the energy efficiency of EPSs. 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 efficiency of small appliances or pieces of equipment such as EPSs, and consumers would still lack information on the energy usage of the EPSs even if they were more concerned. Hence it is concluded that an ETS on its own is unlikely to affect EPS energy performance or market take-up.

4.7 Mandatory Energy Labelling

Mandatory energy labelling requires the application and display of a comparative energy performance label on products and packaging. It is to provide consumers with a visual display of the relative performance of one product to another. Energy labelling requires the establishment of relative energy levels and a marking system, which naturally utilise the harmonised test and marking standards.

For external power supplies, it is important to recognise that the majority of these devices are sold bundled with their end-use equipment, e.g. mobile phone, laptop computer, wired telephony, games machines etc.. The number of products that are sold as a stand-alone external power supply are estimated to be less than 5%. This has ramifications for any labelling program, since it is not obvious where a label would be fixed in order to be visible to the customer at the point of purchase, i.e. on the power supply or the end-use equipment. Furthermore, even if the label is visible, to what extent is the consumer able to change their purchasing decision if they want to buy a more efficient power supply? It seems unlikely at this stage that manufacturers will offer the same end-use equipment with a range of power supply options from which to choose. In some instances, such as games machines. consumers do not have a choice of products due to proprietary nature of these machines and therefore must purchase the appliance as supplied.

In general, appliance manufacturers use multiple sources for external power supplies to prevent exposure to supply problems. Potentially these could have different performance marks which could then introduce problems with packaging and literature.

As with dis-endorsement labelling, labelling alone creates the potential for a consumer to select an appliance with higher overall energy consumption. For example, if there are two appliances A and B that perform the same function, but have different appliance power consumption and different external power supply efficiencies. Comparing them in Table 8, appliance A has a more efficient power supply, but because its own power rating is higher than appliance B, it consumes more energy than appliance B with the less efficient power supply. However, labelling appliance A as having a more efficient power supply, may influence the consumer to purchase it, rather than the lower overall energy consuming appliance B.

Table 8 Energy Labelling Potential Mis-information

Appliance	Appliance Power	EPS efficiency	Power to EPS
A	30 W	60%	50 W
B	20 W	50%	40 W

The comparative energy label which has been used 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. The impact of this program is not well known in Australia but is probably not as effective as in the United States due to the relatively low profile of the ENERGY STAR brand here, and the lower penetration of conforming appliances.

ENERGY STAR labelling has the aim of promoting the better or best performing appliances, but this requires that the label is well-known by consumers, is visible on product shelves and is carried by a reasonable range of products. In the case of external power supplies, the consumer/purchaser is unlikely to see the EPS at the time of appliance selection or purchase. However, if, like ENERGY STAR, the label is on the appliance packaging, the consumer may see it; but the question is whether it would influence their purchasing decision. Therefore voluntary labelling, as the sole means of encouraging purchases of more efficient EPS, is unlikely to succeed.

As with the previous options, costs would be the same as MEPS, but would require a complementary education program, thus increasing program costs.

4.8 Proposed MEPS

MEPS aims to remove the worst performing products from the marketplace, rather than promoting the best. In Australasia this is achieved by including the energy performance criteria within an Australian/New Zealand Standard which is mandated through State, Territory and New Zealand legislation. These requirements apply to products covered by the standard which are sold in Australia or New Zealand.

Mandatory MEPS program would apply to all external power supplies within the scope of the joint Australia/New Zealand Standard AS/NZS 4665, including the recommended amendments shown in APPENDIX 17, whether sold separately or with an end use appliance. A further advantage of MEPS is that it protects the investment of those wishing to sell more efficient devices, 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 RIS proposes a commencement date of 1 October 2008, which is 15 months after regulation commenced in California and almost three years after the publication of the joint Australian and New Zealand Standard.

Some stakeholders requested more time before the commencement of the regulation than 1 April 2008 in the first draft RIS. Two arguments were used by advocates seeking a delay to the regulatory commencement until not earlier than in April 2009 (18 months after the original target of October 2007 and 12 months later than proposed in the first Consultation RIS). The more compelling came from suppliers stating they were having difficulty finding original equipment manufacturers who could supply complying EPS. Several trade associations also argued that a commencement date that was less than 12 months notice gave too short a formal notice period to suppliers of the proposed regulatory change.

The Equipment Energy Efficiency committee accepts the merit of both these arguments. It also believes that it should protect the commercial investments made by those companies who have entered into binding supply contracts based on the original proposed commencement date and in keeping faith with other governments similarly working to improve EPS efficiency. Therefore the revised date of 1 October 2008 is a compromise to address both sides of the issue.

It is worthy of note that the US ENERGY STAR web site lists 1,344 performance mark III or IV EPS registered for use at 230 Vac, 50 Hz, with output power ranging from 1.13W to 220 Watts Table *9* contains phase 1 proposed no-load MEPS requirements from October 2008.

Table 9 Proposed No-Load MEPS Requirements AC-DC only, Australasia 2008

Nameplate Output Power (Pno)	Australian MEPS Proposal Phase (1)
0 to < 10 watts	≤ 0.5 watts
≥ 10 to ≤ 250 watts	≤ 0.75 watts

The phase 2 levels are the same as proposed by the Californian Energy Commission (CEC) for later implementation. Should the future levels proposed by the CEC change from those shown here, the phase 2 MEPS levels would also change so that they harmonised with those adopted in California. Although there is currently no fixed date for the implementation of phase 2 MEPS, for the purpose of this report, it is assumed to be during 2011.

Table 10: Proposed No-Load MEPS Requirements AC-DC only, Australasia 2011

Nameplate Output Power (Pno)	Australian MEPS Proposal Phase (2)
0 to ≤ 250 watts	≤ 0.5 watts

Table *11* contains the phase 1 proposed average efficiency MEPS requirements from October 2008 and Table 12 shows the phase 2 proposed MEPS requirements for 2011.

Table 11 Proposed MEPS Requirements for Average Efficiency. Australasia 2008

Nameplate Output Power (Pno)	Australian MEPS Proposal Phase (1)
0 to ≤ 1 watt	≥ 0.49 * Pno
> 1 to ≤ 49 watts	≥ [0.09 * Ln (Pno)] + 0.49
> 49 watts	≥ 0.84

The MEPS proposal also mandates energy performance marking of external power supplies as per AS/NZS 4665 and the proposed marking revisions for external power supplies tested at 230Vac only. The mandatory mark not only shows compliance, but also shows the energy performance level that the external power supply meets.

Table 12 Proposed MEPS Requirements for Average Efficiency, Australasia 2011

Nameplate Output Power (Pno)	Australian MEPS Proposal Phase (2)
0 to ≤1 watt	≥ 0.5 * Pno
1 to ≤ 51 watts	≥ [0.09 * Ln (Pno)] + 0.5
> 51 watts	≥ 0.85

5 COSTS, BENEFITS AND OTHER IMPACTS

Where it differs from this section, information and data that is specific to New Zealand is detailed in section 6

5.1 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. The 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, which are similar to the allocations made for other products regulated by E_3:

- 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 E_3 activities; and
- Printing and promotional activities at $25,000 per year.

Hence total government program costs are estimated to be $150,000 per annum.

These costs have been included in the "Australia" cost-benefit analyses throughout

5.2 Business compliance costs

Industry and E3 Committee representatives indicated support for the AGO to investigate a supplier registration for energy efficiency performance (rather than the usual system of separate or individual product registration). They advocated E3 use the Commonwealth scheme operated by the Australian Communications and Media Authority where all companies marketing EPS are already "registered". This scheme has operated for years and all EPS suppliers are already required to be registered under that scheme. The E3 committee agreed to explore this option with ACMA and to examine an equivalent registration system if the ACMA scheme cannot be accessed.

Industry and E3 Committee representatives indicated support for the Australian Greenhouse Office to investigate a supplier registration for energy efficiency performance (rather than the usual product registration). Results of discussions held with the Australian Communications and Media Authority (ACMA) regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or 'families' of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments..

Compliance with the standard is the responsibility of the importer or local manufacturer of the external power supply.

This RIS assumes that any increases in external power supply 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. 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.

The Productivity Commission's Business Cost draft user guide specifies a checklist of compliance tasks/costs for analysis in a RIS. The following addresses the checklist.

Notification

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

Businesses will be required to register each external power supply or family of models on a web site. The current registration cost per external power supply of family of models is A$150

Education

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

Business costs will be limited to the initial purchase of AS/NZS4665.1 and AS/NZS4665.2

The current cost of part one of the standard is A$130.68

The current cost of part 2 of the standard is A$61.16

Amendments to standards are available free of charge from the SAI-Global web site.

Permission

Are costs incurred in seeking to conduct an activity?

No.

Purchase cost

Are businesses required to purchase materials or equipment?

Businesses will be required to purchase compliant external power supplies. In this RIS, these costs are assumed to pass to the consumer and are in the Consumer Costs and Benefits analysis.

Record keeping

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

Businesses will be required to retain records, as per AS/NZS 4665.2, 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 show compliance with the standard on the external power supply through a mandatory marking requirement for 230Vac. Examples are contained within the standard to allow manufacturers to amend existing labelling/marking methods such as screen printing, printed labels, casing molds etc.

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?

To be registered and sold in Australia and New Zealand external power supplies must be tested in accordance with AS/NZS4665.1

The two options for an external power supply.

1. Use a compliant model than has been tested elsewhere and request a copy of the test records for the registration process.
2. Test a model that has not been tested.

In this second case, testing costs per external power supply are inversely proportional to the quantity of external power supplies sold. They are also dependent on the hourly rate where the testing is done.

Estimates are shown in Table 13 for a range of quantities and labour rates for testing. Incremental laboratory test times over prevailing tests are estimated at 3 hours per external power supply model.

Table 13 Testing cost per EPS at sample labour rates per hour

Labour rate	100	500	1,000	10,000	50,000	100,000
$ 20	$ 0.60	$ 0.12	$ 0.06	$ 0.006	$ 0.0012	$ 0.0006
$ 45	$ 1.35	$ 0.27	$ 0.135	$ 0.0135	$ 0.0027	$ 0.00135
$ 65	$ 1.95	$ 0.39	$ 0.195	$ 0.0195	$ 0.0039	$ 0.00195
$ 90	$ 2.70	$ 0.54	$ 0.27	$ 0.027	$ 0.0054	$ 0.0027

Globally traded external power supplies are typically manufactured in very high volume. APPENDIX 12 shows testing cost estimates for higher volumes than the tables above.

5.2.1 Impact on Small Business

The compliance costs per unit, as per the previous section, are totally dependent on volume and labour rates for testing and registration. As with other electrical products, businesses are required to utilise products that comply with Australian and New Zealand Standards. It is then a business decision to either purchase complaint products or test an untested model. Given the international harmonisation of testing and marking and the increasing number of compliant models from original equipment manufacturers, businesses can purchase these to suit their needs. In this case, the costs per external power supplies in Table 13 apply.

5.3 Industry, Competition and Trade Issues

5.3.1 Industry issues

This section reviews the impacts of the proposal/s on suppliers. In many industries manufacturers, importers, distributors and retailers vary greatly in size, from trans-national corporations to small family 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.

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.)

The previous sections examined the costs and benefits of the MEPS options from the perspective of external power supply users. It was 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 EPS suppliers as a group is neutral. There may however be some cost benefits for suppliers due to a reduction in the range of EPS types manufactured or carried, and some increased profit derived from the transition to higher priced EPS (assuming a consistent percentage profit margin).

Via international collaboration, the US EPA (ENERGY STAR), the European Union, China and Australia have agreed that the US ENERGY STAR test methods be used in each country/region. In addition a performance marking system for external power supplies has been developed. Australian/New Zealand Standard AS/NZS 4665.1 documents the test methods and performance mark. Testing, irrespective of the energy performance and mark achieved, will be uniform for all products destined for these markets. Therefore the cost of performance testing and marking will be spread across all external power supplies, irrespective of ultimate sale destination and/or application. With the international acceptance of the performance mark, end use appliance suppliers and manufacturers will only need to specify which performance mark is required. As with Californian requirements, Australia and New Zealand performance marking, as a minimum, will only be required for the local supply voltage and frequency.

5.3.2 Trade

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, product specifiers, and end-use appliance manufacturers will need to ensure that external power supplies comply with the new MEPS requirements. Published information by manufacturers and designers of power supplies from China, the USA and Europe state that there are a wide range of power supplies currently available which meet these requirements. If new products need to be developed, integrated circuit manufacturers have control electronics ready for shipment and some external power supply manufacturers and designers have design guides available for the manufacture of compliant external power supplies. [PET 2005] [EDN 2005] [PI 2003] [PI 2006]

The lead time from specification to availability in the marketplace ranges from five to a worst case scenario of 17 months depending upon the specification and component availability.

Table 14 shows estimated times for the major activities from specification to market availability advised by an Australian importer of power supplies whose market sectors include telecommunications, mining and defence. [Benbro 2006]

Safety and C tick can be done in parallel. Components can be ordered after the prototyping stage is complete, thus allowing manufacturing design and component supply to run in parallel, thus reducing the worst time to market of 17 months. [Benbro 2006]

Table 14 New product time to market

Activity	Minimum time Months	Maximum time Months
Design	2	9
Safety	2	2
C tick	0.5	0.5
Components	1	6
Total	5.5	17.5

The Australian New Zealand Standard was published in November 2005, which, with the amended implementation date for MEPS in October 2008 and stakeholder meetings, provides 2 years and 11 months for Australian and New Zealand industries to make necessary adjustments to purchasing policies.

GATT issues

One of the requirements of the RIS is 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*. These are addressed below.

As the vast majority of external power supplies addressed in the RIS are currently imported, MEPS would not favour local supplies against imports.

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 energy test procedure and conditions in the Australian Standard replicates the United States EPA ENERGY STAR tests. China, the world's major source of external power supplies plans to adopt the same test procedure.

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 would be scope for accepting the results of external power supply tests conducted in other countries under comparable standards. However, there is no scope for accepting an external power supply that may comply with MEPS in its country of origin (e.g. in the 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.

5.3.3 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 requirement 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 ANZ 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).

Currently there are no known manufacturers of external power supplies in New Zealand and therefore it is deemed that the TTMRA is not contravened. An issue that may arise is in the instance where a New Zealand manufacturer of appliances imports an external power supply, however if New Zealand implements MEPS legislation, in accordance with the Standard, at the same time as Australian States, then this will not be an issue.

5.3.4 Competition

The proposed regulation will prevent manufacturers from making and selling external power supplies that do not meet the proposed minimum efficiency performance standard, and constitutes a prima facie technical barrier to entry and a potential restriction on competition.

To ascertain whether the proposed minimum efficiency performance standard would restrict competition first requires an analysis of the impact of the standard on the EPS manufacturing sector as this would have a consequential flow-on effect to appliance manufacturers and ultimately consumers.

The minimum efficiency performance standard will result in many current models of linear and, to some extent, some switch-mode external power supplies being removed from the market. It is difficult to quantify the exact number of external power supply models that manufacturers will remove from the market.

Those EPS manufacturers that predominately make inefficient linear external power supplies will be affected the most with the proposed regulation. However, the delayed introduction of the proposed regulation will enable these manufacturers to firstly run down existing stock, and secondly, to have a reasonable amount of time to re-design/ tool-up or specify external power supplies that are compliant.

Mandatory minimum technical standards can impose barriers to entry to potential entrants or speed up the exit of existing firms if the standard imposes significant costs that disadvantage some firms and ultimately affects the level of competition within a market.

The analysis of the technology required and accessibility of the technology to meet the proposed standard reveals there is not a barrier to entry or the exiting of existing firms.

To meet the proposed standard, EPS manufacturers that predominately make poor performing external power supplies would need to undertake redesign. Redesign should not be expensive or lengthy as many major suppliers have proven designs available. Quoting John Jovalusky, Power Integrations (ECN 2005) *"IC manufacturers have already integrated automatic frequency reduction features into their devices. This enables power converters designed around those ICs to easily meet the new energy-efficiency standards. Since the supply's switching frequency automatically adjusts with the load on its output, its efficiency stays high across the full power delivery range. Some ICs also reduce their switching frequency even further when the supply is unloaded, which helps meet the no-load power consumption standards.*

Because these ICs also have many other functions integrated into them, such as over-temperature shutdown, under- and over-voltage protection, cycle-by-cycle current limiting, and switching frequency modulation, they help designers meet their cost goals by keeping design cycle times short and component count low. Additionally, some newer, highly integrated power conversion ICs are accompanied by powerful, easy-to-use, computer-aided engineering (CAE) *software that makes calculating design parameters and component values a quick and painless task. Some CAE tools will even design the transformer for an SMPS."*

According to the U.S National Resources Defense Council (2006), it estimated that the incremental cost for EPS manufacturers converting from a low power linear to switch-mode external power supply to be about A$0.33 to A$0.66 cents based on quotations from Ten Pao, a Chinese EPS manufacturer.

These incremental costs are likely to be off-set to some extent by lower shipping (freight charges) in view of the considerably lighter switch-mode compared with the heavier linear external power supplies.

Table 15 shows weights and savings for current linear and SMPS external power supplies. It demonstrates that freight savings, depending on freight method, can be from 4% of, to in excess of, the price increment at 20% on current price.

Table 15 EPS weights and savings

	EPS Rating	BAU weight Grams	MEPS weight Grams	Weight saving Grams	Air freight saving at $4.50 /kg	Sea freight saving at $0.6 /kg	Price rise at 20% to comply
Answering machine	2.7 W	141	50	91	$ 0.41	$ 0.05	$ 1.27
Cordless Phone 5.8 GHz	3.15 W	261	50	211	$ 0.95	$ 0.12	$ 1.49
Cordless Phone 2.4 GHz	1.35 W	232	50	172	$ 0.82	$ 0.11	$ 0.64

The technology as discussed above is readily accessible and not costly and would appear not to greatly affect the current level of competition in the EPS manufacturing sector. The market is typified by original equipment manufacturers of external power supplies, supplying to appliance suppliers and manufacturers. The market is highly fragmented with the top ten companies accounting for some 41% of the 898 million worldwide sales in 2004. Eight of the top ten competitors, by annual turnover, are headquartered in Asia, with seven of the eight in Taiwan and mainland China. The remaining 59% of the market is supplied by literally hundreds of other companies, mostly manufacturing in Asia (Darnell Group 2005). However, the increased cost of EPS arising from the proposed regulation could increase the cost of some appliances particularly for appliance manufacturers that focus on supplying low cost appliances and are dependent on cheap external power supplies to keep the total selling price low. These appliance manufacturers may need to absorb the increased costs of the external 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 appliance manufacturers of low-cost appliances exit the market or shift production away from cheap appliance models due to the higher costs of EPS, then the level of competition within some of the appliance market would be affected and ultimately impact negatively on consumers. However, as the proposed regulation would apply to all competitors, so the incremental cost should be the same for all, thus allowing them to compete as usual.

The probability of this occurring would depend on the price differential of poor performing linear, compliant linear and switch mode external power supplies. Switch mode external power supplies are currently more expensive to produce than linear external power supplies. However, according to the Darnell Group's External AC-DC Power Supplies: Global Forecasts & Competitive Environment (2005) the price differential has substantially reduced in the past several years and the EPS market, particularly at low output power, is considered ultra competitive. The decline in price for switch-mode external power supplies is due to several factors including the increased take-up by mobile phone suppliers. In some cases, there is a negligible price difference between linear and switch mode external power supplies. Once EPS manufacturers can develop appropriate economies of scale, the price differential is expected to fall even further. It is anticipated the introduction of the proposed standard would create the appropriate demand to enable economies of scale to be achieved thus ensuring the price of external power supplies continues to fall. It is notable that one US headquartered EPS supplier has introduced a range of AC-DC linear replacement EPS based upon SMPS technology. This product line has been designed to have the same output characteristics of a linear EPS, rather than all the attributes associated with SMPS technology.

In view of the low technical barriers and associated cost for the technological adoption required by current and potential EPS manufacturers, the proposed standard is unlikely to affect the ultra competitive EPS and consumer appliance markets. In fact, best available market research suggests the price of high efficient switch-mode external power supplies are likely to continue to decline. This should ensure appliance manufacturers of low-end products who currently rely on cheap inefficient linear external power supplies remain competitive. Accordingly, current levels of competition in the EPS and appliance markets are likely to remain the same without any material impact on consumers.

5.4 Consumer costs and benefits

There are literally thousands of models of appliances in the marketplace powered by external power supplies and the number is increasing as appliance manufacturers use external power supplies to make the appliance itself independent of worldwide voltage and frequency differences. Given the myriad of external power supplies in the market, it is difficult to predict the percentage that will be regulated out of the market. The MEPS report on external power supplies [MEA 2004] provided data on tests carried out in the US, China and Australia on 605 samples in 2003/4. This identified that at that time, 38% met the proposed no load limits, 32.7% met the efficiency requirements and 22% met both no load and efficiency criteria. The report also noted that the sample included older models that may not be representative of new models in the market. Therefore the worst case scenario is that 78% of external supplies will need to be improved or substituted with existing compliant external power supplies.

Data for the impact of MEPS on EPS prices is somewhat limited, however confidential data provided by three international appliance (not EPS) companies, indicates that their cost of compliance will be greater, as a percentage increase, for linear power supplies, due to their typically current low, ultra competitive price and poor performance.

Based upon the confidential data provided on incremental costs and pricing data in Table 16 it is estimated that the average consumer price will increase as follows;

- Power supplies for appliances using linear power supplies will increase by 20%, even though 2006 data for low power EPS indicates equivalent pricing.
- Switch mode power supplies will increase by 2%.

More recently published pricing for low power (2-5W) EPS compliant with Australian proposed MEPS and ENERGY STAR Tier 1 indicates that they are virtually the same price as current, poor performance linear power supplies. [CEC 2006 – 1] Table 16 summarises the base data used in the analysis with pricing based upon the confidential data provided and published pricing from Mouser, an American wholesaler of linear and switch mode external power supplies.

Table 16 External Power Supply Data by Application

Application	Total Annual kWh	Rating W	Average Efficiency	EPS Type	EPS Consumer Purchase Price
Laptops	158.9	65	81%	SMPS	$ 43.17
Mobile Phones	9.0	4	60%	Linear & SMPS	$ 4.32

Computer Monitors (LCD)	167.3	40	79%	SMPS	$ 39.06
Modems Residential	80.6	15	54%	Linear	$ 21.60
Modems Business	86.5	15	54%	Linear	$ 21.60
Printers	59.6	45	79%	SMPS	$ 39.06
Scanner & MFDs	48.7	20	69%	SMPS	$ 28.50
Sundry Battery Chargers	8.7	6	60%	Linear	$ 4.32
Home Audio	46.9	15	69%	SMPS	$ 15.71
Answering Machines	50.2	4	64%	Linear	$ 6.68
Cordless Phones	46.6	4	42%	Linear	$ 4.32
Games consoles	20.7	9	64%	Linear	$15.71
Hospital	73.2	23	69%	SMPS	$ 18.57
Cash registers	78.7	20	69%	SMPS	$ 18.57
Barcode and magnetic strip readers,	22.5	4	42%	Linear	$ 7.20
Networking	63.2	9.5	64%	SMPS	$ 15.71
Sundry Other	10.1	2	42%	Linear	$ 5.81

Also of significance is the relative price of the external power supply to the total purchase price of the appliance. This is shown in

Table 17.

As an example, current published prices for laptop computers are in the range of $986 to $5,500.

Within the analysis, the price of the EPS within the total laptop purchase price is estimated at $43.17. Therefore the price of the EPS is estimated to be in the 4.4% of the low end, $986 laptop and 0.8% of the high end, $5,500 laptop. The incremental cost (2%) of the EPS, to comply with the proposed MEPS is $0.86. This $0.86 as a percentage of the low end, $986 laptop is 0.09% and as a percentage of the high end, $5,500 laptop is 0.02%

Using the same methodology, with 2% for SMPS EPS and 20% for linear EPS,

Table 17 shows typical price ranges for a selection of appliance types where it is known or could be identified that the appliance is powered by an external power supply. This indicates that the main area of impact on total price will be in the consumer electronics sector. It is worthy of note that these appliances are often the subject of significant retail price discounting, indicating that profit margins are high and there is scope for absorbing the price increases due to increased external power supply costs at the wholesale and retail sectors of the supply chain. Retail prices sourced from Dick Smith Electronics web site www.dse.com.au

Table 17 Appliance and External Power Supply Prices

Appliance	Price Low	Price High	EPS Price	EPS Price as % of total Price	Total % Incremental Price Increase due to MEPS
Laptops	$986	$5,500	$43.17	0.8 - 4.4	0.02 - 0.09
Mobile Phones	$149	$1,400	$4.32	0.3 - 2.9	0.01 - 0.06
Computer Monitors (LCD)	$349	$1,299	$39.06	3.0 - 11.2	0.06 - 0.22
Modems	$80	$300	$21.6	7.2 - 27.0	1.44 - 5.40
Answering Machines	$40	$80	$6.68	8.4 - 16.7	1.67 - 3.34
Cordless Phones	$40	$284	$6.48	1.5 - 10.8	0.30 - 2.16
Games consoles	$188	$646	$15.71 to $71	8.4 - 11.0	1.67 - 2.20
Networking	$125	$350	$15.71	4.5 - 12.6	0.90 - 2.51

Operational costs are highly dependent on the appliance being powered, its usage patterns and the type and specifications of the external power supply.

To show the variation in energy usage for a variety of applications, Figure 7 shows normalised energy costs by consumption and application.

Figure 7 Energy Costs as a Percentage of 5 Year NPV – 2004 data

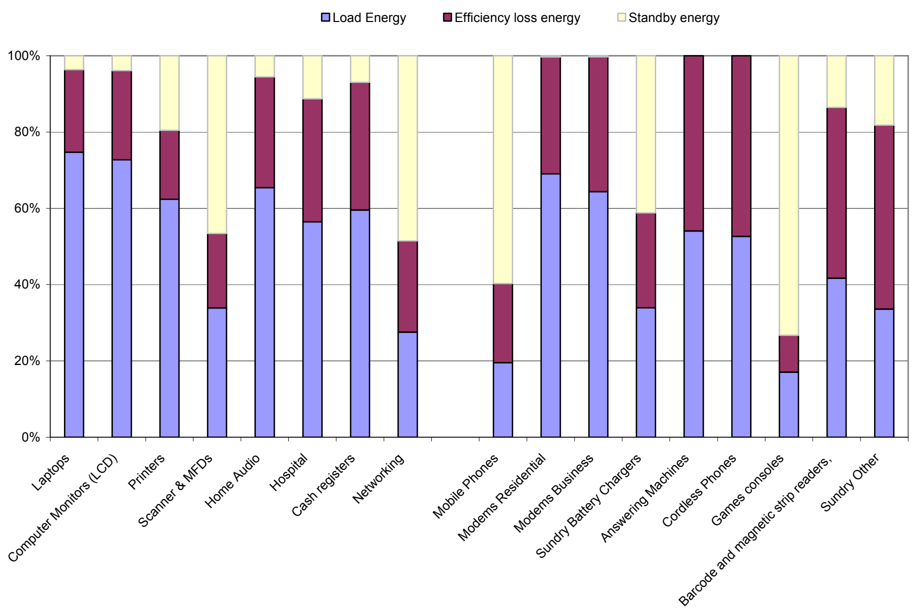


Table 18 summarises the NPV, by application, for current and MEPS 1 compliant external power supplies. The energy calculations are based upon the usage patterns and energy consumption estimated in the Analysis of Minimum Energy Performance Standards [MEA 2004] and more recent data from an Australian standby energy consumption survey [E3 2006]

The NPV calculations use a service life of 5 years.

The following is an extract from an email from Chris Calwell, Vice President & Director of Policy and Research, Ecos Consulting, adviser to the US Environmental Protection Agency:

“Finding a source for the estimated product lifetime of an average EPS has been particularly challenging because of the distinction between functional product lifetimes and desired product lifetimes. From our own measurements of used external power supplies of various ages and observation of the very low incidence of replacement power supplies being sold as standalone items in retail stores, it is evident that the average functional lifetime of an external power supply is longer than 5 years. The devices have no moving parts, they are not generally subjected to prolonged vibration or mechanical stress, they are convectively cooled in free air, and their components are generally simple and rugged in design.

So the limiting factor becomes their desired product lifetime -- namely, the period of time after which the purchaser discards, recycles, or puts in storage a perfectly functioning device because they wanted new features, got tired of the old model, or found it was cheaper to buy a brand new device than continue to maintain and upgrade the old one. This phenomenon is most commonly seen with cellular phones (average desired lifetimes of roughly 1.5 to 3 years), but also happens to a lesser extent with laptop computers, some types of PDAs, portable media and gaming devices, etc.

Five year lifetimes would tend to be consistent with the lifetimes of other popular EPS-powered devices: cordless phones and tools, inkjet printers, answering machines, broadband modems, personal grooming products, etc.

The original California regulatory analysis (2003-2004) used an average lifetime assumption of 7 years. More recent analyses have assumed 5 years."

Table 18 shows the effect of MEPS compared to the BAU case. "BAU Annual Energy" is the total estimated direct and indirect energy for each appliance. "NPV current" is the net present value based upon the current price of the external power supply and the cost of total energy consumed over five years service life. "NPV MEPS" the net present value based upon the current estimated price of a MEPS compliant external power supply and the cost of total energy consumed over five years service life. Economies of manufacturing scale have not been factored into MEPS pricing, nor the susceptibility of linear power supplies costs to raw material costs, such as copper.

Within Table 18 the bulk of appliances will benefit from cost savings over the 5 year service life. The "MEPS % saving" shows the percentage savings due to MEPS. The highlighted boxes, modems only, show a slight increase in cost over the five year service life.

Table 18 Five Year NPV for BAU and MEPS at 7.5% Discount rate

Application	BAU Annual Energy	NPV BAU	NPV MEPS	5 Year Saving	Annual Energy Saving kWh	MEPS % saving
Laptops	158.9	$138.57	$133.24	$5.33	10.3	4%
Mobile Phones	9.0	$9.74	$9.20	$0.55	2.3	6%
Computer Monitors (LCD)	167.3	$139.48	$133.26	$6.22	11.7	4%
Modems Residential	80.6	$70.00	$71.51	$(1.51)	4.7	- 2%
Modems Business	86.5	$73.53	$74.38	$(0.85)	5.8	- 1%
Printers	59.6	$74.85	$69.56	$5.29	10.1	7%
Scanner & MFDs	48.7	$57.75	$45.42	$12.33	21.5	21%
Sundry Battery Chargers	8.7	$9.57	$8.88	$0.68	2.6	7%
Home Audio	46.9	$43.87	$41.98	$1.88	3.7	4%
Answering Machines	50.2	$36.83	$34.65	$2.18	5.9	6%
Cordless Phones	46.6	$32.29	$29.79	$2.50	5.6	8%
Games consoles	20.7	$28.16	$24.34	$3.82	11.6	14%
Hospital	73.2	$62.50	$55.81	$6.69	11.8	11%
Cash registers	78.7	$65.78	$60.06	$5.72	10.2	9%

Barcode and magnetic strip readers,	22.5	$20.70	$19.96	$0.74	3.6	4%
Networking	63.2	$53.67	$34.14	$19.52	33.0	36%
Sundry Other	10.1	$11.89	$11.49	$0.39	2.6	3%

Combining the NPV data by external power supply type and current stock, Table 19 shows that SMPS provide positive benefits for a range of price increases and that linear power supplies may or may not provide a net benefit depending upon percentage price increase. The NPV neutral price rise for linear power supplies is approximately 29% and the NPV neutral price rise for SMPS is approximately 23%

Table 19 Impact of Price Increases on 5 Year NPV by EPS Type

SMPS Price Increase	2%	4%	6%	8%	10%
5 year NPV saving	$M 136.8	$M 85.37	$M 53.22	$M 21.08	$M (11.07)

Linear Price Increase	10%	15%	20%	25%	30%
5 year NPV saving	$M 58.52	$M 42.89	$M 27.26	$M 11.63	$M (4)

APPENDIX 11 provide details of the calculation methodology and worked examples for mobile phones and laptop computer external power supplies. The results for a range of service lives and incremental price increases are shown for mobile phone and laptop computers in Table 20 and Table 21 respectively.

Table 20 Mobile phone benefit cost ratio as a function of service life and incremental price increase.

	Service life					
Price increment to comply	3	4	5	6	7	8
2%	9.49	12.51	15.32	17.94	20.37	22.63
5%	3.20	4.41	5.53	6.58	7.55	8.45
10%	1.10	1.70	2.26	2.79	3.27	3.73
20%	0.05	0.35	0.63	0.89	1.14	1.36
30%	0	0	0.09	0.26	0.42	0.58

Table 21 Laptop benefit cost ratio as a function of service life and incremental price increase.

	Service life					
Price increment to comply	3	4	5	6	7	8
2%	3.61	4.94	6.18	7.33	8.40	9.39
5%	0.85	1.38	1.87	2.33	2.76	3.16
10%	0	0.19	0.44	0.67	0.88	1.08
20%	0	0	0	0	0	0.04
30%	0	0	0	0	0	0

5.4.1 Cost of Forgoing Product Features

The design and some aspects of performance of external power supplies is governed by standards and specifications covering electrical safety, interference, power factor correction and total harmonic distortion.

Current external power supplies 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. However, these are not “features” that are driven by consumer choice and, irrespective of MEPS, the consumer will still have an external power supply that as a minimum will meet these standards. To the consumer the external power supply is a “black box” that may have an LED to indicate that it is connected to the mains supply. If a non compliant linear external power supply is replaced by a compliant linear model, there may be some increase in weight, due to increased material content, such as copper and iron. However, if a SMPS is used, weight and hence shipping cost attributed to the external power supply will decrease.

5.4.2 Distributional Impact

This section provides an analysis of impacts on consumers with respect to patterns of usage different to the base model used for the analysis.

Table 22 shows the impact for active usage time 20% greater and 20% less than the base case. Data for the base case is as per, which is the NPV analysis over 5 years at 7.5% discount rate. Some appliances are not included, such as answering machines, cordless phones and hospital applications, as change in usage pattern is unlikely.

The table shows that there is a benefit from MEPS over the five year service life for higher and lower active energy usage time

Table 22 Impact of usage time 20% greater and 20% less than the base case

Application	Base case BAU	Base case MEPS	Base +20% BAU	Base +20% MEPS	Base - 20% BAU	Base - 20% MEPS
Laptops	$138.57	$133.24	$155.57	$150.34	$121.60	$116.16
Mobile Phones	$9.74	$9.20	$10.00	$9.46	$9.48	$8.94
Computer Monitors (LCD)	$139.48	$133.26	$156.69	$151.19	$122.30	$115.35
Printers	$74.85	$69.56	$79.95	$74.70	$69.74	$64.42
Scanner & MFDs	$57.75	$45.42	$59.50	$47.86	$56.00	$42.97
Home Audio	$43.87	$41.98	$48.05	$46.39	$39.68	$37.58
Games consoles	$28.16	$24.34	$28.65	$24.91	$27.67	$23.77

Table 23 shows the impact of the extreme case where the external power supply is disconnected from the mains supply immediately when appliance use ceases. With the exception of mobile phones and games consoles, MEPS provides a positive benefit.

Table 23 Impact of unplugged if not in use

Application	BAU	MEPS	Variance
Laptops	$134.72	$131.77	2.2%
Mobile Phones	$6.36	$6.97	-9.7%
Computer Monitors (LCD)	$135.18	$132.02	2.3%
Printers	$67.61	$66.70	1.3%
Scanner & MFDs	$43.34	$42.49	1.9%
Home Audio	$42.31	$41.13	2.8%
Games consoles	$19.04	$21.94	-15.3%

5.4.3 Other impacts

Outside the costs and benefits to consumers, there are many 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.
Federal Government	Lower energy sales results in lower GST collected. Reduced Government energy consumption provides reduced operating costs. Contribution to meeting the Kyoto target.
Waste	Smaller external power supplies means less packaging and hence less waste.
Freight	Lower weight means reduced revenue for shipping companies. Lower weight means reduced fuel consumption and greenhouse gas emissions.
Business	Lower operating costs (for EPS) provide increased competitiveness and profits. Marginally increased sales (from consumers spending the money saved on their electricity bills on other goods and services). Higher profits increase Federal Government tax revenue.
Transport/travel	Lower weight means reduced fuel consumption resulting in reduced greenhouse gas emissions and lower operating costs.

Addressing electricity retailers, any energy efficiency improvements lead to less energy supply and hence lower revenue/profits from the reduction in energy supply. In any national assessment of costs and benefits, however, this decrease in energy sales is offset by the increase in sales of other goods and services from consumers spending the money saved from their lower consumption of energy (hence the decrease in energy sales is not considered as a cost in section 5.6).

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.

Appliances powered by external power supplies contribute to both base electricity load and peak demand. The base load contribution arises from the no load demand of appliances not in use, plus those appliances that are permanently on (in active standby mode ready to operate), such as cordless phones, modems and answering machines. The reduction in base load due to lower no load losses and efficiency improvements for active mode for these appliances are estimated to be 53%.

It is difficult to predict the impact of external power supplies on peak load, due to the highly variable patterns of their use and the prevailing demand by the appliance they are powering. They are unlike, say, air-conditioners where external factors such as ambient temperature stimulate broad use and hence contribution to a peak load. Their contribution to load on an electricity network is likely to follow a similar pattern each week, with the bulk of the load being during working hours. Using stock estimates, with current and MEPS efficiency of external power supplies, it is estimated that MEPS will reduce active energy losses by some 19%

There are different impacts on energy distributors and transmission entities (the wires people) and the retailers. The former are regulated businesses and get a more or less fixed return on capital invested. To the extent that reduced electricity demand from EPS fractionally slows down the rate of energy growth, it defers capital investment slightly. Although this may reduce the Dollar return it also reduces the Dollars needed for investment, which at the moment is high due to the demand of peak load growth. There is no single figure that can be attributed to the benefits of reduction in peak demand as it is highly dependent on the nature of supply at each location.

For retailers, the reduction in revenue is the difference between the retail value of the energy and the cost of energy and other costs not included in the fixed service charge applied to consumers. This can be highly variable, depending upon time of use and in some cases, during peak demand periods, retailers can be exposed to large losses as cost can significantly exceed the retail value. However, to the extent that EPS energy savings (which are analogous to base load) drop the whole demand curve, it reduces retailers' exposure to the peaks of the curve, where prices are volatile and losses are possible. Therefore there may be some risk-reduction benefit as well as profit-foregone cost for retailers as well.

This is examined further in section 5.6.3.

5.5 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 these measures impact on the stock of existing products to any major extent as shown in Figure 8 and for 5% annual growth in sales and a high growth scenario respectively. In both scenarios, stock is retired after 5 years service. Within the analysis, BAU waste in 2008 is estimated to be 3% less than 2004 with this trend changing by 1% per annum and peaking at 10% in 2015. The impact of greater reductions in BAU waste are shown in section 5.6.2

Figure 8 Forecast Stock – 5% Sales Growth Scenario

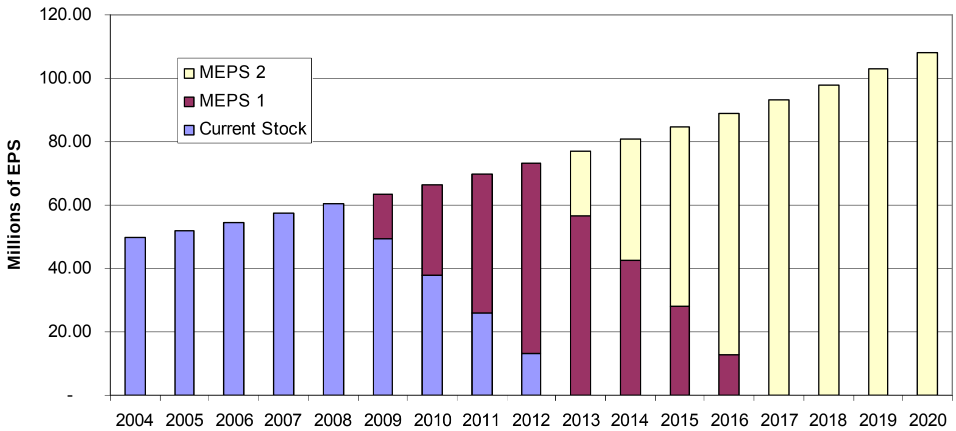
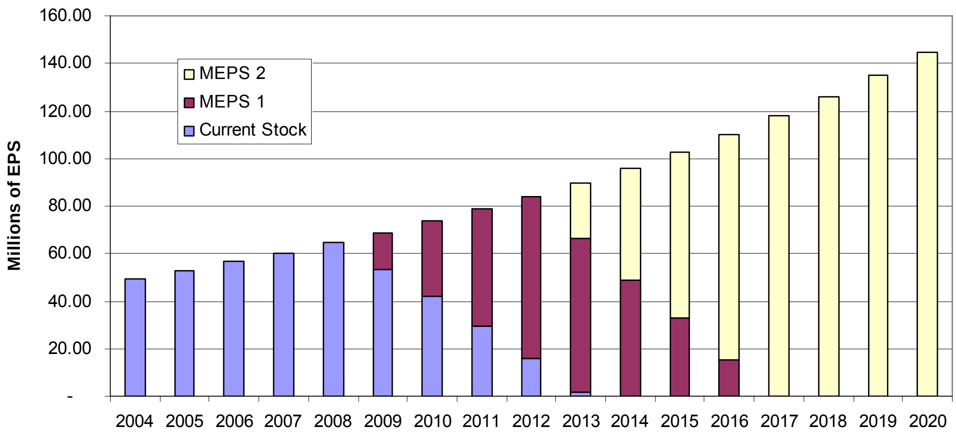


Figure 9 Forecast Stock - High Scenario



For the 5% annual growth in EPS sales, in 2015 the proposed MEPS criteria (phase (1) and (2)) are estimated to reduce annual energy consumption by 476 GWh, and in 2020 the savings will total approximately 687 GWh. (see *Figure 10*) This is equivalent to reducing annual greenhouse emissions by 450 kt CO_2-e and 606 kt CO_2-e respectively (see Figure 11). The estimated total cumulative savings in emissions by these dates are 1.94 Mt CO_2-e and 4.74 Mt CO_2-e. Note: emission savings are based upon projected state household numbers and marginal emissions-intensity of electricity supply by State 2003-2020. (See Greenhouse Gas Emission Factors in APPENDIX 8).

Figure 10 Waste Energy Consumption - BAU and MEPS Scenarios 5% Annual Sales Growth

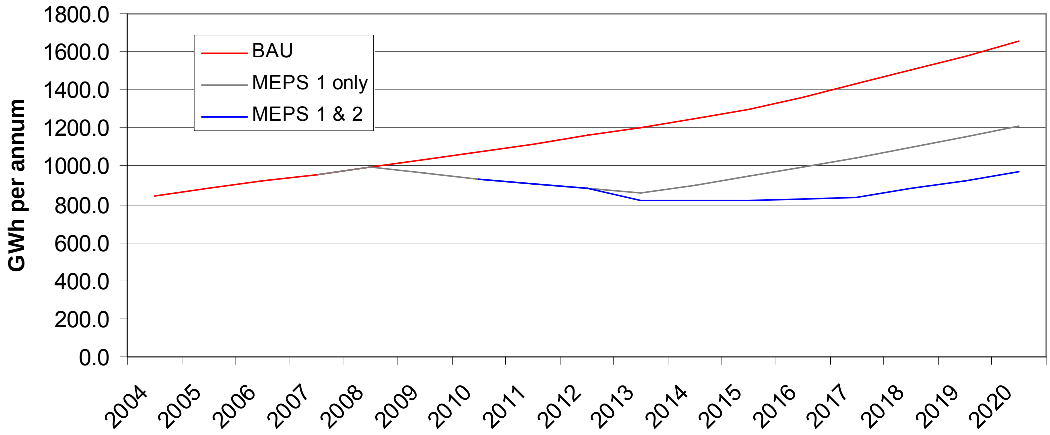
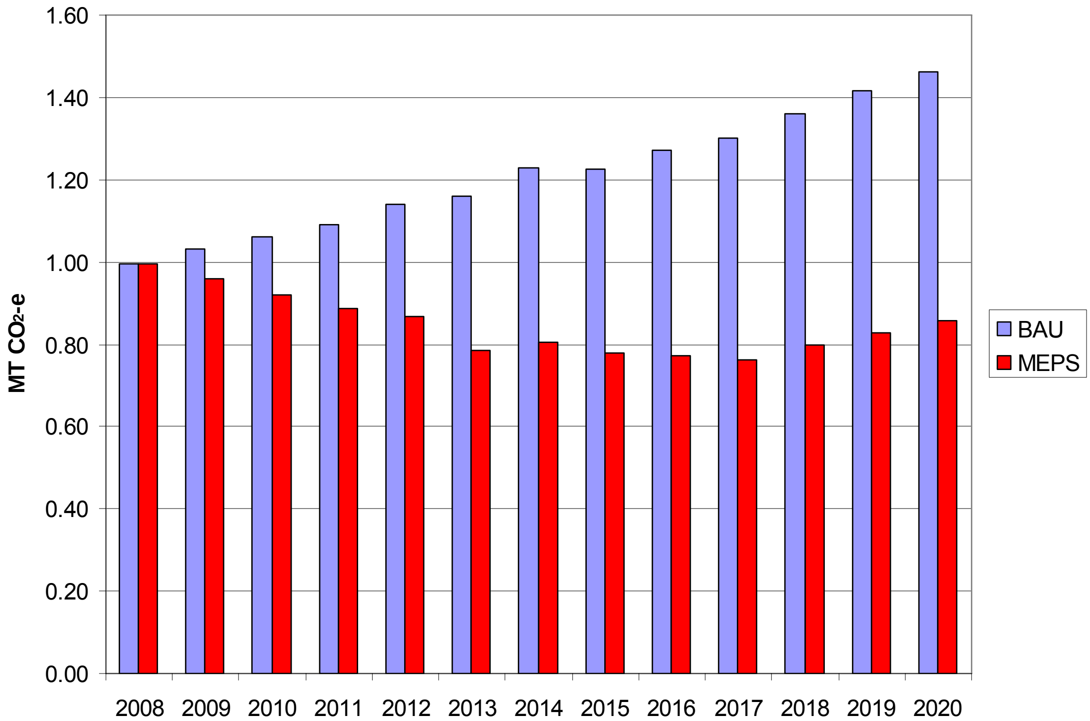


Figure 11 GHG Emissions BAU and MEPS – 5% annual sales growth



Under the high growth scenario in 2015, the proposed MEPS criteria (phase (1) and (2)) are estimated to reduce annual energy consumption by 603 GWh, and in 2020 the annual saving will be approximately 972 GWh. (see Figure 12). This is equivalent to reducing annual greenhouse emissions by 569 kt CO_2-e and 857 kt CO_2-e respectively (see Figure 13). The estimated total cumulative savings in emissions by these dates are 2.33 Mt CO_2-e and 6.12 Mt CO_2-e. Note: emission savings are based upon projected state household numbers and marginal emissions-intensity of electricity supply by State 2003-2020. (See Greenhouse Gas Emission Factors in APPENDIX 8).

Figure 12 Forecast Energy Consumption – High Sales Growth Scenario

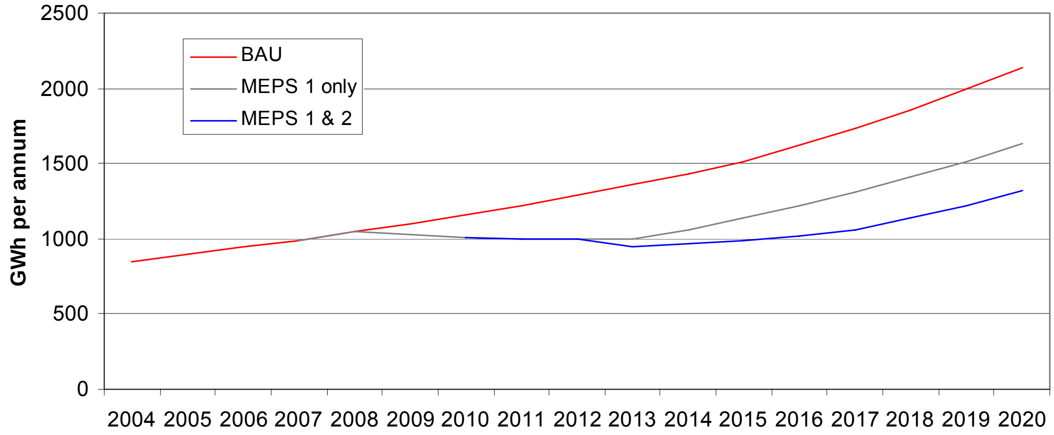
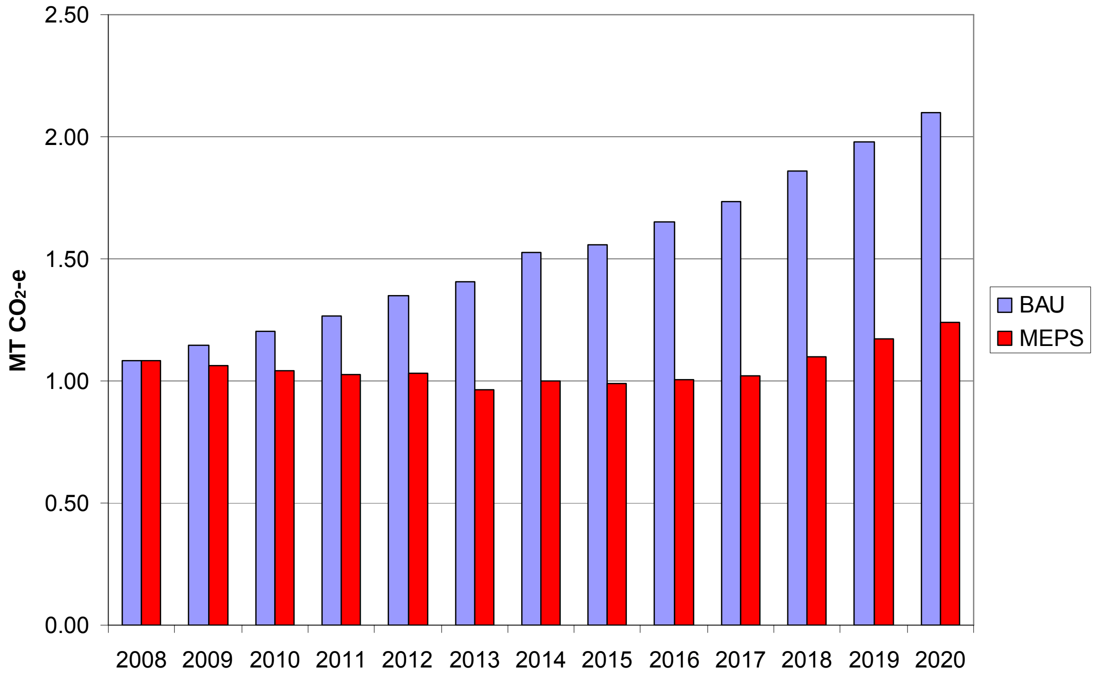


Figure 13 GHG Emissions High Growth Scenario



5.6 Australia - National and State costs and benefits

5.6.1 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, for the two different sales growth scenarios. The rationale for using retail prices here is that the economic value of the electricity saved is the reduction in consumers' expenditure on electricity. (An alternative rationale is provided in section 5.6.3 where the savings are valued at the 'avoidable cost' or variable cost of the electricity, which is lower than the retail price.) Table 25 and Table 27 shows the Net Present Value and Benefit Cost Ratios for Australia for a range of discount rates.

NOTE – All data tables currently based on EPS prices as per Table 16 with the price variations for MEPS compliant EPS. All State and Federal program costs are included.

Table 25 Financial Analysis – Australia 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 1,176.8	$ 361.7	$ 815.1	3.25
5%	$ 641.2	$ 245.7	$ 395.5	2.61
7.5%	$ 485.9	$ 205.9	$ 280.0	2.36
10%	$ 374.2	$ 174.4	$ 199.8	2.15

Table 26 Financial Analysis – Australia High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 1,579.8	$ 460.1	$ 1,119.7	3.43
5%	$ 849.2	$ 308.4	$ 540.8	2.75
7.5%	$ 639.0	$ 256.8	$ 382.1	2.49
10%	$ 488.6	$ 216.1	$ 272.5	2.26

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

Table 27 summarises the cost benefit ratio for each state at 7.5% discount rate at the 5% and high growth scenario. 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 cooling and heating loads. For example, NT and Victorian tariffs are similar, but the benefit cost ratio is superior in the NT due to the reduction of additional cooling load.

Table 27 Summary for Benefit Cost Ratio, Energy Tariffs, Heating and Cooling at 5% and High Growth and 7.5% discount rate.

State	Benefit Cost Ratio 5% growth	Benefit Cost Ratio High growth	Domestic Tariff c/kWh	Commercial Tariff c/kWh	Office % Cooling	Office % Heating
SA	2.79	2.94	14.8	16.0	87	13
Qld	2.47	2.61	11.6	15.0	100	0
ACT	2.10	2.22	11.0	14.0	69	31
NT	3.01	3.18	15.4	17.0	100	0
Tas	2.22	2.34	12.5	14.0	52	48
Vic	2.84	2.99	15.6	16.0	73	27
WA	2.79	2.93	14.7	15.0	95	5
NSW	2.29	2.41	11.0	14.0	94	6

Table 28 to Table 43 show the financial analysis for each State for a range of discount rates. The previous comments on tariffs and heating/cooling apply.

Table 28 Financial Analysis – New South Wales 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 342.5	$ 116.9	$ 225.6	2.93
5%	$ 186.7	$ 75.6	$ 111.1	2.47
7.5%	$ 141.5	$ 61.9	$ 79.6	2.29
10%	$ 109.0	$ 51.2	$ 57.8	2.13

Table 29 Financial Analysis – New South Wales High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 459.7	$ 148.8	$ 310.9	3.09
5%	$ 247.2	$ 95.0	$ 152.2	2.60
7.5%	$ 186.0	$ 77.3	$ 108.7	2.41
10%	$ 142.3	$ 63.6	$ 78.7	2.24

Table 30 Financial Analysis – Victoria 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 307.6	$ 84.5	$ 223.2	3.64
5%	$ 167.9	$ 54.7	$ 113.2	3.07
7.5%	$ 127.4	$ 44.8	$ 82.6	2.84
10%	$ 98.2	$ 37.1	$ 61.1	2.65

Table 31 Financial Analysis – Victoria High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 412.8	$ 107.5	$ 305.3	3.84
5%	$ 222.3	$ 68.7	$ 153.5	3.23
7.5%	$ 167.4	$ 55.9	$ 111.5	2.99
10%	$ 128.1	$ 46.0	$ 82.1	2.78

Table 32 Financial Analysis – Queensland 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 236.2	$ 74.4	$ 161.8	3.17
5%	$ 128.2	$ 48.0	$ 80.3	2.67
7.5%	$ 97.0	$ 39.2	$ 57.8	2.47
10%	$ 74.6	$ 32.4	$ 42.2	2.30

Table 33 Financial Analysis – Queensland High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 317.4	$ 94.9	$ 222.5	3.34
5%	$ 170.1	$ 60.4	$ 109.7	2.82
7.5%	$ 127.7	$ 49.0	$ 78.7	2.61
10%	$ 97.5	$ 40.3	$ 57.3	2.42

Table 34 Financial Analysis – South Australia 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 97.3	$ 27.2	$ 70.1	3.58
5%	$ 53.2	$ 17.6	$ 35.6	3.02
7.5%	$ 40.4	$ 14.5	$ 25.9	2.79
10%	$ 31.2	$ 12.0	$ 19.2	2.60

Table 35 Financial Analysis – South Australia High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 130.5	$ 34.5	$ 95.9	3.78
5%	$ 70.4	$ 22.1	$ 48.3	3.18
7.5%	$ 53.0	$ 18.0	$ 35.0	2.94
10%	$ 40.6	$ 14.8	$ 25.8	2.74

Table 36 Financial Analysis – Western Australia 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 139.5	$ 39.1	$ 100.5	3.57
5%	$ 75.8	$ 25.2	$ 50.6	3.01
7.5%	$ 57.4	$ 20.6	$ 36.8	2.79
10%	$ 44.1	$ 17.0	$ 27.1	2.59

Table 37 Financial Analysis – Western Australia High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 187.5	$ 49.8	$ 137.7	3.76
5%	$ 100.5	$ 31.7	$ 68.8	3.17
7.5%	$ 75.5	$ 25.7	$ 49.8	2.93
10%	$ 57.7	$ 21.1	$ 36.5	2.73

Table 38 Financial Analysis – Tasmania 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 22.9	$ 8.1	$ 14.9	2.84
5%	$ 12.6	$ 5.2	$ 7.3	2.40
7.5%	$ 9.6	$ 4.3	$ 5.3	2.22
10%	$ 7.4	$ 3.6	$ 3.8	2.07

Table 39 Financial Analysis – Tasmania High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 30.7	$ 10.2	$ 20.5	3.00
5%	$ 16.6	$ 6.6	$ 10.0	2.53
7.5%	$ 12.5	$ 5.4	$ 7.2	2.34
10%	$ 9.6	$ 4.4	$ 5.2	2.18

Table 40 Financial Analysis – Northern Territory 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 14.7	$ 3.8	$ 10.9	3.86
5%	$ 8.0	$ 2.5	$ 5.5	3.25
7.5%	$ 6.0	$ 2.0	$ 4.0	3.01
10%	$ 4.6	$ 1.7	$ 3.0	2.79

Table 41 Financial Analysis – Northern Territory High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 19.8	$ 4.9	$ 15.0	4.08
5%	$ 10.6	$ 3.1	$ 7.5	3.44
7.5%	$ 8.0	$ 2.5	$ 5.5	3.18
10%	$ 6.1	$ 2.1	$ 4.0	2.95

Table 42 Financial Analysis – Australian Capital Territory 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 16.0	$ 5.9	$ 10.1	2.70
5%	$ 8.8	$ 3.9	$ 4.9	2.27
7.5%	$ 6.6	$ 3.2	$ 3.5	2.10
10%	$ 5.1	$ 2.6	$ 2.5	1.96

Table 43 Financial Analysis – Australian Capital Territory High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 21.5	$ 7.6	$ 14.0	2.85
5%	$ 11.6	$ 4.8	$ 6.8	2.40
7.5%	$ 8.7	$ 3.9	$ 4.8	2.22
10%	$ 6.7	$ 3.2	$ 3.4	2.06

Figure 14 shows the forecast savings by State over the period 2008 to 2020 at a discount rate of 7.5% for the 5% sales growth scenario. The negative benefits reflect the initial incremental cost increase on EPS prices before the reduced energy costs occur. The data used to generate Figure 14 is detailed in APPENDIX 10.

Figure 14 Annual Net Benefit $M 5% Sales Growth Scenario

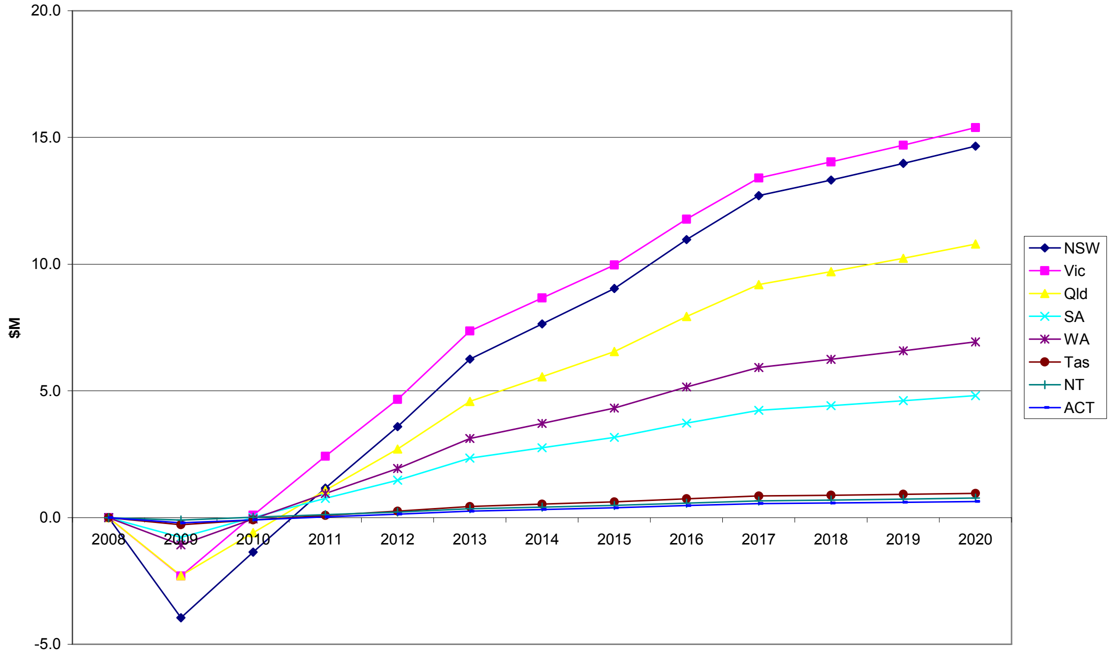
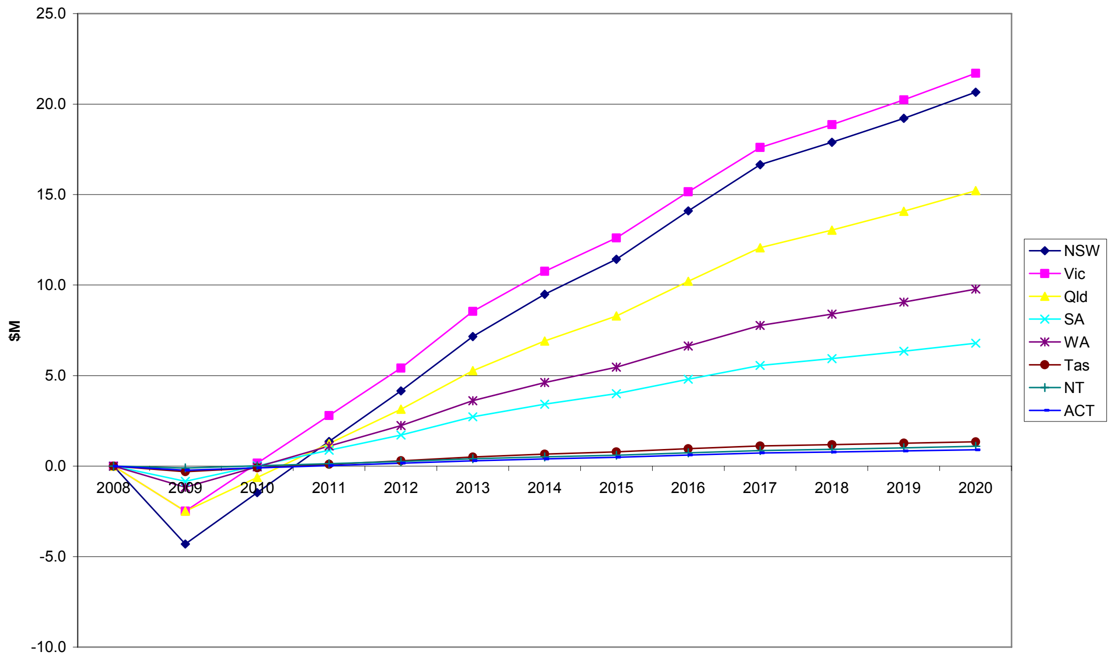


Figure 15 shows the forecast savings by State over the period 2008 to 2020 at a discount rate of 7.5% for the high sales growth scenario. The negative benefits reflect the initial incremental cost increase on EPS prices before the reduced energy costs occur. The data used to generate Figure 15 is detailed in APPENDIX 10

Figure 15 Annual Net Benefit $M High Sales Growth Scenario



5.6.2 Summary data for alternative BAU waste energy reductions

5% growth scenario

The impact of greater reduction in BAU waste energy compared to the base case is shown Table 44 for the 5% growth scenario. It provides data for a 2% reduction per annum, peaking at 20% in 2015 and the third case where BAU waste reduces to the equivalent of MEPS in 2015. Note, for the calculation of MEPS investment in these two cases, any natural "free of cost" improvement to the BAU case would also apply to the MEPS option.

Table 44 Summary data for other reduction rates in BAU waste – 5% scenario

7.5% discount rate	**Base case 1% pa, peak 10%**	**2% pa, peak 20%**	**Equals MEPS in 2015**
Energy saved	8,536 GWh	6,253 GWh	2,725 GWh
CO2 – e saved	7.6 Mt	5.7 Mt	3.0 Mt
Total Benefit	A$ 485.9 Million	$ 357.2 Million	$ 173.2 Million
Investment	A$ 205.9 Million	$ 187.5 Million	$ 161.2 Million
Benefit cost ratio	2.36	1.9	1.07

High growth scenario

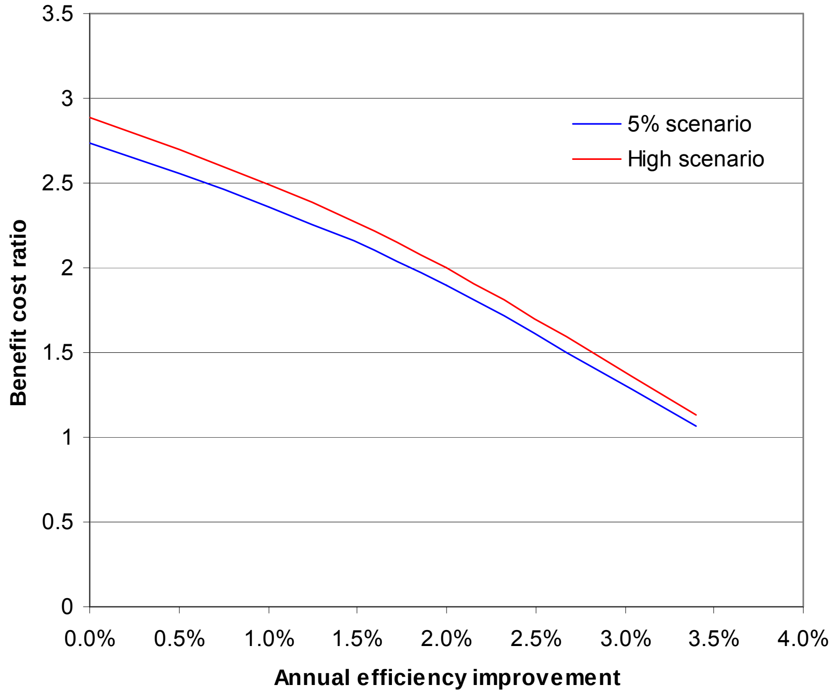
The impact of greater reduction in BAU waste energy compared to the base case is shown Table 44 for the high growth scenario. It provides data for a 2% reduction per annum, peaking at 20% in 2015 and the third case where BAU waste reduces to the equivalent of MEPS in 2015. Note, for the calculation of MEPS investment in these two cases, any natural "free of cost" improvement to the BAU case would also apply to the MEPS option.

Table 45 Summary data for other reduction rates in BAU waste – High scenario

7.5% discount rate	**Base case 1% pa, peak 10%**	**2% pa, peak 20%**	**Equals MEPS in 2015**
Energy saved	11,459 GWh	8,356 GWh	3,995 GWh
CO2 – e saved	10.4 Mt	7.6 Mt	3.6 Mt
Total Benefit	A$ 639.0 Million	$ 467.5 Million	$ 222.6 Million
Investment	A$ 256.8 Million	$ 233.4 Million	$ 200.5 Million
Benefit cost ratio	2.49	2.00	1.13

Figure 16 shows the data from the previous tables in graphical form.

Figure 16 Benefit cost ratio versus Annual efficiency improvement



5.6.3 Community at large analysis - valued at the "avoidable cost" of electricity

In this section, the national benefits and costs are valued only at the 'avoidable cost' of electricity for the two different sales growth scenarios. This 'avoidable' component of electricity costs is less than the full retail tariff, as explained below.

From an economy wide perspective, it can be argued that the true economic value of the saving that results from reducing electricity consumption is considerably less than the retail value of the electricity, and that this should be valued at its 'avoidable cost' or variable cost that excludes sunk costs and other fixed costs. The rationale for considering only the avoidable cost of the electricity saved is that this is the only economic resource freed/available for use elsewhere in the economy.

The following extract on the avoidable cost of electricity is from the Consultation RIS 'Proposal to include standby power in the energy ratings of clothes washers and dishwashers'. This was prepared by Seneca Consulting in May 2006, and is available at http://www.energyrating.gov.au/library/pubs/200605-ris-standby-cw-dw.pdf The appendix referred to is on pp 61-63.

> "**Avoidable cost of electricity**
>
> "The cost of electricity consists of the cost of electricity generation (including the energy lost as heat in transmission and distribution), the cost of network services (poles, wires and substations for transmission and distribution of electricity) and the market costs associated with functions such as metering, billing and advertising. These costs are recovered in the tariffs charged to consumers and they rightly look to the tariff schedules to determine the value of energy savings. However some of these costs are not avoidable, which means they cannot be reduced by energy saving measures. A trivial example is that the cost of metering and billing is independent of the amount of energy used.

"We have estimated the avoidable cost of electricity at 8 cents/kWh, comprising 7 cents/kWh in avoided cost of generation and 1 cent/kWh in avoided network costs. (In contrast, our figure for the marginal tariff is 12.7 cents/kWh.) The details are provided in section B.5 of appendix B. Briefly, however, the estimate is obtained by separately identifying the marginal network charges and the marginal retailer charges and applying a significant discount to the former. We recognise that there is considerable uncertainty about this estimate, reflecting the lack of information about the time profile of standby power. We have implicitly assumed that standby power has an average load profile. This may be incorrect. On the one hand, the avoidable cost of energy used overnight can be very low, with only the most efficient generating units in operation and excess network capacity available at zero marginal cost. On the other hand, many washing cycles are initiated during the morning and evening peaks and subsequently left in end-of-cycle mode during these peaks. The avoidable cost of peak electricity often exceeds the marginal tariff. Our sense of the uncertainties is reported in the sensitivity tests, section 5.7."

Note that the analysis in the EPS RIS spans a period of only 18 years (2008-2025), which is considerably shorter than the life of most electricity generation assets. So costs that cannot be avoided are treated as fixed costs here. If the analysis was over many decades, however, then all fixed costs become variable and the appropriate valuation would be at full cost.

In this analysis, electricity savings are estimated from the Australian data, and are valued at the avoidable cost of electricity, estimated at 8 cents/kWh. No consideration is given to any potential benefits of the electricity savings to the electricity generation, distribution and retail sectors, as described in section 5.4.3.

Table 46 compares the data and benefit cost ratios for the two cases of valuation at retail tariff and valuation at avoidable cost at the 5% growth scenario.

Table 46 Benefit & cost summary for Australia - 5% growth scenario - A$ millions

Discount Rate	NPV Benefits Retail Prices $M	NPV Benefits Avoidable Cost $M	NPV Costs $M	Benefit Cost Ratio Retail Prices	Benefit Cost Ratio Avoidable Cost
0%	1176.8	937.16	361.7	3.25	2.59
5%	641.2	493.27	245.7	2.61	2.01
7.5%	485.9	367.74	205.9	2.36	1.79
10%	374.2	278.89	174.4	2.15	1.60

Table 47 compares the data and benefit cost ratios for the two cases of valuation at retail tariff and valuation at avoidable cost at the high growth scenario.

Table 47 Benefit & cost summary for Australia - high growth scenario - A$ millions

Discount Rate	NPV Benefits Retail Prices $M	NPV Benefits Avoidable Cost $M	NPV Costs $M	Benefit Cost Ratio Retail Prices	Benefit Cost Ratio Avoidable Cost
0%	1579.8	1269.64	460.1	3.43	2.76
5%	849.2	659.62	308.4	2.75	2.14
7.5%	639.0	488.30	256.8	2.49	1.90
10%	488.6	367.65	216.1	2.26	1.70

6 New Zealand

6.1 Introduction

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

6.2 Stock

As with the analysis for Australia, establishing accurate numbers of installed stock is difficult due to lack of direct data. Statistics New Zealand (SNZ), like the Australian Bureau of Statistics, does not collect data on external power supplies. Also, due to the grouping of products, that may or may not be powered by an external power supply, it is not possible to make accurate estimates from SNZ data of external power supply stock in New Zealand.

Data from three sources has been used to estimate New Zealand's stock of external power supplies.

In January 2005 the Energy Efficiency and Conservation Authority (EECA) published a report, prepared by Dialogue Consulting, on standby energy use. [EECA 2005] The authors also identified that specific data for external power supplies was difficult (impossible) to obtain from the two major data sources - Statistics New Zealand (SNZ) and a household energy report. [HEEP 2005] As with the Australian Bureau of Statistics, Statistics New Zealand group products that may or may not utilise external power supplies.

Table 1 in the EECA report for 2004 has been analysed on import data of external power supplies and products, such as laptops and tools, likely to utilise external power supplies. From this report, the total estimated 2004 import quantity is 2.05 million. Estimated sales in Australia for 2004 is 10.88 million, which after applying the ratio of Australian households to New Zealand households returns estimated sales of 2.12 million for New Zealand. It is identified, within the report, that there is no data for some products that utilise external power supplies, therefore the 2.04 million is an underestimate. In the absence of more accurate data, the New Zealand analysis utilises 2.12 million sales in 2004 from the pro rata sales figures in the Australian sales estimate.

In support of the previous estimates, Statistics New Zealand published data on computer and internet use in business and households for 2001, which also compared their use between New Zealand, Australian and Canadian Standards data. The report shows that New Zealand use of computers and the internet was 5% higher than Australia. [SNZ 2001] Whilst not directly related to external power supplies, it is useful as an indicator that New Zealand's use of technology is equal to or greater than Australia's. From this it is assumed that there are sufficient similarities between the two countries to use the same stock per household as in the Australian analysis, resulting in an estimated stock of 10.29 million external power supplies in 2004.

Finally, personal communication with Michael Camilleri of BRANZ Ltd. in New Zealand indicates similar household external power supply ownership as in Australia.

6.3 Assumptions

The proportion of external power supplies in the residential and non residential sectors is the same as Australia.

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

External power supply costs and incremental costs are the same as the Australian analysis, as they are packaged with internationally traded end use products.

Indirect energy is based upon the heating and cooling for Tasmania for the commercial sector. Additional calculation methodology details are in APPENDIX 11.

6.4 Data

The household electricity tariff is NZ$ 0.204 per kWh and the commercial tariff is NZ$ 0.16 per kWh. [EECA 2007]

The marginal electricity system CO_2–e intensity coefficient is 0.698 kg/kWh.

The exchange used is NZ$ 1.10 = A$ 1.00 [EECA 2006]

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 E_3 funding.

Summary data is reported at 5% discount rate. [EECA 2007]

6.5 Energy and Greenhouse Gas Emissions

6.5.1 5% annual sales growth scenario

For the 5% annual growth in EPS sales, by 2015, the proposed MEPS criteria (phase (1) and (2)) are estimated to reduce annual energy consumption in that year by 86 GWh, and by 2020 the annual saving in that year will be approximately 123 GWh. This is equivalent to reducing annual greenhouse emissions by 60 kt CO_2-e and 86 kt CO_2-e respectively. The estimated total cumulative savings in emissions by these dates are 253 kt CO_2-e and 640 kt CO_2-e. Note: emission savings are based upon projected household numbers.

Figure 17 Forecast Waste Energy Consumption - 5% Sales Growth Scenario

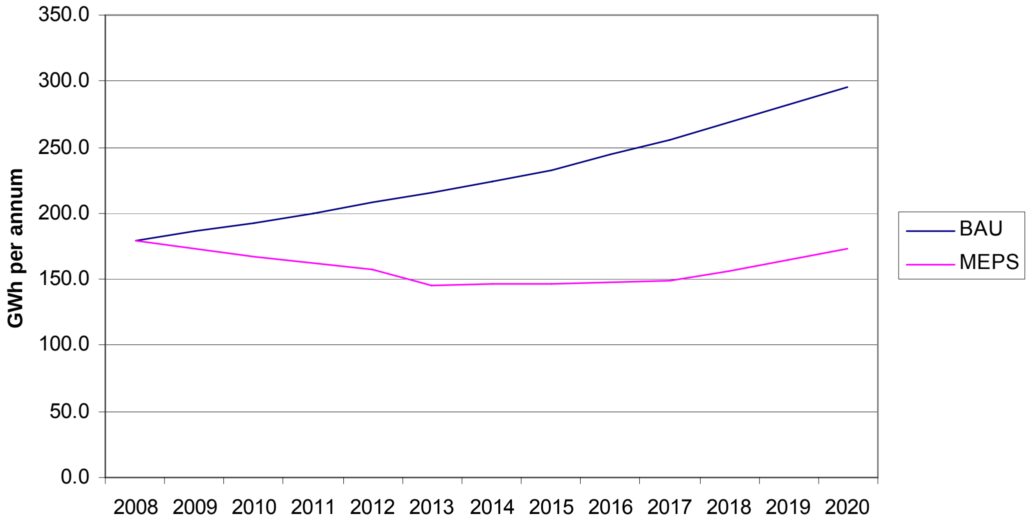
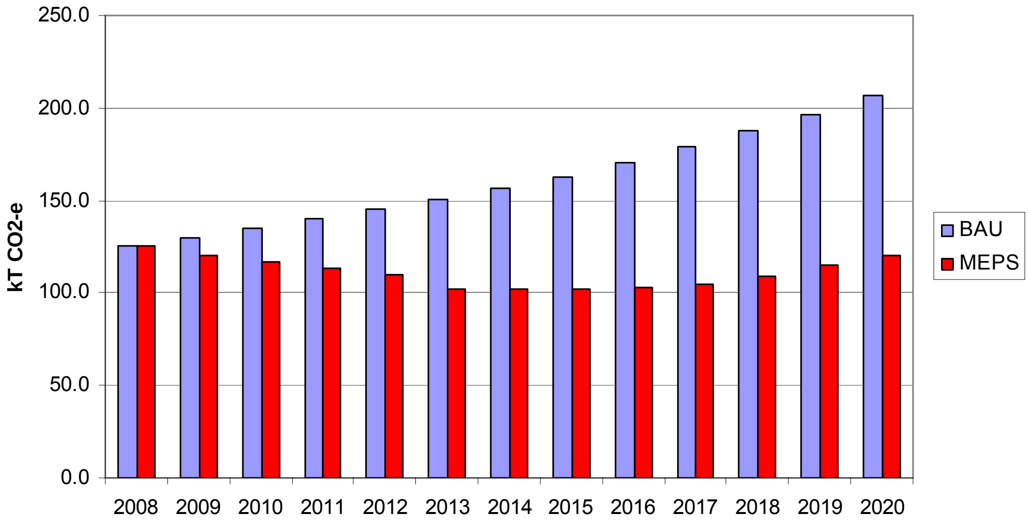


Figure 18 Forecast Greenhouse Gas Emissions 5% sales Growth Scenario



6.5.2 High annual sales growth

For the high annual growth in EPS sales, in 2015, the proposed MEPS criteria (phase (1) and (2)) are estimated to reduce annual energy consumption by 108 GWh, and in 2020 the annual saving will total approximately 174 GWh. This is equivalent to reducing annual greenhouse emissions by 75.7 kt CO_2-e and 121.5 kt CO_2-e respectively. The estimated total cumulative savings in emissions by these dates are 304 kt CO_2-e and 829 kt CO_2-e. Note: emission savings are based upon projected household numbers.

Figure 19 Forecast Waste Energy Consumption - High Sales Growth Scenario

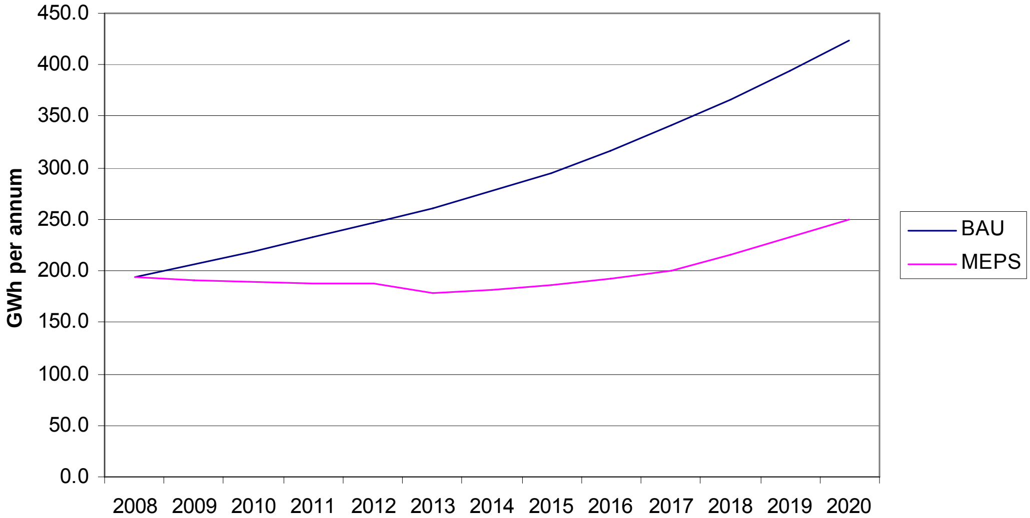
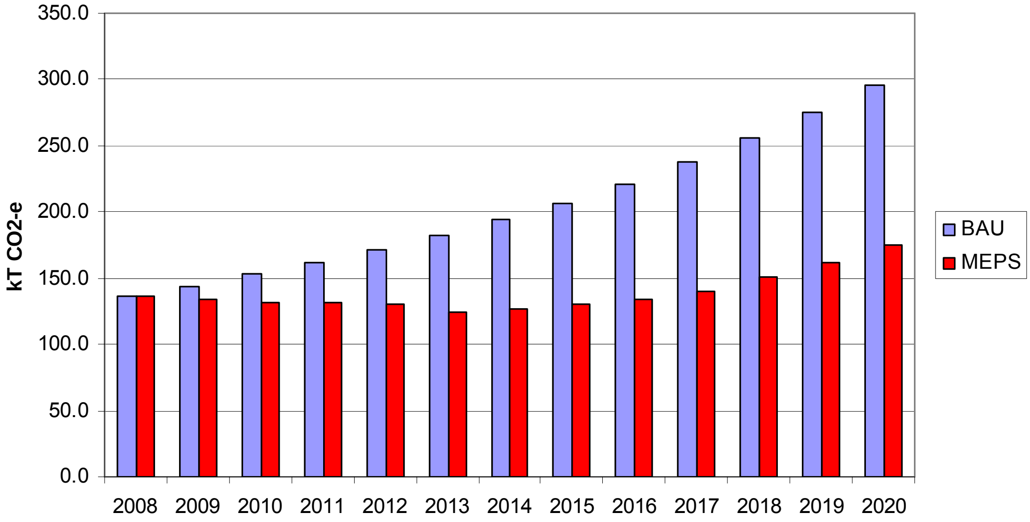


Figure 20 Forecast Greenhouse Gas Emissions - High Sales Growth Scenario



6.6 Summary Data

Table 48 New Zealand Financial Summary 5% Annual Sales Growth

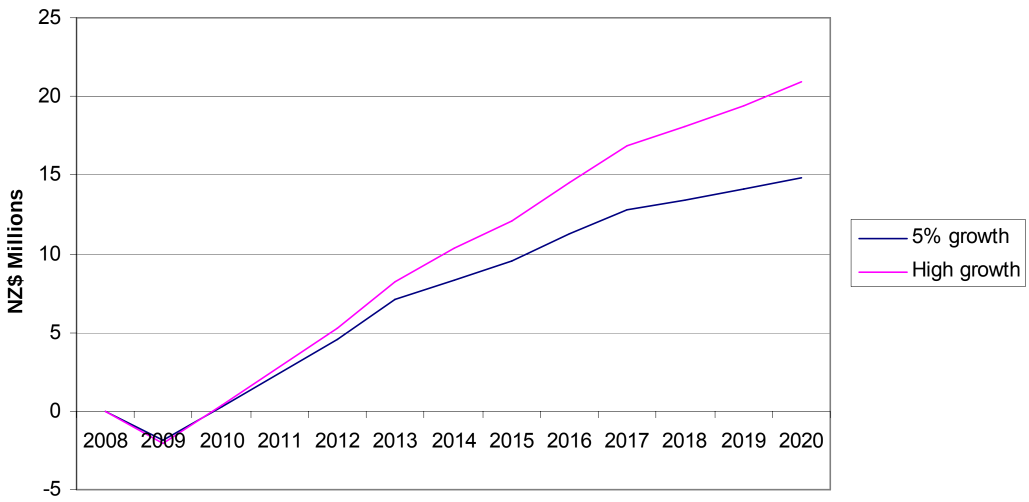
Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$ 287.3	$ 75.1	$ 212.2	3.8
5%	$ 156.7	$ 48.6	$ 108.1	3.2
7.5%	$ 118.8	$ 39.8	$ 79.0	3.0
10%	$ 91.5	$ 32.9	$ 58.6	2.8

Table 49 New Zealand Financial Summary High Sales Growth

Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$ 385.6	$ 95.6	$ 290.1	4.0
5%	$ 207.4	$ 61.0	$ 146.4	3.4
7.5%	$ 156.2	$ 49.6	$ 106.5	3.1
10%	$ 119.5	$ 40.8	$ 78.6	2.9

Note – net benefits are evaluated to 2025 based upon an average 5 year service life for external power supplies purchased in 2020.

Figure 21 Annual Net Benefit – 5% and High Growth Scenarios



7 CONSULTATIONS AND COMMENTS

***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)

7.1 Consultations

The MEA Technical Report and the NAEEEC Profile were launched at the NAEEEC public forum in Brisbane on 26 October 2004. Industry participants were invited to attend a workshop on the technical report and NAEEEC plans, and to provide comments over a three month period. The profile was also made available on the public web site www.energyrating.gov.au and comments were invited.

The requirements were also discussed at a special meeting of Standards Australia Committee TE-01 on 29 September 2004, which includes industry representation. Members of the committee have been extensively consulted in the drafting of the Test Standard and the Regulatory Standard. The committee issued drafts for ballot on 27 July 2005.

In addition, presentations have been made to CESA, the Consumer Electronics Suppliers Association at their meetings on 1 June and 10 August 2005. Considerable debate has been conducted between the AGO and CESA on this issue, in order to reach an agreement on the details of the MEPS requirements.

On 13 September 2006, an early draft of the RIS, its contents and the RIS process was presented to a meeting of the Consumer Electronics Suppliers Association. The same information was presented to a wider audience of stakeholders in Sydney on 24 October 2006.

At the National Standby Conference in Canberra in November 2006, a presentation was given on external power supplies and battery chargers to inform attendees on which external power supplies are covered by AS/NZS4665 and to flag intentions to analyse battery charger energy performance.

The first Consultation RIS was published in March 2007 with an invitation to provide comments in April 2007. Subsequently forums were held in Sydney and Auckland to discuss the RIS in May 2007. The following section provides an overview of the submissions on the RIS and the comments received at the forum, and an overview of comments and responses from earlier consultation.

7.2 Summary of Comments and Responses

Summary of submissions on Consultation RIS of March 2007 and at May 2007 forum

Issue	Recommendations/comments
Family of models (a request to lower registration costs to suppliers)	Amend standard based upon proposed US ENERGY STAR. “An EPS model family would be defined as a group of switchmode external power supplies that feature the same design (e.g. circuitry components), transformer, and output wattage, but differ in rated output voltage.” In addition, the standard will require amendment to specify test and data requirements as follows. Testing and reporting of efficiency data for the highest and lowest output voltage members of the EPS model family that meets the part 2 of the standard.
Inability of AC-AC EPS over 40VA to meet no-load and efficiency MEPS.	Amend standard to remove no-load requirement. Note – most AC-AC applications do not operate in no-load.
Testing at 115Vac in a 230 Vac market.	Amend standard to remove testing and marking requirement for 115Vac.
Remove registration requirement and introduce a system of supplier declaration.	E3 has explored supplier registration options. Results of discussions held with the Australian Communications and Media Authority (ACMA) regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has also since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or ‘families’ of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.
Concerns on time for the Regulators to handle registration.	It is proposed to amend the standard to utilise the US ENERGY STAR definition of family of models as it provides greater clarity has been developed in response to specifications that have been in place longer than the Australian and New Zealand standard and will assist in reducing registration processing time and costs for ‘Family of Models’.

Detailed individual submissions and responses are at APPENDIX 13.

Summary of comments prior to the release of the Consultation RIS in March 2007

Comment	Response/action
There are no major objections to the standard AS/NZS4665 and the Draft RIS for AC-DC external power supplies.	
Two designers and importers of AC-AC external power supplies advise that compliance with no load levels for these external power supplies rated above 40VA is not possible.	Additional information has been provided by these companies and international partners have been contacted for their opinions and data. Note – this does not affect the analysis in this RIS, as the products concerned typically do not operate in a no load mode.
From a suppliers point of view, there was concern on the cost of registration - not the need to register, but the process. It was pointed out that formats in Part 1, Part 2 and the web site are different. They felt this meant that they could not use a junior member of staff to take data directly from the test report and register on-line.	Amend the standard to provide consistency between each part and make the web site format consistent with the standard.
There was discussion of the need to test at 115Vac for the Australian market and additional costs.	Within the same discussion it was noted that many of these products are globally traded and hence are used at 115 and 230 Vac. This is also the case in 115 Vac jurisdictions and the international marking method is being amended to allow marking at one or more AC voltage as appropriate.
A general comment on any product being registered was that after on-line registration it could be 3 to 6 weeks before the regulators completed the process. A “whitegoods” supplier agreed that time from on-line registration was slow for their sector. The comment was made that this could affect their time to market.	It is unlikely that a new product is introduced without advance knowledge. Registration for MEPS should be part of the plan just as compliance, testing and registration for other matters such as C tick, etc.
Mandatory marking as per AS/NZS4665 was questioned as to time of introduction.	Marking for 230Vac will be mandatory from 1 October 2008.
Test laboratory requirements were discussed.	AS/NZS4665 does not require the use of a NATA registered laboratory. Applicants can use a laboratory of their choice and need to provide and details of tests.
Check testing – what triggers it and who does it.	Stakeholders were advised that, as with many other products, the industry is, to a degree, self-policing to ensure that all suppliers are complying. If non-compliance is suspected, then advise a Regulator and it will be investigated. Check testing is also carried out via E3 programs.
With respect to voluntary levels for external power supplies, it was	This is why mandatory MEPS provide a level playing field for all suppliers.

predicted that “Brand Name” appliance suppliers would comply, whilst others “could not care”.	
International harmonisation is imperative for all. As an example, some US States are introducing the same legislation as California, but are not keeping up to date on amendments resulting from discussion and input from industry.	This will make it difficult for suppliers due to lack of uniformity. Australia is up to date and in accord with international harmonisation.
At the National Standby Conference in Canberra in November 2006, there was continuing debate on the pros and cons of voluntary and mandatory measures. European and US industry associations are in favour of voluntary levels as opposed to mandatory levels. Australian industry associations prefer mandatory. Either way the clear message is that industry want and need to be involved as soon as possible.	In the US, the Federal Government has issued an Executive Order stating that Federal Agencies must use ENERGY STAR qualified products. As the Federal Government is one of the largest purchasers of equipment in the world, this is akin to mandatory MEPS. Europe has flagged its intention to consider mandatory MEPS for member countries.
Availability of spares.	*The Trade Practices Act 1974* requires a part to be “reasonably available” after the acquisition of the goods by a consumer. Therefore an external power supply that is made available by a manufacturer directly to a consumer or to a service or repair facility after and separate from the original sale of the product requiring the external power supply as a service part or spare part shall be exempt from meeting the above MEPS requirements for a period of 5 years from the date of introduction of MEPS.
Medical applications – other standards may prevent compliance with MEPS.	Therapeutic devices in the Australian Register of Therapeutic Goods in accordance with *The Therapeutic Goods Act 1989* as amended by *The Therapeutic Goods Amendment (Medical Devices) Bill 2002*, the *Therapeutic Goods (Medical Devices) Regulations 2002* and any subsequent amendments are exempt from meeting the above MEPS requirements. For further information see: http://www.tga.gov.au/devices/devices.htm#guidelines

8 EVALUATION AND RECOMMENDATIONS

8.1 Assessment

8.1.1 Reduce Greenhouse Gas Emissions Below Business as Usual

Based on a service life of 5 years, the majority of low efficiency EPS will therefore be removed from the Australian stock within 5 years.

It is expected that, due to their voluntary nature, the other options will not reduce inefficient EPS stocks to zero in a linear fashion. This is because the other options do not have the ability to cease sales of inefficient EPS immediately.

Due to its non-voluntary nature, mandatory MEPS option has the highest probability of reducing greenhouse gas emissions below business as usual.

8.1.2 Addressing Market Failures

By requiring the removal of low efficiency EPS from the market, mandatory MEPS will most effectively address market failures, including a reduction in average lifetime costs of appliances powered by external power supplies. All other options rely on voluntary mechanisms and therefore cannot as effectively require that average lifetime costs are taken into account (i.e. by mandating EPS with lowest lifetime costs).

Mandatory MEPS will not effectively provide buyers with improved access to product performance information, nor will any of the other options, with the exception of labelling, which would be limited in the main to the small replacement market.

The mandatory MEPS option would clearly require importers of EPS and appliances powered by EPS to remove non-complying products or utilise compliant external power supplies. This is not thought to involve negative impacts on suppliers as the volume of sales would not be substantially affected. There may be an additional benefit in that the range of external power supplies they would be required to support would decrease rather than increase. The other options would have similar negligible impacts on suppliers.

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, from sections 5.6.1. and **Error! Reference source not found.**, and the benefits are valued at retail prices and not at avoidable costs of electricity as in section 5.6.3.

Table 50 Financial Analysis – Australia 5% Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 1,176.8	$ 361.7	$ 815.1	3.25
5%	$ 641.2	$ 245.7	$ 395.5	2.61
7.5%	$ 485.9	$ 205.9	$ 280.0	2.36
10%	$ 374.2	$ 174.4	$ 199.8	2.15

Table 51 Financial Analysis – Australia High Sales Growth

Discount Rate	NPV Benefits $M	NPV Costs $M	Net Benefit $M	Benefit Cost Ratio
0%	$ 1,579.8	$ 460.1	$ 1,119.7	3.43
5%	$ 849.2	$ 308.4	$ 540.8	2.75
7.5%	$ 639.0	$ 256.8	$ 382.1	2.49
10%	$ 488.6	$ 216.1	$ 272.5	2.26

Table 52 New Zealand Financial Summary 5% Annual Sales Growth

Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$ 287.3	$ 75.1	$ 212.2	3.8
5%	$ 156.7	$ 48.6	$ 108.1	3.2
7.5%	$ 118.8	$ 39.8	$ 79.0	3.0
10%	$ 91.5	$ 32.9	$ 58.6	2.8

Table 53 New Zealand Financial Summary High Sales Growth

Discount Rate	NPV Benefits NZ$ M	NPV Costs NZ$ M	Net Benefit NZ$ M	Benefit Cost Ratio
0%	$ 385.6	$ 95.6	$ 290.1	4.0
5%	$ 207.4	$ 61.0	$ 146.4	3.4
7.5%	$ 156.2	$ 49.6	$ 106.5	3.1
10%	$ 119.5	$ 40.8	$ 78.6	2.9

8.1.4 Conclusions

After consideration of the mandatory MEPS option and the provisions of the Standard in this RIS, it is concluded that:

- The mandatory MEPS option is likely to be effective in meeting all the stated 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 possibly mis-inform consumers.
- Given that the proposal for MEPS has been in the public domain since October 2004, and the Australian Standard was published in November 2005, the program could be implemented as early as October 2008.

8.2 Recommendations (draft)

It is recommended that:

- States, Territories and New Zealand implement mandatory minimum energy performance standards for external power supplies utilising the joint Australian and New Zealand Standard AS/NZS 4665 and the proposed amendments contained within this RIS.
- 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 external power supplies to the schedule of products for which minimum energy performance standards are required.
- The regulations refer to Australian and New Zealand Standard AS/NZS 4665.1 - Performance of External Power Supplies – establishing the Test Method by which EPS are measured for energy efficiency purposes
- The regulations refer to Australian and New Zealand Standard AS/NZS 4665.1 - Performance of External Power Supplies – establishing the Energy Performance Mark as a mandatory compliance marking requirement for EPS sold in our market.
- The regulations refer to Australian and New Zealand Standard AS/NZS4665.2 – Performance of External Power Supplies – establishing the minimum energy performance standards to apply to all types of EPS
- The amendments take effect not earlier than 1 October 2008.
- State, Territory and the New Zealand governments should require registration of external power supplies, so invoking the Australian and New Zealand Standard AS/NZS 4665.2. The registration system should be for individual products or 'families' of products. Note, a working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.
- Governments agree to review EPS MEPS and agree not to impose more stringent MEPS any earlier than October 2011.

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)

External power supply 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 National Appliance and 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.

E_3 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 October 2008, the earliest possible revision would be October 2011. 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.

APPENDIX 1 References

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APPENDIX 2 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'*[2]*, 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 Council of Australian Governments (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.

The Australian Government's 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*.

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[2] 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.

In 2007, emissions trading became a major new plank in the Australian Government's response to climate change. The Prime Minister, the Hon John Howard MP, announced in June 2007 that Australia will 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 greenhouse gases. 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 3 Other Technology Factors

Typically, switch-mode type power supplies are more efficient than linear power supplies but are more expensive to manufacture. However, all costs of supply to the end user need to be considered, rather than just cost to manufacture. Most linear power supplies, particularly those used with low power consumer electronic appliances, have non-regulated outputs, so the appliance may incorporate an inbuilt voltage regulator, at additional cost. Conversely, a switch mode power supply with built-in voltage regulation, simplifies design and can reduce the manufacturing cost of the appliance.

As outlined in the previous section, linear power supplies are typically designed for specific mains voltages and frequencies. Therefore, to cater for a worldwide market, more variants are required, which may result in higher inventory and costs of qualification and certification for each external power supply in each destination country. A major advantage of switch-mode power supplies, due to their design, is that they operate over a wide input voltage range (e.g. 100-240 volts) and frequencies. This allows the “black box” and DC output lead and plug to be suitable for a wide range of countries, leading to higher manufacturing volumes and resultant reduced cost, lower inventory and shorter lead times. The only variable would then be the AC lead/plug combination.

A further consideration is that, even with the best inventory forecasting, airfreight is often necessary to meet demand fluctuations. Switch mode-power supplies are far lighter than linear power supplies for the same power rating and therefore may be air-freighted more cheaply when required. It is notable that the airfreight costs may be similar to the wholesale purchase cost for linear power supplies [Phihong 2003].

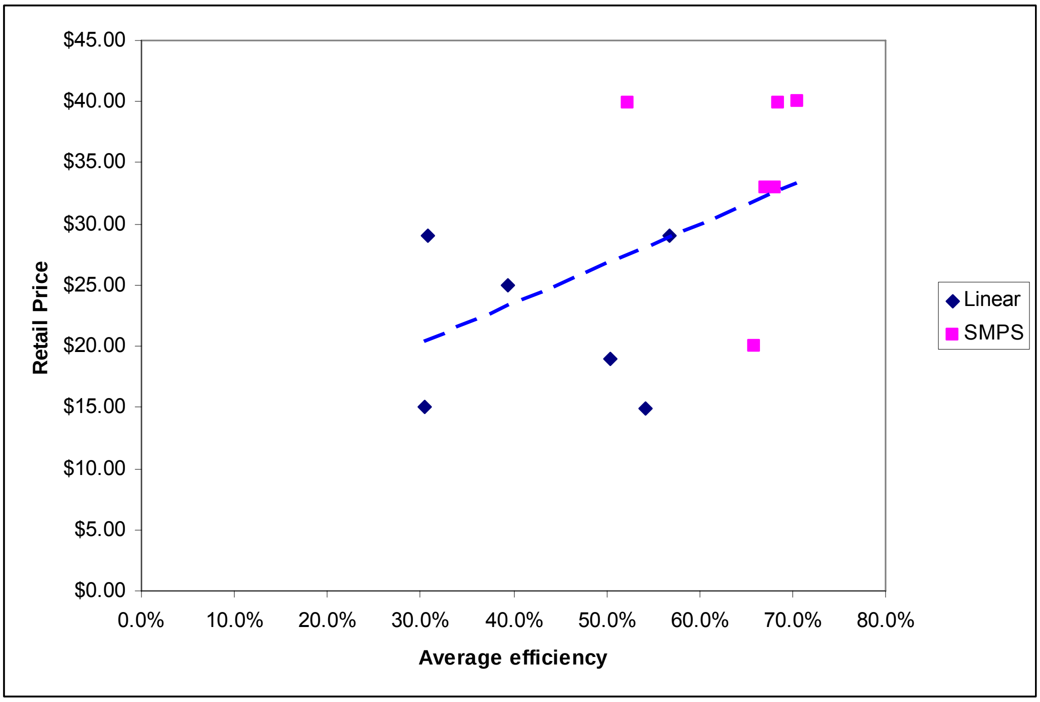
These factors indicate that the total cost of moving away from linear power supplies to more efficient technologies may have very limited effects on total appliance costs. When considering the cost of both the power supply and the end-use appliance packaged together, these additional costs may be negligible.

Being considerably smaller and lighter, switch-mode power supplies often provide further benefits, including increased marketability. Portability is a valued commodity in the current marketplace, and likely to become more so, with many consumers now needing to carry a range of power supplies for their portable devices. A survey at a business forum showed that many attendees regularly carried three or more power supplies for their portable electronic devices, and that the bulk and weight of these was considered a distinct hindrance. As appliances become smaller and lighter, the size and weight of power supplies is becoming more evident.

Even amongst switch-mode external power supplies, there is a range of efficiencies. A limited survey of appliances purchased at random and tested in Australia demonstrates that there is a correlation between efficiency and purchase price. As shown in Figure 22, the sample showed a wide variety of average efficiencies and purchase prices for external power supplies sold as replacements, and although the overall trend is upwards, there are clearly some very efficient power supplies on the market at the cheaper end of the scale. Other factors such as the rated power of the power supply probably have an influence on the cost of manufacture, and therefore may mean that the relationship between manufacturing costs and efficiency is not straightforward.

As with all newer technologies, the costs of components used in high efficiency power supplies are expected to fall as sales volumes increase.

Figure 22 Distribution of Efficiencies and Retail Prices for Replacement EPS



APPENDIX 4 The Global Market and Growth Forecast

Globally there are nearly one billion external power supplies sold every year, with at least 50% of these produced in China, and distributed equally amongst markets in Asia, North America and Europe [MEA 2004]. The majority of power supplies sold are rated less than 5 watts, and this market is heavily dominated by mobile phone chargers representing some 52% of unit sales. [PSMA 2005]. The other major market is for laptop power supplies, in the 51-100 watt category (see Figure 23) [Shepard 2004].

Figure 23 Distribution of Global Sales by Output Rating Category, 2004

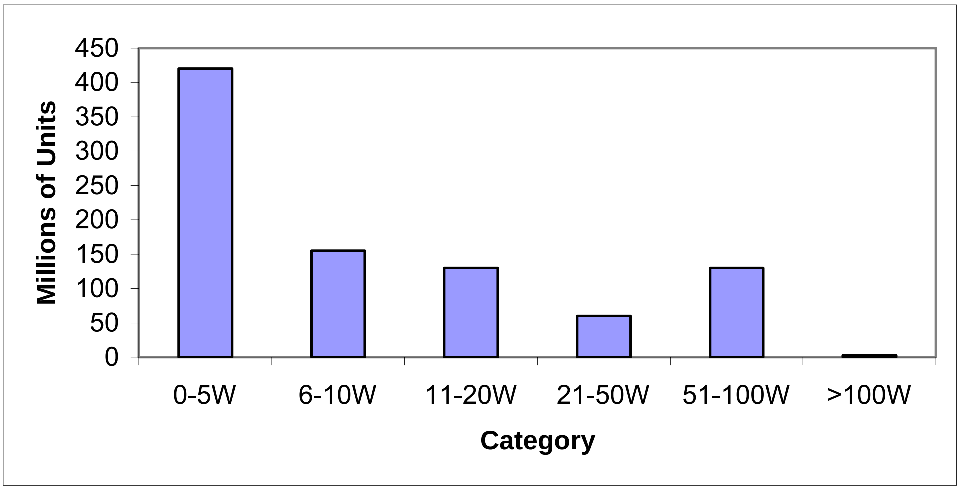
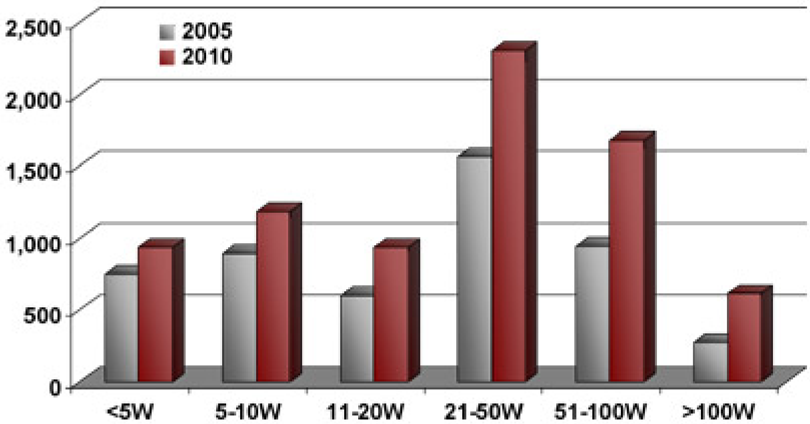


Figure 24 shows the forecast global sales in US$ M for 2005 and 2010. In growth terms, the major market growths are in the 21 – 50 W and 51 – 100 W bands. Sales of these higher powered external power supplies are also being influenced by increased penetration of larger screen (17” and larger) LCD monitors as well as the growth in laptop computers.

Figure 24 Forecast global sales US$ Millions of EPS by Wattage [PSMA 2005]



From Figure 23 and Figure 24 it can be seen that whilst low power external power supplies dominate unit sales, revenue is low, which is due to low cost, linear power supplies in a highly competitive, high volume market. The lower wattage bands are also being threatened by emerging technologies such as power over the Ethernet (PoE) and USB powering of computer connected devices up to 2.5W.

APPENDIX 5 Stock and Energy Estimates

Estimating the total energy consumed by external power supplies requires knowledge of power supply stock numbers, broken down by product application, typical efficiencies and typical loadings. Whilst some of this data is available from Australian and international studies, there are still significant unknowns.

Two surveys of Australian households have been conducted in recent years.

In 2001 an Australian household appliance survey found that the average Australian household contained at least 5 appliances likely to utilise an external power supply. Such appliances include mobile phones, cordless phones, answering machines, “dustbusters”, laptops, computer speakers, playstations and other battery operated appliances [NAEEEC 2001]. Note however that this study did not set out to document the number of external power supplies in homes.

In 2005, a survey on standby energy use in households was conducted. This found that, within the sample, the average number of external power supplies owned was 6.86 per household and the quantity in use is 4.7 per household. [E3 2006]

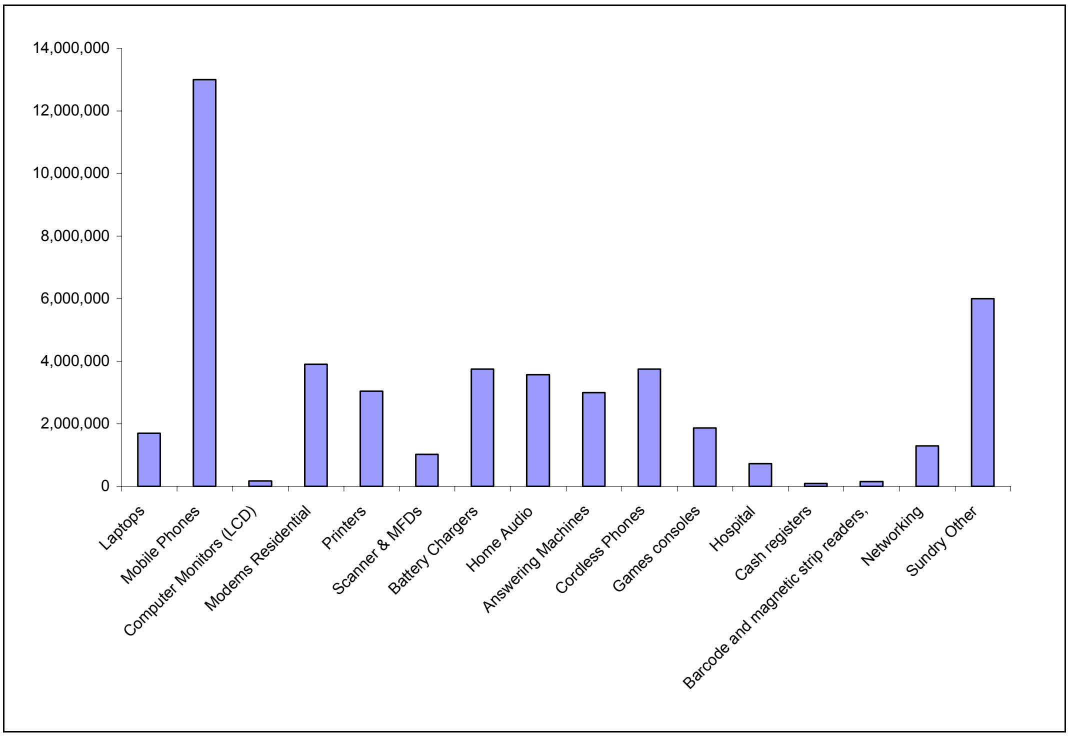
From this report it is estimated that there are 53 million external power supplies owned and 36 Million external power supplies in use in the 7.8 million Australian households.

It should be noted that many countries are also experiencing difficulties in obtaining accurate estimates of the numbers of external power supplies in operation, because they are so widely used on such a diverse range of appliances, and because their numbers appear to be growing rapidly.

A Natural Resources Defense Council report from the US states that, including commercial uses, there may be more than one billion products using external power supplies in the USA [NRDC 2002]. Assuming that there are a similar number of such products per capita in Australia, then it is possible that there are circa 50 million external power supplies in operation in Australia. In 2004, NAEEEC published a report entitled Analysis of Potential for Minimum Energy Performance Standards - External Power Supplies [MEA 2004]. This report estimated the stock and total energy consumption of appliances powered by external power supplies, broken down by application. These estimates compare well with Arthur D Little’s office energy consumption report and Australian studies. [ADL 2002, NAEEEC 2001 and E3 2006]. In the absence of more accurate information, the data from MEA 2004 and E3 2006 has been used for the modelling in this RIS.

Based upon the research for this report, Figure 25 shows the estimated distribution of power supplies by application in Australia.

Figure 25 Estimated distribution of external power supply stock by application

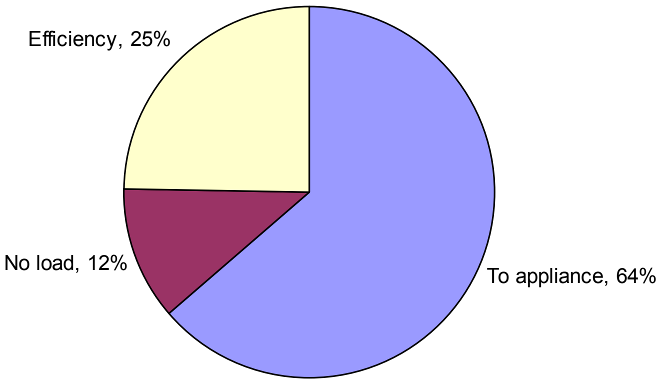


The energy consumption of external power supplies can be broadly categorised into two modes:

Active mode - energy used by the appliance and energy lost as heat in the conversion process.

No load mode, where the appliance is plugged in to mains electricity supply but switched off or unattached from the appliance being powered.

Across the entire product sector, it is estimated that no load mode accounts for some 12% of all energy consumption and conversion efficiency 25% of all energy consumption.



Based upon the estimated distribution by application from Figure 25 and on estimates of time spent in no load mode and in active mode, Table 54 shows estimated no load and efficiency loss energy consumption of a range of appliances powered by external power supplies.

Approximately 45% of wasted energy due to external power supplies arises from low wattage (up to 10 Watts) applications. These applications use approximately 64% of all external power supplies manufactured and are typified by low efficiency, low cost external power supplies. Higher efficiency power supplies are available, however low uptake inhibits economies of scale.

Table 54 Estimated direct no load and efficiency loss energy consumption by application and sector

Application	Estimated Residential stock	Other Stock	Residential Stock GWh pa	Other Stock GWh pa
Laptops	170,000	1,530,000	5.7	51.5
Mobile Phones	7,800,000	5,200,000	53.7	35.8
Computer Monitors (LCD)	18,000	162,000	0.7	6.2
Modems Residential	3,900,000	-	97.3	0.0
Modems Business	-	2,500,000	0.0	62.4
Printers (1)	2,131,500	913,500	45.5	19.5
Scanner & MFDs	514,500	514,500	15.5	15.5
Battery Chargers (2)	3,000,000	750,000	16.8	4.2
Home Audio	3,570,000	-	57.9	0.0
Answering Machines	2,850,000	150,000	65.0	3.4
Cordless Phones	2,625,000	1,125,000	54.1	23.2
Games consoles	1,875,000	-	32.2	0.0
Hospital applications	-	729,000	0.0	19.4
Cash registers	-	100,000	0.0	2.6
Barcode and magnetic strip readers,	-	150,000	0.0	1.6
Networking	130,000	1,170,000	5.3	47.5
Sundry Other	5,400,000	600,000	35.6	4.0
Total	33,984,000	15,594	485.3	296.7

(1) Printers with external power supplies dominate in the residential sector due to typically lower price and lower performance than that required in non-residential commercial environment.

(2) These are external power supplies that connect to chargers for appliances such as cordless tools, where the battery is removed for charging.

APPENDIX 6 Overseas Policies, Programs and Measures

1 Specific Policies for Power Supplies

1.1 European Commission Code of Conduct on the Efficiency of External Power Supplies

In June 2000 the European Commission developed a voluntary Code of Conduct on the Efficiency of External Power Supplies [EC 2001], which applies to external power supplies for electronic and electrical appliances in the input power range 0.3W to 75W.

Signatories to the Code of Conduct agree to:

- purchase or manufacture power supplies to minimise no-load energy consumption;
- achieve no-load power consumption targets within the time schedule for an identified proportion of models (i.e. 60% by 2001, 70% by 2003 and 80% by 2005).

In 2003, the Code of Conduct was amended to include [EC 2003]:

- Power supplies with a rated output of between 0.3-150 Watts;
- Minimum efficiency requirements at rated load output, at the 2005 levels shown below.

In November 2004, Version 2 of the Code of Conduct was issued by the EC. The levels for 2007 were agreed upon, as shown in Table 55, which is harmonisation the US ENERGY STAR Levels. Up to, but not including 2007, this applies to 80% of models or sales from an individual manufacturer. From 2007, 90% of models or sales from an individual manufacturer must meet the criteria.

The scope of the Version 2 Code of Conduct is single voltage, external ac-ac and ac-dc power supplies.

Table 55 No-load Power Consumption

Rated Power Output	Phase 1 January 1, 2005	Phase 2 January 1, 2007
0.3 ≤ W < 15	0.3 W	0.3 W
15 ≤ W < 50	0.5 W	0.3 W
50 ≤ W < 60	0.75 W	0.3 W
60 ≤ W < 150	1.0 W	0.5 W

Table 56 Energy Efficiency Criteria

<table>
<tr><th>Rated Power Output</th><th>Minimum Average Efficiency %
January 1, 2005 to December 31, 2006</th><th>Rated Power Output</th><th>Minimum Average Efficiency %
Effective
January 1, 2007</th></tr>
<tr><td>0 < W < 1.5</td><td>30</td><td>0 < W < 1.</td><td>≥ 0.49 * Pno</td></tr>
<tr><td>1.5 ≤ W < 2.5</td><td>40</td><td rowspan="5">1 < W ≤ 49</td><td rowspan="5">≥ [0.09 * Ln(Pno) +0.49</td></tr>
<tr><td>2.5 ≤ W < 4.5</td><td>50</td></tr>
<tr><td>4.5 ≤ W < 6.0</td><td>60</td></tr>
<tr><td>6.0 ≤ W < 10.0</td><td>70</td></tr>
<tr><td>10.0 ≤ W < 25.0</td><td>75</td></tr>
<tr><td>25.0 ≤ W < 150.0</td><td>80</td><td>49 < W ≤ 150</td><td>≥ 84 *</td></tr>
</table>

* 75 W and above power supplies that have power factor correction have a 4% allowance. Therefore the average allowed efficiency is 80%

1.2 United States ENERGY STAR

ENERGY STAR is a voluntary partnership between the US Department of Energy (DOE), the US Environmental Protection Agency (EPA) and industry members to promote energy efficient products. The primary objective of the ENERGY STAR Program is to prevent air pollution by expanding the market for energy-efficient products. The ENERGY STAR label is given to products that meet key efficiency criteria, which may also include low power mode and or "off" specifications.

In December 2004, ENERGY STAR released Version 1 ENERGY STAR specification for single voltage external ac-dc and ac-dc power supplies to come into force on 1st January 2005. In order to meet the proposed criteria, products are required to meet conditions for both no-load and active mode power consumption, tested according to the test method contained in APPENDIX 15. The criteria have been selected such that the top 22% of products in a sample database of over 600 power supplies qualify.

Tier 1: Active Mode

To be eligible for the ENERGY STAR label, an AC-DC or AC-AC external power supply model must meet or exceed a minimum average efficiency for Active Mode, which varies based on the model's nameplate output power. Table 57 below outlines the equations for determining minimum average efficiency where Pno stands for nameplate output power and Ln refers to the natural logarithm. This is also shown in Figure 26 below.

Table 57 Energy-Efficiency Criteria for Active Mode

Nameplate Output Power (Pno)	Minimum Average Efficiency in Active Mode (expressed as a decimal) 1
0 to ≤1 watt	≥ 0.49 * Pno
1 to ≤ 49 watts	≥ [0.09 * Ln (Pno)] + 0.49
> 49 watts	≥ 0.84

[1] "Ln" refers to the natural logarithm (base e). The algebraic order of operations requires that the natural logarithm calculation be performed first and then multiplied by 0.09, with the resulting output added to 0.49

The proposed ENERGY STAR levels are consistent with those provided in the European Code of Conduct which took effect on January 1, 2005.

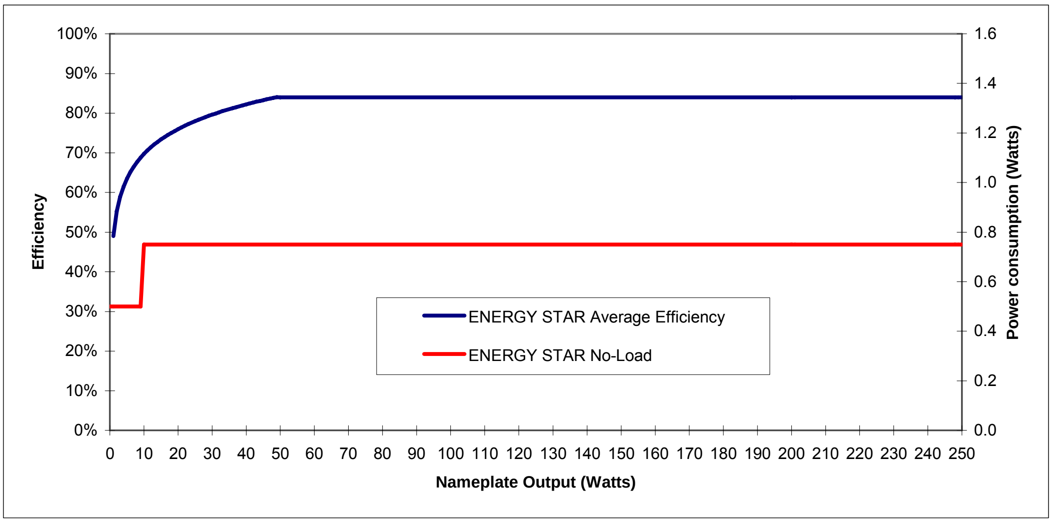
Tier 1: No-Load Mode

The no-load power requirement specifies the maximum AC power that may be used by a qualifying external power supply in the no-load condition (i.e. the input of a power supply is connected to an AC source consistent with the power supply's nameplate AC voltage, but the output is not connected to a product or any other load). Proposed maximum power consumption levels for no-load mode are provided in Table 58, below.

Table 58 Energy-Efficiency Criteria for No Load

Nameplate Output Power (Pno) Maximum Power in	No-Load
0 to < 10 watts	≤ 0.5 watts
10 to ≤ 250 watts	≤ 0.75 watts

Figure 26 ENERGY STAR Criteria



Tier 2:

The EPA plans to implement a Tier 2 specification on July 1, 2006 and has indicated that this is likely to include the no load requirement of 0.3 watts for products <10 watts, and 0.5 watts for products between 10 and 250 watts.

1.2.1.1 California Energy Commission

In April 2005 the California Energy Commission (CEC) issued Appliance Efficiency Regulations (CEC 400-2005-012) to regulate the energy efficiency of external power supplies to come into force 1st July 2006. Recent discussions with industry are likely to delayed to 1st January 2007.

The CEC regulations reference US EPA ENERGY STAR "Test method for calculating the energy efficiency of single voltage external AC-DC and AC-AC power supplies dated 11th August 2004" APPENDIX 15 The levels to be proposed by CEC are shown in Table 59 and Table 60.

Table 59 Californian Efficiency Standards Effective July 1, 2006

Nameplate Output Power (Pno)	Minimum Average Efficiency in Active Mode (expressed as a decimal) 1
0 to ≤1 watt	≥ 0.49 * Pno
1 to ≤ 49 watts	≥ [0.09 * Ln (Pno)] + 0.49
> 49 watts	≥ 0.84
	Maximum Power in No-Load
0 to < 10 watts	≤ 0.5 watts
10 to ≤ 250 watts	≤ 0.75 watts

Table 60 Californian Efficiency Standards Effective January 1, 2008

Nameplate Output Power (Pno)	Minimum Average Efficiency in Active Mode (expressed as a decimal) 1
0 to ≤1 watt	≥ 0.5 * Pno
1 to ≤ 51 watts	≥ [0.09 * Ln (Pno)] + 0.5
> 51 watts	≥ 0.85
	Maximum Power in No-Load
0 to ≤ 250 watts	≤ 0.5 watts

1.3 Other US States

A number of other US States have enacted legislation to introduce the same standards as adopted in California, with an effective date of January 1 in the year shown in Table 61.

Table 61 Other US States EPS Standards Implementation Year

State	Arizona	Massachusetts	New York	Oregon	Rhode Island	Washington
Year	2008	2007	2007	2007	2007	2007

1.4 GEEA (formerly GEA) label

The Group for Energy Efficient Appliances (GEEA), made up of government agencies and institutions from several European countries, has introduced a labelling system for a range of appliances which includes external power supplies.

To apply the GEEA label, all types of external power supplies, either sold as a separate product or as part of portable personal equipment (I.e. equipment that can run on batteries and is sold with a charger or external power supply.

Table 62 GEEA criteria

Date	Maximum Power Consumption
To December 31, 2005	0.3W or less in no-load mode
From January 1, 2006	0.1W or less in no-load mode

1.5 Korean Energy-saving Office Equipment & Home Electronics Program

The Korea Energy Management Corporation (KEMCO) supervises the implementation of the following energy efficiency labelling programs which set energy saving standards for a range of products:

- Energy Efficiency Standards & Labelling Program
- Energy-saving Office Equipment & Home Electronics Program
- Certification of High Efficiency Energy-using Appliances Program

In January 2004, Korea adopted a government purchasing specification for external power supplies up to 100VA, which sets a maximum no-load limit of 0.8 Watts. This is believed to have wide application beyond government [Meier 2004].

Table 63 Power Supplies Korea: (from 1 Nov 2004)

Classification:	No load
Rated Input ≤15VA	≤ 0.8 W
15VA < Rated Input ≤ 50VA	
50VA < Rated Input ≤ 100VA	

1.6 China

The China Certification Centre for Energy Conservation Projects (CECP) and the China National Institute for Standardisation (CNIS) have confirmed that China will adopt the proposed ENERGY STAR program for external power supplies to be effective as a voluntary program from January 1, 2005. [EPA 2005] China will also introduce a MEPS level in due course, although the stringency of these is currently under debate between CNIS and manufacturers [MEA 2004].

1.7 United Kingdom Market Transformation Program

The UK Market Transformation Program includes a Policy Brief on the UK Energy Consumption of Domestic External Power Supplies. The Brief describes the issues, priorities and actions needed to reduce the energy consumption of external power supplies, and is used in policy discussions and in support of Government decisions. The Brief endorses adoption of the EC Code of Conduct for external power supplies by manufacturers supplying UK markets. Further details are in APPENDIX 16.

2 Policies for Products with External Power Supplies

The following section describes measures implemented for end-use appliances which use external power supplies. Computer monitors have been excluded from this since they are too numerous, and most newer monitors tend to have internal power supplies.

2.1 USA: Executive Order 13221

In July 2001 President Bush issued Executive Order 13221 which applies to all Federal Agencies when purchasing products that use an external standby power device (or with an internal standby power function). The Order requires that they purchase products using no more than one watt in their standby power consuming mode, or otherwise purchase those using the lowest wattage in their standby power consuming mode. Agencies must adhere to these requirements, when life-cycle cost-effective and practicable and where the relevant product's utility and performance are not compromised as a result.

Recommended standby levels for a variety of products have been published for the Federal Energy Management Program [FEMP 2004] which are outlined in Table 64. Note, not all may necessarily include an external power supply.

Table 64 FEMP recommended standby energy levels

Appliance	Maximum standby* power consumption Watts
TV	1
VCR	2
DVD	1
TV/VCR/DVD Combination	3
Audio Product	1
Desktop Computer	2
Integrated Computer	3.5
Workstation	2
Laptop Computer	1
Computer Monitor	1
Printer	1
Fax	2
Copier	1
Multi-function Device	1
Docking Station	2
Scanner	1

** Note: standby is defined here as the lowest power consumption when connected to the mains*

Recommended standby levels are also being developed for computer speakers, modems, cell phones, cordless phones, telephone answering machines, desktop halogen lamps and portable power tools.

2.2 ENERGY STAR in the USA

External power supplies must support the overall product specifications for relevant product types. In the recent development of ENERGY STAR telephony specifications this system approach to power supplies was taken.

Recommended standby levels have been developed for the following products with external power supplies: [EPA 2005-1]

Table 65 ENERGY STAR standby criteria for telephony products

Appliance	Maximum Power Consumption
Answering machines and cordless telephones	3.3 W or less when inactive*
Combination cordless telephones / answering machines	4 W or less when inactive**

2.3 ENERGY STAR in other countries

The United States EPA has also established government agreements with the European Union, Australia and New Zealand, Canada, Japan and Taiwan to promote ENERGY STAR labelled products. Brazil and Mexico are amongst other countries which have also expressed interest in the program [IEA, 2001]. These partnerships are intended to unify voluntary energy-efficiency labelling programs in major global markets. Such agreements make it easier for partners to participate by providing a single set of energy-efficiency requirements, instead of the patchwork of different country criteria. The range of products covered by each country varies, as shown in Table 66 below.

Table 66 Coverage of ENERGY STAR by Country [MEA 2004]

Appliance	Country						
	US	EU	Japan	Canada	Taiwan	NZ	Australia
Home Electronics							
Televisions	✓			✓			✓
VCRs	✓			✓			✓
Combination Units	✓			✓			✓
DVD Products	✓			✓			✓
Home Audio	✓			✓			✓
Set-top Boxes	✓						
Cordless Phones	✓						
Answering Machines	✓						
Cordless Phone/Answering Machine Combination Units	✓						
Office Equipment							
Computers	✓	✓	✓	✓	✓	✓	✓
Monitors	✓	✓	✓	✓	✓	✓	✓
Printers	✓	✓	✓	✓	✓	✓	✓
Fax Machines	✓	✓	✓	✓	✓	✓	✓
Copiers	✓	✓	✓	✓	✓	✓	✓
Scanners	✓	✓	✓	✓	✓		
Multifunction Devices	✓	✓	✓	✓	✓		
Mailing Machines		✓		✓			

2.4 GEEA (formerly GEA) labelling of products using external power supplies

The Group for Energy Efficient Appliances (see previous section for details) sets standby standards for the following products with external power supplies.

Table 67 GEEA standby specifications for cordless and mobile phones

	2002	2003
Battery chargers		
Standby mode	1.0W or less	1.0W or less
Cordless and mobile phones (standby according to function in base station)		
Without answering machine	1 W	1 W (preliminary to be confirmed)
With answering machine	5 W	5 W (preliminary to be confirmed)

2.5 Switzerland's Energy 2000 label

Under the SwissEnergy program (formerly Energy 2000), the Energy 2000 label is applied to battery chargers and a range of products including monitors and scanners. The Group for Energy Efficient Appliances coordinates the standby criteria for Energy 2000 labelled appliances (see section above re GEEA).

2.6 European Union, Nordic Swan and Blauer-Engel (Blue Angel) Eco-labels

These are voluntary labelling systems which cover 'cradle to grave' environmental impacts and set standby criteria for a range of office and home equipment. The only product with criteria for an external power supply is laptops. The criteria for laptops is shown in Table 68 The Nordic Swan Eco-label is the official eco-label in Norway, Sweden, Denmark, Finland and Iceland; the Blue Angel Eco-label is used in Germany; and the EU Eco-label in European Union countries.

Table 68 EU, Nordic Swan and Blue Angel Eco-label standby criteria for laptop computers

Laptop operating modes	Maximum Power Consumption
Low power (standby or sleep) mode	5 W or less after 15 minutes inactivity (default)
Off-mode	2 W or less (battery fully charged and power supply connected to mains)
Power supply unit without computer	1 W or less (power supply connected to mains but not to computer)

2.7 UK Market Transformation Program [MEA 2004]

The UK Market Transformation Program provides a Buyer's Guide for laptops with information on the most energy efficient models. The Guide supplies details of the power consumption of the power supply unit when it is connected to the mains but is not supplying power to battery or computer.

The Market Transformation Program also provides information on the environmental performance of a range of products through the UK Environmental Product Information Consortium, which has product databases on laptops and monitors.

2.8 Japan

The Ministry of Economy, Trade and Industry (METI) released guidelines in June 2002 on the development of energy-saving technologies, which included a recommendation for improving the efficiency of adapters and chargers for use in home electronics. [Kyodo, 2002]

In addition, three major Japanese manufacturers associations have set voluntary targets for products which require standby power functions, to reduce this standby power to 1 W or less by fiscal year 2003. Their voluntary target for standby power of other products is close to zero by the end of fiscal year 2003. [IEA, 2003a]

A best practices approach implemented by the Japanese Ministry for Economic Trade and Industry (METI, formerly MITI) in order to lower CO_2 emissions as required by Japan's Law Concerning the Rational Use of Energy. The Top Runner approach identifies the most efficient product in the market and turns its specifications into the level that all similar products must meet by a specified date. Standby requirements currently exist for computers, copiers, TVs, and VCRs, with more anticipated in the future. (Source – Power Integrations web site)

Whilst external power supplies are not directly addressed in current criteria, the criteria will influence the design and selection of products using them.

2.9 Korean Energy-saving Office Equipment & Home Electronics Program

Battery chargers and products using external power supplies are covered under the Energy-Saving Office Equipment and Home Electronics Program, a voluntary partnership between manufacturers and KEMCO to reduce the standby electricity used by products.

By Regulation, all public institutions in Korea must purchase energy saving office equipment with the energy saving label attached [IEA, 2002b]. Standby power consumption standards for external power supplies and battery chargers are as follows:

Table 69 Korean Energy-Saving Office Equipment and Home Electronics Program standby power consumption standards

Appliance	Maximum Power Consumption
Battery chargers	1.0W or less in standby mode
External Power Supplies	0.8 W or less in standby/no load mode

APPENDIX 7 Energy Prices and Factors

Consumer energy prices

Table 70 Marginal Energy Tariffs, 2005

	c/kWh Household (day rate)	c/kWh Household (off peak)	c/kWh Commercial	c/kWh Industrial	C/MJ Natural gas (household)
NSW	11.0	4.8	14.0	7.2	1.42
Victoria	15.6		16.0	7.8	1.00
Queensland	11.6		15.0	8.5	1.41
SA	14.8/18.0 (a)		16.0	8.5	1.17
WA	14.7		15.0	10.7	1.26
Tasmania	12.5		14.0	4.6	1.40
NT	15.4		17.0	14.5	1.17
ACT	9.8		14.9	7.2	1.37
Australia (weighted)	**12.7**		**14.9**	**8.0**	**1.14**
New Zealand (NZ$)	**20.4 (b)**		**16.0**	**9.0**	**1.40**

Source: Household estimates from *Electricity Australia* 2004, except (a) 14.8 for year-round energy use; 18.0 for energy use in summer (e.g. air conditioning) (b) Advised by NZ EECA 2007. Other sector estimates by author.

Table 71 Typical household time-of-use tariff profile

	Period	Hrs	Workday c/kWh	Weekend c/kWh
Shoulder	7am-2pm	7	9.32	9.32
Peak	2pm-8pm	6	17.60	9.32
Shoulder	8pm-10pm	2	9.32	9.32
Off-peak	10pm-7am	9	4.83	4.83
24-hr average			9.71	7.64
Day rate			12.36	12.36

Source: EnergyAustralia, January 2005

APPENDIX 8 Greenhouse Gas Emission Factors

Table 72 Projected marginal emissions-intensity of electricity supply by State 2003-2020

Region	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
NSW+ACT	0.950	0.950	0.958	1.018	1.027	1.021	1.031	1.039	1.018	0.987	0.975	0.963	0.965	0.945	0.961	0.919	0.910	0.883	0.888	0.881	0.866
VIC	0.988	0.988	0.992	1.122	1.128	1.106	1.117	1.130	1.130	1.094	1.075	1.086	1.105	1.085	1.112	1.048	1.023	0.992	0.995	0.965	0.936
Qld	1.053	1.053	1.035	1.021	0.991	1.020	0.994	1.022	0.979	0.935	0.935	0.929	0.932	0.901	0.929	0.912	0.901	0.894	0.874	0.864	0.869
SA	1.020	1.020	1.003	1.163	1.167	1.112	1.123	1.153	1.161	1.113	1.093	1.099	1.120	1.078	1.093	1.014	0.993	0.986	0.979	1.000	0.955
WA	1.040	1.040	0.996	1.038	1.029	0.906	0.884	0.868	0.885	0.890	0.894	0.830	0.826	0.823	0.838	0.845	0.855	0.817	0.804	0.808	0.810
NT	0.008	0.008	0.008	0.754	0.757	0.760	0.760	0.764	0.770	0.769	0.775	0.779	0.727	0.732	0.735	0.739	0.743	0.747	0.750	0.752	0.754
Tas	0.651	0.651	0.663	0.840	0.769	0.769	0.902	1.007	1.024	1.033	0.998	0.993	1.000	1.016	1.005	1.038	0.984	0.965	0.954	0.966	0.976
New Zealand	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698	0.698

Source: www.greenhouse.gov.au/ggap/round3/emission-factors.html: see separate emissions factor file for each State. Regional weightings by GWA
All values state-wide average kg CO_2-e per kWh delivered, taking into account transmission and distribution losses (combustion emissions only).

APPENDIX 9 Population and Household Numbers

Table 73 Population and Household Numbers

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NSW	HH ('000)	2489.1	2523.5	2557.8	2591.9	2625.7	2659.6	2692.2	2724.6	2756.8	2789.2	2821.4	2852.1	2882.6	2912.7	2942.9	2972.5	3001.7	3030.3	3058.4	3086.0
	Persons	6513.2	6566.2	6619.7	6673.5	6727.8	6782.6	6830.1	6878.0	6926.1	6974.6	7023.5	7067.8	7112.3	7157.1	7202.2	7247.6	7288.8	7330.3	7372.0	7413.9
VIC	HH ('000)	1836.1	1859.4	1882.6	1905.5	1928.1	1950.6	1971.6	1992.4	2012.9	2033.6	2053.8	2072.6	2091.1	2109.3	2127.5	2144.9	2162.1	2178.7	2194.9	2210.7
	Persons	4756.5	4786.0	4815.7	4845.6	4875.6	4905.9	4930.5	4955.1	4979.9	5004.9	5029.9	5051.2	5072.6	5094.1	5115.6	5137.3	5155.7	5174.2	5192.8	5211.4
QLD	HH ('000)	1410.9	1443.6	1476.9	1510.1	1543.5	1577.3	1609.9	1642.8	1675.8	1709.3	1742.9	1775.2	1807.4	1839.6	1872	1904.2	1936.0	1967.7	1999.0	2030.1
	Persons	3645.6	3705.5	3766.4	3828.3	3891.2	3955.1	4013.0	4071.8	4131.5	4192.0	4253.4	4310.6	4368.5	4427.3	4486.8	4547.1	4608.9	4671.6	4735.1	4799.5
SA	HH ('000)	617.8	623.7	629.5	635.3	640.9	646.5	651.3	655.9	660.6	665.1	669.5	673.2	676.7	680.2	683.6	686.7	689.8	692.7	695.4	697.9
	Persons	1502.4	1506.5	1510.7	1514.8	1519.0	1523.2	1525.5	1527.8	1530.1	1532.4	1534.7	1535.9	1537.1	1538.4	1539.6	1540.8	1541.0	1541.2	1541.5	1541.7
WA	HH ('000)	750.3	767.1	784.0	801.1	818.1	835.4	852.0	868.8	885.3	902.0	918.8	934.6	950.4	966.1	981.9	997.5	1012.8	1028.1	1043.2	1058.2
	Persons	1920.1	1948.7	1977.8	2007.2	2037.1	2067.5	2095.5	2123.8	2152.6	2181.7	2211.2	2238.8	2266.8	2295.2	2323.9	2352.9	2379.8	2407.0	2434.5	2462.4
TAS	HH ('000)	192.2	193.4	194.6	195.8	196.9	198.0	198.7	199.4	200.1	200.7	201.3	201.5	201.6	201.8	201.8	201.7	201.6	201.3	201.0	200.5
	Persons	470.3	469.2	468.2	467.1	466.1	465.0	463.3	461.6	459.9	458.2	456.5	454.3	452.2	450.0	447.9	445.8	443.1	440.5	437.8	435.2
NT	HH ('000)	69.1	70.9	72.6	74.3	76.1	77.9	79.6	81.4	83.2	85.0	86.9	88.8	90.6	92.5	94.3	96.2	98.1	100	101.8	103.7
	Persons	204.7	208.5	212.3	216.2	220.2	224.2	228.0	231.9	235.8	239.8	243.9	247.9	251.9	256.0	260.2	264.4	268.5	272.7	276.9	281.2
ACT	HH ('000)	123.6	125.6	127.6	129.6	131.5	133.5	135.2	137	138.7	140.5	142.2	143.8	145.3	146.8	148.3	149.8	151.3	152.7	154.0	155.3
	Persons	319.8	322.4	325.1	327.8	330.5	333.2	335.5	337.8	340.2	342.5	344.9	347.0	349.1	351.2	353.3	355.4	357.3	359.1	361.0	362.9
AUST	HH ('000)	7489.1	7607.2	7725.6	7843.6	7960.8	8078.8	8190.5	8302.3	8413.4	8525.4	8636.8	8741.8	8845.7	8949	9052.3	9153.5	9253.4	9351.5	9447.7	9542.4
	Persons	19333	19513	19696	19881	20068	20257	20421	20588	20756	20926	21098	21253	21411	21569	21729	21891	22043	22197	22352	22508
	Persons/HH	2.58	2.57	2.55	2.53	2.52	2.51	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.37	2.36
NZ	HH ('000)	1441.0	1461.8	1482.9	1504.3	1526.0	1548	1566.2	1584.6	1603.1	1622.0	1641	1659.0	1677.2	1695.6	1714.2	1733	1749.7	1766.5	1783.5	1800.7
	Persons	3880.0	3924.8	3970.0	4015.8	4062.1	4109	4136.4	4164.0	4191.8	4219.8	4248	4273.9	4299.9	4326.1	4352.5	4379	4404.1	4429.3	4454.7	4480.2
	Persons/HH	2.69	2.68	2.68	2.67	2.66	2.65	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.52	2.51	2.50	2.49
ANZ	HH ('000)	8930	9069	9208	9348	9487	9627	9757	9887	10017	10147	10278	10401	10523	10645	10766	10887	11003	11118	11231	11343
	Persons	23213	23438	23666	23896	24130	24366	24558	24752	24948	25146	25346	25527	25710	25895	26082	26270	26447	26626	26806	26988
	Persons/HH	2.60	2.58	2.57	2.56	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.40	2.39	2.39	2.38

Source: ABS 3236.0 Household and Family Projections Australia 1996 to 2021; Statistics New Zealand

APPENDIX 10 Annual Benefit and Cost Data

NOTE – all NPV calculations in these tables is at a 7.5% discount rate.

Table 74 Australia - 5% annual sales growth - benefits and costs (2007 Dollars)

Australia		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	996.3	1035.2	1075.6	1117.4	1160.7	1205.5	1251.9	1300.0	1364.9	1433.1	1504.6	1579.8	1658.6
Energy with program	GWh/yr	996.3	963.5	933.4	906.2	882.1	816.7	819.6	823.5	827.5	839.1	881.0	925.0	971.2
Energy Savings	GWh/yr	0.0	71.7	142.2	211.2	278.6	388.8	432.3	476.5	537.4	593.9	623.6	654.7	687.4
Energy Cost Savings	$M	0.0	9.9	19.6	29.1	38.4	53.6	59.6	65.7	74.1	81.9	86.0	90.3	94.8
Emissions Saved	kt CO2-e	0.0	71.5	140.3	206.4	273.8	373.8	424.4	449.8	500.6	539.8	564.2	586.3	606.2
Additional EPS cost	$M	0.0	20.9	21.7	22.6	23.4	28.9	30.0	31.2	32.7	34.4	36.1	37.9	39.8
Net Benefit	$M	0.0	-11.0	-2.1	6.6	15.0	24.7	29.6	34.5	41.4	47.5	49.9	52.4	55.0

Table 75 Australia – High sales growth - benefits and costs (2007 Dollars)

Australia		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	1081.2	1147.7	1218.6	1294.1	1374.7	1460.6	1552.3	1650.1	1774.1	1908.1	2053.0	2209.6	2379.1
Energy with program	GWh/yr	1081.2	1067.5	1057.4	1051.5	1050.2	1000.1	1016.2	1047.2	1080.9	1125.7	1212.2	1305.8	1407.3
Energy Savings	GWh/yr	0.0	80.2	161.2	242.7	324.5	460.5	536.1	602.8	693.2	782.5	840.8	903.8	971.8
Energy Cost Savings	$M	0.0	11.1	22.2	33.5	44.8	63.5	73.9	83.1	95.6	107.9	115.9	124.6	133.9
Emissions Saved	kt CO2-e	0.0	80.0	159.0	237.2	319.0	442.8	526.2	569.0	645.8	711.1	760.8	809.4	857.0
Additional EPS cost	$M	0.0	23.0	24.4	25.8	27.4	35.0	37.2	39.5	42.4	45.5	48.9	52.5	56.5
Net Benefit	$M	0.0	-11.9	-2.1	7.6	17.4	28.5	36.8	43.7	53.2	62.4	67.0	72.0	77.5

Table 76 New South Wales - 5% annual sales growth - benefits and costs (2007 Dollars)

NSW		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	330.1	342.5	355.3	368.6	382.5	396.8	411.6	427.0	447.8	469.7	492.7	516.8	542.1
Energy with program	GWh/yr	330.1	318.9	308.5	299.1	290.8	269.0	269.6	270.6	271.7	275.2	288.7	302.8	317.6
Energy Savings	GWh/yr	0.0	23.6	46.8	69.5	91.6	127.8	142.0	156.4	176.2	194.5	204.0	214.0	224.5
Energy Cost Savings	$M	0.0	2.9	5.7	8.5	11.2	15.7	17.4	19.2	21.6	23.8	25.0	26.2	27.5
Emissions Saved	kt CO2-e	0.0	23.3	45.6	66.9	88.4	120.8	136.5	143.7	160.3	171.8	181.2	188.5	194.4
Additional EPS cost	$M	0.0	6.8	7.1	7.4	7.6	9.4	9.8	10.1	10.6	11.1	11.7	12.3	12.9
Net Benefit	$M	0.0	-4.0	-1.4	1.2	3.6	6.3	7.6	9.0	11.0	12.7	13.3	14.0	14.7

Table 77 New South Wales - High sales growth - benefits and costs (2007 Dollars)

NSW		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	358.2	379.7	402.6	426.9	453.0	480.8	510.4	541.9	582.1	625.4	672.3	722.9	777.6
Energy with program	GWh/yr	358.2	353.4	349.5	347.1	346.3	329.4	334.3	344.1	354.8	369.2	397.2	427.5	460.2
Energy Savings	GWh/yr	0.0	26.4	53.1	79.9	106.7	151.4	176.1	197.8	227.2	256.3	275.1	295.4	317.4
Energy Cost Savings	$M	0.0	3.2	6.5	9.8	13.1	18.6	21.6	24.2	27.9	31.4	33.7	36.2	38.9
Emissions Saved	kt CO2-e	0.0	26.0	51.7	76.9	103.0	143.1	169.2	181.8	206.8	226.3	244.3	260.3	274.8
Additional EPS cost	$M	0.0	7.5	8.0	8.4	8.9	11.4	12.1	12.8	13.8	14.8	15.8	17.0	18.3
Net Benefit	$M	0.0	-4.3	-1.5	1.4	4.2	7.2	9.5	11.4	14.1	16.7	17.9	19.2	20.7

Table 78 Victoria - 5% annual sales growth - benefits and costs (2007 Dollars)

Vic		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	233.6	242.0	250.7	259.7	269.0	278.6	288.5	298.8	312.8	327.5	342.9	359.1	376.0
Energy with program	GWh/yr	233.6	224.9	217.3	210.3	204.2	188.5	188.6	189.0	189.4	191.5	200.6	210.0	219.9
Energy Savings	GWh/yr	0.0	17.1	33.4	49.4	64.8	90.1	99.9	109.8	123.4	136.0	142.4	149.1	156.1
Energy Cost Savings	$M	0.0	2.7	5.3	7.8	10.2	14.2	15.7	17.3	19.4	21.4	22.4	23.5	24.6
Emissions Saved	kt CO2-e	0.0	18.7	35.9	53.6	71.6	97.8	111.1	115.0	126.2	134.9	141.7	143.9	146.1
Additional EPS cost	$M	0.0	5.0	5.2	5.4	5.6	6.8	7.1	7.3	7.7	8.0	8.4	8.8	9.2
Net Benefit	$M	0.0	-2.3	0.1	2.4	4.7	7.4	8.7	10.0	11.8	13.4	14.0	14.7	15.4

Table 79 Victoria - High annual sales growth - benefits and costs (2007 Dollars)

Vic		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	253.5	268.3	284.1	300.8	318.6	337.6	357.7	379.2	406.6	436.1	467.9	502.3	539.3
Energy with program	GWh/yr	253.5	249.2	246.2	244.1	243.1	230.8	233.9	240.4	247.4	257.0	275.9	296.5	318.6
Energy Savings	GWh/yr	0.0	19.1	37.9	56.7	75.5	106.7	123.9	138.9	159.2	179.2	192.0	205.8	220.7
Energy Cost Savings	$M	0.0	3.0	6.0	8.9	11.9	16.8	19.5	21.9	25.1	28.2	30.3	32.4	34.8
Emissions Saved	kt CO2-e	0.0	20.9	40.7	61.6	83.5	115.8	137.7	145.5	162.8	177.7	191.0	198.6	206.6
Additional EPS cost	$M	0.0	5.5	5.8	6.1	6.5	8.3	8.8	9.3	9.9	10.6	11.4	12.2	13.1
Net Benefit	$M	0.0	-2.5	0.2	2.8	5.4	8.5	10.8	12.6	15.2	17.6	18.9	20.2	21.7

Table 80 Queensland - 5% annual sales growth - benefits and costs (2007 Dollars)

Qld		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	200.3	209.4	218.9	228.8	239.0	249.7	260.7	272.2	287.4	303.3	320.1	337.8	356.5
Energy with program	GWh/yr	200.3	195.1	190.1	185.7	181.8	169.3	170.8	172.6	174.3	177.7	187.6	197.9	208.9
Energy Savings	GWh/yr	0.0	14.3	28.8	43.1	57.2	80.4	89.9	99.7	113.0	125.6	132.6	139.9	147.6
Energy Cost Savings	$M	0.0	1.9	3.8	5.6	7.5	10.5	11.7	13.0	14.7	16.4	17.3	18.3	19.3
Emissions Saved	kt CO2-e	0.0	13.4	26.9	40.0	53.3	72.4	83.5	90.9	101.8	112.3	115.9	120.9	128.3
Additional EPS cost	$M	0.0	4.2	4.4	4.6	4.8	5.9	6.2	6.4	6.8	7.2	7.6	8.0	8.5
Net Benefit	$M	0.0	-2.3	-0.6	1.1	2.7	4.6	5.6	6.6	7.9	9.2	9.7	10.2	10.8

Table 81 Queensland - High annual sales growth - benefits and costs (2007 Dollars)

Qld		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	217.4	232.2	248.0	265.0	283.1	302.5	323.3	345.5	373.5	403.9	436.8	472.6	511.4
Energy with program	GWh/yr	217.4	216.1	215.4	215.4	216.4	207.3	211.8	219.4	227.7	238.4	258.1	279.4	302.7
Energy Savings	GWh/yr	0.0	16.0	32.6	49.5	66.7	95.2	111.5	126.1	145.8	165.5	178.7	193.1	208.7
Energy Cost Savings	$M	0.0	2.1	4.3	6.5	8.7	12.4	14.5	16.4	19.0	21.6	23.3	25.2	27.2
Emissions Saved	kt CO2-e	0.0	15.0	30.5	46.0	62.1	85.8	103.6	115.0	131.4	147.9	156.2	166.9	181.4
Additional EPS cost	$M	0.0	4.6	4.9	5.2	5.6	7.2	7.6	8.2	8.8	9.5	10.3	11.1	12.0
Net Benefit	$M	0.0	-2.5	-0.6	1.2	3.1	5.3	6.9	8.3	10.2	12.1	13.0	14.1	15.2

Table 82 South Australia - 5% annual sales growth - benefits and costs (2007 Dollars)

SA		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	78.7	81.3	84.0	86.7	89.5	92.4	95.4	98.4	102.7	107.2	111.9	116.8	121.9
Energy with program	GWh/yr	78.7	75.7	72.9	70.3	68.0	62.6	62.5	62.4	62.3	62.8	65.6	68.4	71.4
Energy Savings	GWh/yr	0.0	5.6	11.1	16.4	21.5	29.8	32.9	36.1	40.4	44.4	46.4	48.4	50.5
Energy Cost Savings	$M	0.0	0.9	1.7	2.5	3.3	4.6	5.0	5.5	6.2	6.8	7.1	7.4	7.7
Emissions Saved	kt CO2-e	0.0	6.3	12.1	18.0	24.1	32.1	36.0	36.6	40.2	43.8	45.4	48.4	48.2
Additional EPS cost	$M	0.0	1.6	1.7	1.8	1.8	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9
Net Benefit	$M	0.0	-0.8	0.0	0.8	1.5	2.3	2.8	3.2	3.7	4.2	4.4	4.6	4.8

Table 83 South Australia - High annual sales growth - benefits and costs (2007 Dollars)

SA		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	85.4	90.1	95.1	100.4	106.0	112.0	118.3	125.0	133.5	142.8	152.7	163.4	174.9
Energy with program	GWh/yr	85.4	83.8	82.5	81.6	81.0	76.7	77.4	79.3	81.4	84.2	90.2	96.6	103.5
Energy Savings	GWh/yr	0.0	6.3	12.6	18.8	25.0	35.3	40.8	45.6	52.2	58.5	62.5	66.8	71.4
Energy Cost Savings	$M	0.0	1.0	1.9	2.9	3.8	5.4	6.2	7.0	8.0	9.0	9.6	10.2	10.9
Emissions Saved	kt CO2-e	0.0	7.0	13.7	20.7	28.0	38.0	44.6	46.3	51.8	57.7	61.2	66.8	68.2
Additional EPS cost	$M	0.0	1.8	1.9	2.0	2.1	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.1
Net Benefit	$M	0.0	-0.8	0.0	0.9	1.7	2.7	3.4	4.0	4.8	5.6	5.9	6.4	6.8

Table 84 Western Australia - 5% annual sales growth - benefits and costs (2007 Dollars)

WA		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	105.2	109.8	114.7	119.8	125.0	130.4	136.0	141.9	149.6	157.7	166.2	175.2	184.7
Energy with program	GWh/yr	105.2	102.3	99.6	97.2	95.0	88.4	89.1	89.9	90.7	92.4	97.4	102.6	108.2
Energy Savings	GWh/yr	0.0	7.6	15.1	22.6	30.0	42.0	46.9	52.0	58.9	65.3	68.9	72.6	76.5
Energy Cost Savings	$M	0.0	1.1	2.2	3.4	4.4	6.2	7.0	7.7	8.7	9.7	10.2	10.8	11.3
Emissions Saved	kt CO2-e	0.0	6.7	13.5	18.8	24.7	34.6	39.3	43.9	50.3	53.4	55.4	58.7	62.0
Additional EPS cost	$M	0.0	2.2	2.3	2.4	2.5	3.1	3.2	3.4	3.6	3.8	4.0	4.2	4.4
Net Benefit	$M	0.0	-1.1	-0.1	0.9	1.9	3.1	3.7	4.3	5.2	5.9	6.2	6.6	6.9

Table 85 Western Australia - High annual sales growth - benefits and costs (2007 Dollars)

WA		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	114.1	121.8	129.9	138.7	148.0	158.0	168.6	180.0	194.4	210.0	226.8	245.1	265.0
Energy with program	GWh/yr	114.1	113.3	112.8	112.7	113.1	108.2	110.4	114.3	118.5	123.9	134.0	144.9	156.8
Energy Savings	GWh/yr	0.0	8.5	17.1	26.0	34.9	49.8	58.2	65.7	75.9	86.1	92.9	100.2	108.2
Energy Cost Savings	$M	0.0	1.3	2.5	3.8	5.2	7.4	8.6	9.7	11.3	12.8	13.8	14.9	16.0
Emissions Saved	kt CO2-e	0.0	7.5	15.3	21.5	28.8	41.0	48.8	55.6	64.9	70.3	74.7	81.0	87.6
Additional EPS cost	$M	0.0	2.4	2.6	2.8	2.9	3.8	4.0	4.3	4.6	5.0	5.4	5.8	6.3
Net Benefit	$M	0.0	-1.2	0.0	1.1	2.2	3.6	4.6	5.5	6.6	7.8	8.4	9.1	9.8

Table 86 Tasmania - 5% annual sales growth - benefits and costs (2007 Dollars)

Tas		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	22.6	23.2	23.9	24.6	25.3	25.9	26.7	27.4	28.4	29.5	30.6	31.8	32.9
Energy with program	GWh/yr	22.6	21.5	20.7	19.9	19.1	17.5	17.4	17.3	17.2	17.2	17.9	18.5	19.2
Energy Savings	GWh/yr	0.0	1.7	3.2	4.7	6.1	8.4	9.3	10.1	11.2	12.3	12.7	13.2	13.7
Energy Cost Savings	$M	0.0	0.2	0.4	0.6	0.8	1.1	1.2	1.3	1.5	1.6	1.7	1.7	1.8
Emissions Saved	kt CO2-e	0.0	1.3	2.5	3.7	4.5	6.2	6.8	7.5	8.4	9.2	9.6	9.9	10.3
Additional EPS cost	$M	0.0	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8
Net Benefit	$M	0.0	-0.3	-0.1	0.1	0.3	0.4	0.5	0.6	0.7	0.9	0.9	0.9	1.0

Table 87 Tasmania - High annual sales growth - benefits and costs (2007 Dollars)

Tas		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	24.5	25.8	27.1	28.5	29.9	31.4	33.1	34.7	36.9	39.3	41.8	44.4	47.2
Energy with program	GWh/yr	24.5	23.9	23.4	23.1	22.8	21.4	21.6	22.0	22.4	23.1	24.6	26.2	27.9
Energy Savings	GWh/yr	0.0	1.9	3.7	5.4	7.1	10.0	11.5	12.8	14.5	16.2	17.2	18.3	19.4
Energy Cost Savings	$M	0.0	0.2	0.5	0.7	0.9	1.3	1.5	1.7	1.9	2.1	2.2	2.4	2.5
Emissions Saved	kt CO2-e	0.0	1.4	2.8	4.2	5.2	7.3	8.4	9.4	10.8	12.1	12.9	13.7	14.6
Additional EPS cost	$M	0.0	0.6	0.6	0.6	0.6	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.2
Net Benefit	$M	0.0	-0.3	-0.1	0.1	0.3	0.5	0.7	0.8	1.0	1.1	1.2	1.3	1.3

Table 88 Northern Territory - 5% annual sales growth - benefits and costs (2007 Dollars)

NT		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	9.9	10.4	10.9	11.4	11.9	12.5	13.1	13.7	14.5	15.3	16.2	17.2	18.2
Energy with program	GWh/yr	9.9	9.7	9.4	9.2	9.1	8.5	8.6	8.7	8.8	9.0	9.5	10.1	10.6
Energy Savings	GWh/yr	0.0	0.7	1.4	2.1	2.9	4.0	4.5	5.0	5.7	6.4	6.7	7.1	7.5
Energy Cost Savings	$M	0.0	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.1	1.2
Emissions Saved	kt CO2-e	0.0	0.7	1.4	2.1	2.9	4.1	4.5	5.2	5.6	6.1	6.4	6.9	7.3
Additional EPS cost	$M	0.0	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Net Benefit	$M	0.0	-0.1	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.8

Table 89 Northern Territory - High annual sales growth - benefits and costs (2007 Dollars)

NT		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	10.8	11.5	12.3	13.2	14.1	15.1	16.2	17.4	18.8	20.4	22.1	24.0	26.0
Energy with program	GWh/yr	10.8	10.7	10.7	10.7	10.8	10.4	10.6	11.0	11.5	12.1	13.1	14.2	15.4
Energy Savings	GWh/yr	0.0	0.8	1.6	2.5	3.3	4.8	5.6	6.3	7.4	8.4	9.1	9.8	10.6
Energy Cost Savings	$M	0.0	0.1	0.3	0.4	0.5	0.8	0.9	1.0	1.2	1.3	1.5	1.6	1.7
Emissions Saved	kt CO2-e	0.0	0.8	1.6	2.4	3.3	4.8	5.6	6.6	7.2	8.1	8.6	9.5	10.4
Additional EPS cost	$M	0.0	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6
Net Benefit	$M	0.0	-0.1	0.0	0.1	0.3	0.4	0.5	0.6	0.7	0.9	0.9	1.0	1.1

Table 90 Australian Capital Territory - 5% annual sales growth - benefits and costs (2007 Dollars)

ACT		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	16.0	16.6	17.2	17.9	18.5	19.2	19.9	20.7	21.7	22.7	23.9	25.0	26.2
Energy with program	GWh/yr	16.0	15.4	14.9	14.5	14.1	13.0	13.0	13.1	13.1	13.3	13.9	14.6	15.3
Energy Savings	GWh/yr	0.0	1.2	2.3	3.4	4.5	6.2	6.9	7.6	8.6	9.5	9.9	10.4	10.9
Energy Cost Savings	$M	0.0	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.0	1.1	1.2	1.2	1.3
Emissions Saved	kt CO2-e	0.0	1.2	2.2	3.3	4.3	5.9	6.6	7.0	7.8	8.3	8.8	9.2	9.4
Additional EPS cost	$M	0.0	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7
Net Benefit	$M	0.0	-0.2	-0.1	0.0	0.1	0.3	0.3	0.4	0.5	0.6	0.6	0.6	0.6

Table 91 Australian Capital Territory - High annual sales growth - benefits and costs (2007 Dollars)

ACT		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	17.3	18.4	19.5	20.7	21.9	23.3	24.7	26.2	28.2	30.3	32.5	35.0	37.6
Energy with program	GWh/yr	17.3	17.1	16.9	16.8	16.7	15.9	16.2	16.6	17.1	17.8	19.2	20.6	22.2
Energy Savings	GWh/yr	0.0	1.3	2.6	3.9	5.2	7.4	8.6	9.6	11.0	12.5	13.4	14.3	15.4
Energy Cost Savings	$M	0.0	0.2	0.3	0.5	0.6	0.9	1.0	1.1	1.3	1.5	1.6	1.7	1.8
Emissions Saved	kt CO2-e	0.0	1.3	2.5	3.8	5.0	7.0	8.2	8.8	10.0	11.0	11.9	12.6	13.3
Additional EPS cost	$M	0.0	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9
Net Benefit	$M	0.0	-0.2	-0.1	0.0	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.9

Table 92 New Zealand - 5% annual sales growth - benefits and costs (2007 NZ Dollars) at 5% discount rate

NZ		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	179	186	193	200	208	216	224	232	244	256	269	282	296
Energy with program	GWh/yr	179	173	167	162	157	146	146	147	147	149	157	164	173
Energy Savings	GWh/yr	0	13	26	38	50	70	78	86	97	107	112	117	123
Energy Cost Savings	$M	0.0	2.5	4.9	7.2	9.4	13.1	14.6	16.1	18.1	20.0	20.9	22.0	23.1
Emissions Saved	kt CO2-e	0.0	9.4	18.2	26.8	35.2	48.9	54.3	59.8	67.4	74.4	78.0	81.9	86.0
Additional EPS cost	$M	0.0	4.4	4.6	4.7	4.9	6.0	6.3	6.5	6.8	7.2	7.5	7.9	8.3
Net Benefit	$M	0.0	-1.9	0.3	2.5	4.5	7.1	8.3	9.5	11.3	12.8	13.4	14.1	14.8

Table 93 New Zealand - High annual sales growth - benefits and costs (2007 NZ Dollars) at 5% discount rate

NZ		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy BAU	GWh/yr	195	206	219	232	246	261	278	295	317	341	366	394	424
Energy with program	GWh/yr	195	191	189	188	187	178	181	187	193	200	216	232	250
Energy Savings	GWh/yr	0	15	30	44	59	83	97	108	125	140	151	162	174
Energy Cost Savings	$M	0.0	2.8	5.5	8.3	11.0	15.6	18.1	20.3	23.3	26.3	28.2	30.3	32.6
Emissions Saved	kt CO2-e	0.0	10.5	20.6	30.8	41.0	58.0	67.4	75.7	87.0	98.0	105.2	113.1	121.5
Additional EPS cost	$M	0.0	4.8	5.1	5.4	5.7	7.3	7.8	8.2	8.8	9.5	10.2	10.9	11.7
Net Benefit	$M	0.0	-2.0	0.4	2.9	5.3	8.2	10.3	12.1	14.5	16.8	18.1	19.4	20.9

APPENDIX 11 Calculation Methodology and Worked Examples

The following describes the assumptions, data sources and calculation steps and methodology for this RIS.

This methodology and the assumptions made are the basis of the Costs, Benefits and Impacts of the proposal. As such, careful scrutiny and feedback is sought from stakeholders in this consultative phase.

- Usage time, power ratings and efficiency data from the MEPS profile [MEA 2004] and the standby energy survey [E3 2006]for the BAU case and proposed MEPS requirements case for “off”, 25%, 50%, 75% and 100% loading.
- For energy calculations, EPS stocks per State were apportioned by percentage of household numbers in that State from the household data in APPENDIX 9.
- Estimates were then made on the percentage of each product stock for residential and non-residential sectors. It was assumed that the ratio of residential to non-residential applications is the same for all States.
- Details of the Australian analysis for indirect energy due to additional loading on air conditioning systems and beneficial reduced heating loads are shown in APPENDIX 14,

  In the New Zealand analysis, the cooling load and heating effects are based upon Tasmanian heating and cooling.

  In the absence of heating and cooling data, this is applied to the non-residential stock estimates only. Not all offices and households will have reverse cycle heating/cooling system. Applying this to the non residential load only accounts for offices without air conditioning and those households with air conditioning and other electrical heating systems.
- Greenhouse gas emissions used the State energy calculations combined with the Greenhouse Gas Emission Factors in APPENDIX 8.
- An average service life of 5 years is assumed for all external power supplies.
- NPVs calculated on State residential and non-residential estimates using the domestic and commercial tariffs as per APPENDIX 7.
- Incremental costs are based upon limited supplier information and US wholesaler data.
- Market growth – two scenarios are reported. A conservative 5% considered and “high growth” based upon Darnell’s Global Forecast 2005 to 2010.
- BAU wasted energy is assumed to decrease by 1% pa, then plateau at 10% in 2015 from current wasted energy due to no cost technology improvements. Incremental benefits for MEPS options also include these improvements at no cost.

In the following tables, laptop computers and mobile phones, the calculations are shown for energy consumption, waste energy and benefit cost ratios for a range of service lives and incremental price increases.

Table 94 Laptop computer energy calculations for a 65W output EPS

BAU Mode	Annual hours in mode	Power/waste Watts	Energy used by laptop	Energy wasted by EPS at 81% efficiency
Off	300	0 W		
No load	2,954	1.97 W		5.81 kWh
25% load	4,505	16.25 / 3.81	73.21 kWh	17.17 KWh
70% load	1,001	45.5 /10.67	45.55 kWh	10.68 kWh
		Total	118.76 kWh	33.67 kWh
		Indirect energy due to waste	Based on APPENDIX 14	6.54 kWh
			Total waste	40.2 kWh

MEPS Mode	Annual hours in mode	Power/waste Watts	Energy used by laptop	Energy wasted by EPS at 84% efficiency
Off	300	0 W		
No load	2,954	0.75 W		2.22 kWh
25% load	4,505	16.25 / 3.10	73.21 kWh	13.94 kWh
70% load	1,001	45.5 / 8.67	45.55 kWh	8.67 kWh
		Total	118.76 kWh	24.84 kWh
		Indirect energy due to waste	Based on APPENDIX 14	5.04 kWh
			Total waste	29.9 kWh

Table 95 shows the benefit cost ratio for a range of service years and price increments to meet the MEPS levels.

The data used for the NPV calculations for the benefit cost ratio are;

Energy saving per annum – BAU energy minus MEPS energy = 40.2 – 29.9 = 10.3 kWh

Discount rate 7.5%

Current price to consumer A$ 43.17

Electricity tariff $0.138 per kWh

Table 95 Laptop benefit cost ratio as a function of service life and incremental price increase.

	Service life					
Price increment to comply	3	4	5	6	7	8
2%	3.61	4.94	6.18	7.33	8.40	9.39
5%	0.85	1.38	1.87	2.33	2.76	3.16
10%	0	0.19	0.44	0.67	0.88	1.08
20%	0	0	0	0	0	0.04
30%	0	0	0	0	0	0

Table 96 Mobile phone energy calculations for a 4W output EPS

BAU Mode	Annual hours in mode	Power/waste Watts	Energy used by phone	Energy wasted by EPS at 54% efficiency
Off	900	0 W		
No load	6,290	0.76 W		4.78 kWh
25% load	1,460	1.0 / 0.84 W	1.46 kWh	1.23 KWh
70% load	110	2.80 / 2.35 W	0.31 kWh	0.26 kWh
		Total	1.77 kWh	6.27 kWh
		Indirect energy due to waste	Based on APPENDIX 14	0.36 kWh
			Total waste	6.64 kWh

MEPS Mode	Annual hours in mode	Power/waste Watts	Energy used by phone	Energy wasted by EPS at 61% efficiency
Off	900	0 W		
No load	6,290	0.5 W		3.15 kWh
25% load	1,460	1.0 / 0.63	1.46 kWh	0.92 KWh
70% load	110	2.8 / 1.75	0.31 kWh	0.19 kWh
		Total	1.77 kWh	4.26 kWh
		Indirect energy due to waste	Based on APPENDIX 14	0.25 kWh
			Total waste	4.50 kWh

Table 95 shows the benefit cost ratio for a range of service years and price increments to meet the MEPS levels.

The data used for the NPV calculations for the benefit cost ratio are;

Energy saving per annum – BAU energy minus MEPS energy = 6.64 – 4.50 = 2.14 kWh

Discount rate 7.5%

Current price to consumer A$ 4.32

Electricity tariff $0.138 per kWh

Table 97 Mobile phone benefit cost ratio as a function of service life and incremental price increase.

	Service life					
Price increment to comply	3	4	5	6	7	8
2%	8.52	11.26	13.81	16.19	18.39	20.45
5%	2.81	3.91	4.93	5.87	6.76	7.58
10%	0.90	1.45	1.96	2.44	2.88	3.29
20%	0	0.23	0.48	0.72	0.94	1.14
30%	0	0	0	0.15	0.29	0.43

APPENDIX 12 Manufacturer Compliance Costs

Compliance costs for manufacturers comprise testing, marking and registration.

Testing
Manufacturers already test the performance of their EPS.
Testing to the standard is incremental time only to the set up and tests already carried out. The incremental time for testing and reporting is estimated to be 2 hours. The estimate is based upon test and reporting times carried out during round robin testing of EPS in 2004 by an Australian laboratory. The testing required in the Australian standard is in accordance with international agreements on test methods for external power supplies. Therefore test costs will be amortised over all EPS of a particular model made.

Marking
External power supplies are already labelled with electrical data and compliance symbols for a wide range of safety marks for jurisdictions around the world. The performance mark required in the Australian standard is in accordance with international agreements to mark external power supplies. Therefore the proposal will not itself add to marking costs.

Registration
Industry and E3 Committee representatives indicated support for the AGO to investigate a supplier registration for energy efficiency performance (rather than the usual product registration). An alternative process to individual EPS registration was investigated .

Results of discussions held with the Australian Communications and Media Authority (ACMA) regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or 'families' of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.

The registration method in Australia is via web site submission. The estimated time to complete registration is one hour.

Table 98 shows the compliance cost per EPS for a range of labour rates for test and registration against a range of total quantities of EPS manufactured. These costs are based on three hours compliance labour time per EPS model.

The bulk of EPS are manufactured in Asia and would be tested there. Labour rates are much lower and even using the conservative $20 per hour, incremental costs for compliance range from very low to insignificant, depending upon quantity manufactured.

Table 98 Compliance Costs per EPS - Compliance Costs versus No. of EPS Manufactured

	Test and registration costs per hour			
No. of EPS manufactured	$ 20	$ 45	$ 65	$ 90
1,000	$ 0.06	$ 0.135	$ 0.195	$0.27
10,000	$ 0.006	$ 0.0135	$ 0.0195	$0.027
100,000	$ 0.0006	$ 0.00135	$ 0.00195	$0.0027
1,000,000	$ 0.00006	$ 0.000135	$ 0.000195	$0.00027
10,000,000	$ 0.000006	$ 0.0000135	$ 0.0000195	$0.000027

APPENDIX 13 Comments and Responses

Details of the individual submissions received in 2007 and responses to them are provided in this appendix. Summaries of these and earlier submissions and responses are in Section 6.2 above.

Responses to individual submissions on Consultation RIS of March 2007

Dyne Industries

Introduction - No EPS manufacturers were identified. Focus has been on AC-DC

This RIS has been amended with respect to local manufacturers. The RIS and proposed amendments to the Australian and New Zealand Standard addresses the AC-AC MEPS issue, as was identified in the first public draft.

Increase in EMI

Australian and New Zealand offices and homes utilise many products that have electro-magnetic interference, such as all home entertainment equipment, fluorescent lamps, refrigerators, etc. The increase in EMI due to utilising, where required, SMPS is minor in comparison. EMI levels and compliance is regulated and just as existing EPS must comply, so would substitute EPS. Some equipment, such as DSL modems may be more susceptible to EMI, however, in the case of DSL modems, these are typically low Wattage and there are linear EPS, particularly with the proposed removal of the no-load requirement, that will meet MEPS and not introduce interference. There are other products that are susceptible to EMI, but as addressed in the later response to Elliot Sound Systems' submission, there are products in this category that utilise SMPS. There are also SMPS entering the market that mimic the characteristics of linear EPS, without the full benefits and impacts of a SMPS.

Energy and waste

This submission questioned other impacts, rather than simply in use energy consumption. These questions and the responses are addressed in the following table.
Referring to the recently published European EuP Lot 7 study, in the production phase, SMPS are superior to linear power supplies in virtually all aspects of environmental considerations. In particular SMPS are calculated to require some 30% of the energy required to produce a linear EPS. Therefore, SMPS, due to lower waste energy and lower manufacturing energy, are superior to linear EPS.

The following table provides data from the EuP study and compares a 2.5 W linear for a DECT phone with data for a 4 W SMPS mobile phone. Note the data for the SMPS is overstated slightly as their analysis was based upon some 24% of these EPS being linear.

Issue	2.5 Watt linear	4 Watt SMPS
A comparison of the energy required to manufacture the SMPS and to manufacture a similarly rated linear power supply.	31.7 kWh	7.2 kWh
A comparison of the energy required to correctly dispose of an SMPS and a similarly rated linear power supply.	3.05 kWh	1.11 kWh
The extra energy required in the manufacture and disposal referred to above.	34.7 kWh	8.3 kWh
A comparison of the toxicity of the components in a correctly disposed of SMPS and a similarly rated linear power supply. A comparison of the toxicity of the components in an incorrectly disposed of SMPS and a similarly rated linear power supply such as dumping it in landfill. Total from manufacturing to disposal. Non-hazardous/landfill Hazardous/incinerated	1,239 g 153 g	327 g 62 g
A comparison of the energy saved during the 5 year lifetime of an SMPS and a similarly rated linear power supply.	This is covered in the Consultation RIS and shows savings throughout the EPS use phase and as above, significant savings before and after the use phase	

AC-AC

Complete agreement that the AC-AC issue requires revision. As this is an internationally harmonised test and performance marking standard, there has been persistent contact with the EU, EPA and CEC. US ENERGY STAR have recently sought submissions on Tier 2 performance and including seeking additional input on the no-load issue. Comments and data highlighting the no-load issue have been submitted by Punchline Energy. Within this document, it is proposed that the no-load requirement be deleted, thus simplifying compliance with MEPS for efficiency.

CESA

The delay in time taken to publish the Consultation RIS (and the production of this second consultation draft) means industry should be given more time to comply with the regulation.

The RIS drafting time has been lengthy due to the increased requirements for the RIS from the Office of Best Practice Regulation, the difficulties experienced in obtaining the additional data (in particular, for valuing electricity savings at the avoidable cost of electricity generation and transmission, and then "processing" the data) and regulators' endeavours at settling stakeholder concerns expressed at different meetings over time. This latter consideration has been frustrating for many of those regularly reviewing the issues but it also shows the good faith of regulators listening to all stakeholders and revising the regulatory proposal accordingly.

This RIS is probably the most comprehensive economic analysis and extended consultation undertaken for this product type. The result is a comprehensive report detailing all issues raised by industry and most suggestions have resulted in acceptance or at least compromise.

The proposed implementation time for example has been delayed to account of the need for all parties to have sufficient time to implement the regulatory proposal but not to the extent that parties who organised their supply in accord with the original date will be financially disadvantaged. The Australian New Zealand Standard stated not earlier than October 2007. The initial consultation RIS targeted a later commencement date of 1 April 2008 and this consultation RIS proposes 1 October 2008. It does not, however, delay implementation until 1 April 2009 as was requested by some industry groups.

The current standard states that regulatory authorities have advised that it is intended to mandate this Part 2 Standard in regulations in Australia and New Zealand no earlier than 1 October 2007. This was a signal of impending legislation and some companies have responded. For example, Dell laptop EPS are badged with the performance mark. A Nokia mobile phone acquired in late 2005 has an EPS marked IV and at the recent CeBit conference, exhibitors already had compliant EPS in their catalogue with reference to MEPS.
IC manufacturers such as Power Integrations and Fairchild have ICs for immediate shipment for manufacturers. Power Integrations also has an extensive range of circuit diagrams for downloading by customers.

The US ENERGY STAR web site lists 1,344 performance mark III or IV EPS registered for use at 230 Vac, 50 Hz, with output power ranging from 1.13W to 220 Watts and there are a number of suppliers already wanting to register compliant product in Australia/ New Zealand. There is also a definition for family of models that has been proposed as an amendment to address industry concerns.

The E3 Committee has committed to conduct a market survey prior to the commencement of regulation to measure the availability of compliant product and present the results at a stakeholder forum in the first half of 2008.

Delays for testing and registering at 115Vac.

The following proposals will resolve this issue.
Amend standard to remove testing and marking requirement for 115Vac.

The increase in time taken by regulators to register other products covered by MEPS and/or energy labelling.

Industry and E3 Committee representatives indicated support for the Australian Greenhouse Office to investigate a supplier registration for energy efficiency performance (rather than the usual product registration). Results of discussions held with the Australian Communications and Media Authority (ACMA) regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or 'families' of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.

The failure of a major market to fully adopt the ENERGY STAR requirements for EPS, on which the Australian Standards were developed.

California, with a population of over 36 million, has legislation, however this has been limited to 115Vac compliance and marking of all EPS. The US Government requires the purchase of ENERGY STAR compliant products where they exist, which makes it a *de facto* standard. The US Government has commenced its RIS-type process. The EU has signalled looming legislation. China is reported to be introducing MEPS in 2007 at a lower performance mark, and at performance mark III within two years.

This revised RIS recommends removal of the requirement to test and report 115Vac results for Australia/ New Zealand MEPS but will require mandatory marking for 230Vac.

CESA additional comments

TTMRA - that TTMRA conditions would allow non-compliant product to enter Australia.

The recommendation is for equal MEPS in Australia and New Zealand and therefore New Zealand suppliers will also have to comply.

NZ summary of comments

Family of models

This needs further consideration to simplify for registrants, should the alternative supplier registration not prove to be successful. ENERGY STAR in the US have made the following proposal:

"For ENERGY STAR's purposes, an EPS model family would be defined as a group of switchmode external power supplies that feature the same design (e.g. circuitry components), transformer, and output wattage, but differ in rated output voltage. This proposed EPA definition of an EPS model family might not be identical to each manufacturer's model family definition. When qualifying products as ENERGY STAR, EPA's model family definition would take precedence."

Recommend amending AS/NZS4665 to reflect this proposal.

Model registration – no other country requires.

ENERGY STAR in the USA has over 1300 individual EPS registered. This could also be a potential marketing/sales tool for registrants. If models are not registered or reported in some manner, then there will be no data on the market and performance to assist in the recommended review. New Zealand requires suppliers to submit sales data for products subject to MEPS annually to allow monitoring.

40 VA plus AC-AC inability to meet efficiency and no-load requirements

As detailed earlier, it is proposed to remove the requirement for no-load compliance, thus simplifying compliance with the revised proposal.

DSL interference

Also the comments from Telecom NZ about concerns with DSL.

Some equipment, such as DSL modems may be more susceptible to EMI, however, in the case of DSL modems, these are typically low Wattage and there are linear EPS, particularly with the proposed removal of the no-load requirement, that will meet MEPS and not introduce interference. There are other products that are susceptible to EMI, but as addressed in the later response to Elliot Sound Systems' submission, there are products in this category that utilise SMPS. There are also SMPS entering the market that mimic the characteristics of linear EPS, without the full benefits and impacts of a SMPS.

AMTEX

Agree with harmonised international standards, but do not support mandatory MEPS in Australia unless USA, EU and Asia all introduce mandatory MEPS.

No reason provided. The analysis within this document demonstrates that there is positive benefit to the community from the proposed introduction of MEPS.

Support voluntary EPS with a review of MEPS within 5 years.

No comment on whether they would participate in voluntary EPS.

ASTRA

Email saying there are concerns but no detail.

Clipsal

Special case for long distance cable runs to evaluate EPS performance at the output of the EPS or short output lead.

The example shows the EPS with a short output lead to a plug. In use an extension lead of site-specific length is added. The extension lead is not part of the EPS and would not be included in the test. The EPS would be tested at the fitted plug.

DSE (Holdings)

115 Vac testing

This document recommends that testing at 115Vac be removed from the standard and hence MEPS requirement.

State-based regulation and registration

The submission appeared to think that registration was required in each state, territory and New Zealand. EPS need only be registered in one jurisdiction, not all.

In the case of primary products, each model is imported by a relatively small number of importers (typically one). By contrast, each model of external power supply is imported, as a component, by many different suppliers. Under the proposed scheme, each importer would be required to maintain documents and register power supplies imported by them, resulting in massive duplication in the registration process by both importers and regulators.

While it is possible that the original supplier/manufacturer could register each model, the proposal is to move to supplier registration.

Furthermore, as there are multiple importers and no product marking requirements, it is not possible to link a registration to a physical power supply after it is dissociated from its primary product.

As per the previous response, central registration would cover the EPS, irrespective of the importer/user. Once dissociated from the primary product it probably has no further use, as there is no product to power.

From a primary product manufacturer's perspective, external power supplies are a component. They are bought on the open market, readily approved for specific destinations, from a large range of suppliers. The manufacturer is free to procure a suitable power supply from a different supplier for each production run. This delivers competitive benefits and mitigates material shortfalls. It causes no difficulty to the Australian importer as the different power supplies are already covered by necessary safety approvals and have appropriate EMC reports readily available. Under the proposed MEPS regulation, upon receiving a shipment using a variant power supply, a supplier will need to await completion of a lengthy registration process before the goods can be sold.

> As stated above, the alternate power supplies are covered by necessary approvals, etc. Similar forward planning of registering alternate power supplies would negate this outcome.

State regulators are not subject to competitive pressures and have generally not offered service level guarantees. The registration process will take weeks or months resulting in suppliers incurring lost opportunity costs not currently experienced. The sheer number of individual registrations that regulators will be faced with processing, even without the multiple duplicate registrations, will exceed those for any other product.

> Initial registration will increase the number of registrations, as with the introduction of MEPS for any product. There is usually approximately a six month period to allow for registration of EPS prior to implementation. Thereafter new EPS will require registration which could be done in parallel with all other Australian and New Zealand requirements such as Ctick. It is a matter for the market if the registration process is so backlogged that people cannot get reasonable turnaround.

AC-AC comments.

> As per comments above.

Motorola

Motorola are in favour of introduction of MEPS on the proviso that they are consistent with internationally harmonised test methods and performance levels.

> This is the case and was the intent of the harmonised approach.

Five year life estimate

> They agree with the five year life estimate. They also provided confidential price increment data, but did not specify EPS rating. The indication was that incremental price for SMPS could be greater than 2%, but less than 5%. It is notable that there were no other comments received on price or life.

Soanar

AC-DC

> Soanar fully agree that linear power supplies can be replaced with efficient SMPS at a small cost increase and have started to implement the change for both plug pack and desktop EPS.

AC-AC

> As per other respondents, Soanar expressed concerns about the ability of AC-AC EPS to meet MEPS. They also provided confidential pricing information which indicates high incremental prices. Based upon other submissions, this may not occur if MEPS for AC-AC only address efficiency, not no-load.

Elliot Sound Products

In general this submission addresses current or older non-compliant technologies, which to a degree strengthens the case for the proposed MEPS.

> More sophisticated integrated circuits are far more frequently being used that have additional functions over and above discrete component or simple IC SMPS. Digital control and variable frequency SMPS have dramatically improved energy efficiency and no load losses. For example, one presentation at the recent Standby Power Conference in November 2006 included a range of EPS with 30mW standby, which is almost a factor of 10 below the proposed MEPS requirement.

Actual power low when not in use

> Power can be low when not in use, but the volume of EPS makes the total no load energy significant. The Consultation RIS estimated this to be 250 GWh for 2004. The proposed MEPS would reduce this to an estimated 103 GWh.

The Consultation RIS is primarily concerned with no load

Section 2.2 specifies modes and identifies no load losses of 16% of total energy consumed and active losses 43% of total energy consumed. Therefore active losses are the most significant and are included in the analysis.

Increase in EMI

See comments for EMI under Dyne industry submission.

SMPS do emit EMI, as do linear EPS. Linear EPS EMI is much lower. EMI is already covered by standards. The switching frequencies are much lower than many products such as cordless phones, wireless routers and modems that fill our homes and offices.

Quoting two sections of an Natural Resource Defense Council submission to the California Energy Commission:

"We also understand that samples of the Sharp phone as well as the CEC complying EPS from a Panasonic model sold in Europe have been provided to the CEC for inclusion in the docket. We also want to point out that Sagem sells cordless phones in Australia with a CEC complying switching EPS and that large ODM is using switchers with cordless phones sold under Philips, GE, and Alcatel brands."

"AM/FM radios already use switching EPS.

Noise issues are easily solvable with standard filtering techniques.

Many other products already use internal switching power supplies in close proximity to tuners, even in the same box:

Conventional TVs, LCD TVs, Plasma TVs, Set-top boxes;

Security cameras are far less sensitive than TV tuners.

Homes already have many switching EPS close to AM/FM receivers that do not interfere.

FCC specs prevent interference between products through the power line and through radiation.

The noise conducted through the low voltage cable to the product can be filtered in the same way.

Additional components are likely to cost only US$0.05 to US$0.10 extra."

Power Factor

Power factor of SMPS is worse than linear SMPS, but larger SMPS would typically have power factor correction. Households and offices are subject to many other reactive load products such as fluorescent lights, ICT equipment, refrigeration, fans, etc. The magnitude of loads powered by EPS is minor in comparison. Many EPS-powered products operate at low power when not being used for their intended function.

Longevity - SMPS units do not last for more than a few years

Evidence was not provided for this claim. SMPS have been in the market for some 25 years. Many of our existing home and office products utilise SMPS both internally and externally.

Typically the EPS, irrespective of type, will outlast the product being powered.

Typical Asian made SMPS are shoddy.

The bulk of EPS, both SMPS and linear, are manufactured in Asia. Seven of the top ten manufacturers are headquartered in mainland China and Taiwan. Of the author's two SMPS from significant brand names, Dell and Nokia, both are made in China. All other linear EPS in use are also made in China.

According to one industry source, every DVD player manufactured uses an internal SMPS. Most of our televisions, set top boxes, DVD players and recorders and computers are made in Asia and use SMPS.

Fire risk greater with SMPS

SMPS are typically much more efficient than linear EPS and therefore generate much less heat. All developed nations, at least, have safety codes and standards. Evidence was not provided for this claim.

Regulated output

This submission expresses concern that "small" SMPS cannot provide regulated (stable) output over the full output range. The amount of regulation depends upon the appliance being powered. Even products using linear EPS may require additional regulation. The use of SMPS, as stated within the report, is increasing, particularly in the very low power mobile phone sector.

Small SMPS incapable of maintaining good regulation.

Quoting the technical manager of one of the largest SMPS manufacturers, "This may have been the case 10 years ago."

There are also SMPS designed to be "linear replacements", such that they mimic the performance of a linear EPS, rather than providing the full attributes of a SMPS.

Ban on traditional linear power supplies

It is not a ban of linear EPS. It is to improve the performance of linear and SMPS to a minimum level. There are linear EPS that comply with the proposed regulation, as there are SMPS that do not comply.

Standby VA

IC manufacturers have responded to the challenge and there is increasing availability of ICs that allow energy consumption well below the requirements, thus reducing no-load power and VA. Power Integrations have achieved 30mW no load power consumption by adding components at a OEM cost of US$0.01.

AC-AC

The potential inability of these EPS to meet the both conditions in the proposed MEPS has been recognised in the Consultation RIS.

US Department of Energy

The DoE provided up-to-date information on their program which has be added to this report.

Wakefield Laboratories

AC/AC External Power Supplies

Suggests that MEPS apply to AC-DC only at first awaiting resolution of the AC-AC difficulty in complying. The report proposes the removal of the no-load requirement, therefore allowing MEPS to apply to AC-AC EPS for efficiency only. Therefore AC-AC can remain.

Registration

The submission notes supplier registration proposal from the Sydney stakeholder forum. The submission suggests that the registration database be publicly available and that registration should lapse unless it is renewed within a pre-set period. As previously mentioned results of discussions held with the Australian Communications and Media Authority (ACMA) regarding database sharing to include mandatory energy performance requirements are that it is unlikely to be a workable option due to restrictions placed on the use of these symbols under the Telecommunications Act 1997. E3 has since sought legal opinion as to the legality of a supplier registration rather than product registration. Advice is that the current State and Territory legislative scheme does not allow for the registration of corporate entities supplying a range of electrical products rather than the registration of individual or 'families' of electrical products. A working group made up of government and an industry/standards representative and has been established and tasked with finding a practical solution, acceptable to all parties using the Australian/New Zealand Standard and family of models criteria. In the absence of an alternative solution, EPS and EPS families of models will require registration as per AS/NZS4665 and the proposed amendments.

Family of models

The submission suggests some options for rewording. This is addressed in the proposed amendments to the standard.

115 Vac testing

The submission comments on time and provides an estimate of extra cost if carried out in New Zealand. This report proposes that the requirement to test at 115Vac be removed from the standard and is therefore not an issue.

Comments on the standard

These comments will be tabled at the standards meeting when the proposed amendments are considered.

APPENDIX 14 Indirect Energy Calculations

Indirect energy gains and loses arise from the impact of waste energy from external power supplies on other energy consuming products. In this RIS, this has been applied only to heating and cooling loads in the non-residential sector.

The heating and cooling loads depend upon the ambient temperatures in the each region.
To estimate indirect energy, data has been sourced by capital city on the basis of energy consumed in office buildings. [DEW 2006]
Referring Table 99 below; 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 percentage of heating and cooling time, as shown in columns C and D respectively.
In calculating the no load energy in column F, analysis of office appliance usage patterns provides an estimate that 36% of the total daily no load energy is consumed during office hours, when heating or cooling is required.
From the same analysis of office appliance usage for calculating the active energy losses in column G, it is estimated that 82% of the total daily active energy loss is consumed during office hours when heating or cooling is required.
No load and active energy losses are then apportioned by State on the basis of number of households in column E.
The heating energy saved is calculated by dividing the total energy in column H by a co-efficient of performance (COP) for heating at 3.0. This COP is based upon the E3 report on heat pumps from http://www.energyrating.gov.au/library/pubs/200417-mepsheatpumps.pdf
The cooling energy saved is calculated by dividing the total energy in column H by a co-efficient of performance (COP) for cooling at 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

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 99 Indirect Energy Data

Column	A	B	C	D	E	F	G	H	I	J	K
	Heating energy	Cooling energy	% time heating	% time cooling	Households per State	No load Office hours	Active losses Office hours	Total	Heating GWh saved	Cooling GWh added	Net indirect GWh
Adelaide	3	20	13%	87%	635.3	2.43	9.49	11.92	0.39	3.84	3.45
Brisbane	0	27	0%	100%	1510.1	5.77	22.56	28.34	0.00	10.50	10.50
Canberra	7.5	17	31%	69%	129.6	0.50	1.94	2.43	0.19	0.62	0.44
Darwin	0	47	0%	100%	74.3	0.28	1.11	1.39	0.00	0.52	0.52
Hobart	8.8	9.5	48%	52%	195.8	0.75	2.93	3.67	0.44	0.71	0.26
Melbourne	5.5	15	27%	73%	1905.5	7.29	28.47	35.76	2.40	9.69	7.29
Perth	1.5	28	5%	95%	801.1	3.06	11.97	15.03	0.19	5.28	5.09
Sydney	2	31	6%	94%	2591.9	9.91	38.73	48.64	0.74	16.92	16.18

APPENDIX 15 US ENERGY STAR Test Method

Test Method for Calculating the Energy Efficiency of Single-Voltage External Ac-Dc and Ac-Ac Power Supplies

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August 11, 2004

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California Energy Commission

1

1. Scope

This document specifies a test method for calculating the energy efficiency of *single-voltage external ac-dc and ac-ac power supplies, herein referred to collectively as "power supplies." Power supplies* are designed to convert line voltage ac into the low voltage output (either ac or dc) typically required by laptop computers, cordless and cellular phones, portable stereos, etc. *External* power supplies are contained in a separate housing from the product they are powering. These external power supplies are often referred to as "ac adapters."

A *single voltage* power supply provides one dc or ac output that is either at a fixed voltage or user selectable through a selector switch. Power supplies with multiple, simultaneous output voltages, whether internal or external, are beyond the scope of this document. Dc-dc voltage conversion equipment such as dc-dc converters are not included in the scope of this document, except to the extent that such circuitry may be found within a power supply.

The purpose of this test procedure is to establish a standardized method that can be used worldwide to measure the efficiency of single voltage external ac-dc and ac-ac power supplies across a full range of load conditions. Its intent is not to replace IEC 62301, which focuses closely on the measurement of standby power, but to augment and extend it downward to the measurement of no load conditions and upward to the measurement of active mode conditions. Likewise, its intent is not to replace IEEE 1515-2000, but to add specificity regarding loading conditions and reporting requirements. A number of governments around the world intend to use this test procedure to assess and compare the efficiency of power supplies.

2. References

The following list includes documents used and/or referenced in the development of this proposed test specification.

I. IEEE Std 1515-2000, IEEE Recommended Practice for Electronic Power Subsystems: Parameter Definitions, Test Conditions, and Test Methods
II. IEEE Std 519-1992, IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
III. IEC 62301 Ed 1: Measurement of Standby Power
IV. IEC 60050 International Electrotechnical Vocabulary - Electrical and electronic measurements and measuring instruments
V. IEEE 100: The Authoritative Dictionary of IEEE Standards Terms

3. Definitions

For the purpose of this document the following definitions apply. Terms defined in IEC 60050 and IEEE 100 also apply.

a. Active Mode

Active mode refers to a condition in which the input of a power supply is connected to line voltage ac and the output is connected to a dc or ac load drawing a fraction of the power supply's nameplate power output greater than zero.

b. Active Mode Efficiency

Active mode efficiency is the ratio, expressed as a percentage, of the total real output power (dc or ac) produced by a power supply to the real input power (ac) required to produce it. See IEEE 1515-2000, 4.3.1.1.

c. No Load

In this document, *no load* refers to a condition in which the input of a power supply is connected to an ac source consistent with the power supply's nameplate ac input voltage, but the output is not connected to a product or any other load.

d. No Load Power

No load *efficiency* would by definition be 0 when calculated on a percentage basis (see 3b above). In this document, *no load power* is defined as the wattage of real power (ac) consumed by a power supply operating in the no load condition.

e. UUT

UUT is an acronym for "unit under test," which in this case refers to the power supply sample being tested.

f. Ambient Temperature

Ambient temperature is the temperature of the ambient air immediately surrounding the UUT.

g. Power Factor (True)

The *true power factor* is the ratio of the active, or real, power (P) consumed in watts to the apparent power (S), drawn in volt-amperes (VA).

$$PF = \frac{P}{S}$$

This definition of power factor includes the effect of both distortion and displacement.

h. Total Harmonic Distortion (THD)

THD is the ratio, expressed as a percent, of the rms value of an ac signal after the fundamental component is removed to the rms value of the fundamental component. THD of current is defined as:

$$THD_I = \frac{\sqrt{I_2^2 + I_3^2 + I_4^2 + I_5^2 \ldots + I_{13}^2}}{I_1}$$

where I_{13} = rms value of 13^{th} harmonic of the current signal.

i. Apparent Power (S)

The total or *apparent power* (S) is the product of rms voltage and rms current (VA).

j. Instantaneous Power

The product of the instantaneous voltage and instantaneous current at a port (the terminal pair of a load).

k. Active Power (P)

The rms value, taken over one period, of the instantaneous power. Most measuring instruments average active power over a number of periods (ac cycles); readings from such instruments are equally valid for this measurement.

l. Nameplate Input Voltage

Nameplate input voltage is the appropriate ac input voltage of the power supply as specified by the manufacturer on the label on the housing of the power supply. This is often expressed as a range, such as 100 to 240 V.

m. Nameplate Input Frequency

Nameplate input frequency is the appropriate ac input frequency of the power supply as specified by the manufacturer on the label on the housing of the power supply. Many power supplies are labeled to operate on more than one input frequency.

n. Nameplate Output Voltage

Nameplate output voltage is the voltage output of the power supply as specified by the manufacturer on the label on the housing of the power supply (either dc or ac). Because unregulated and regulated power supplies both exhibit some voltage deviation from nameplate output voltage when supplying current, actual output voltage is likely to differ from nameplate voltage at certain current outputs.

o. Nameplate Output Current

Nameplate output current is the current output of the power supply as specified by the manufacturer on the label on the housing of the power supply. Loading conditions for the power supply are determined by multiplying nameplate output current by 100%, 75%, 50%, 25%, and 0% respectively.

4. General Conditions for Measurement

a. General

Unless otherwise specified, measurements shall be made under test conditions and with equipment specified below.

b. Measuring Equipment

Power measurements shall be made with a suitably calibrated voltmeter and ammeter, or power analyzer. As is specified in IEC 62301, measurements of active power of 0.5 W or greater shall be made with an uncertainty of ≤ 2%. Measurements of active power of less than 0.5 W shall be made with an uncertainty of ≤ 0.01 W. The power measurement instrument shall have a resolution of 0.01W or better for active power. Measurements of voltage and current shall be made with an uncertainty of ≤ 2%.

c. Test Room

As is specified in IEC 62301, the tests shall be carried out in a room that has an air speed close to the UUT of ≤ 0.5 m/s, and the ambient temperature shall be maintained at 23°C ± 5°C throughout the test. There shall be no intentional cooling of the UUT by use of separately powered fans, air conditioners, or heat sinks. The UUT shall be tested on a thermally non-conductive surface. Products intended for outdoor use may be tested at additional temperatures, provided those are in addition to the conditions specified above and are noted in a separate section on the test report.

d. Test Voltage

An ac reference source shall be used to provide input voltage to the UUT. As is specified in IEC 62301, the input to the UUT shall be the specified voltage ± 1% and the specified frequency ± 1%. The UUT shall be tested at two voltage and frequency combinations: 115 V at 60 Hz and 230 V at 50 Hz if its nameplate input voltage and frequency indicate that it can operate safely under both conditions. If testing at both conditions is not possible, the UUT shall be tested at one of the above voltage and frequency combinations that is closest to its nameplate input voltage and frequency. If voltage and/or frequency ranges are not specified by the manufacturer (or the nameplate value is unclear), the UUT shall not be tested.

e. Input ac reference source

The input voltage source shall be capable of delivering at least 10 times the nameplate input power of the UUT (as is specified in IEEE 1515-2000). Regardless of the ac source type, the THD of the supply voltage when supplying the UUT in the specified mode shall not exceed 2%, up to and including the 13th harmonic (as specified in IEC 62301). The peak value of the test voltage shall be within 1.34 and 1.49 times its rms value (as specified in IEC 62301).

f. Test leads

All leads used in the test set-up should be of large gauge and short length in order to avoid the introduction of errors in the testing process. For further guidance, see Table B.2, "Commonly used values for wire gages and related voltage drops" in IEEE 1515-2000.

5. Measurement Approach

a. Preparing UUT for Test

Any built-in switch in the UUT controlling power flow to the ac input shall be in the "on" position for this measurement, and the existence of such a switch shall be noted in the final test report.

Power supplies that are packaged for consumer use to power a product must be tested with the output cord supplied by the manufacturer. There are two options for connecting metering equipment to the output of this type of power supply: cut the cord immediately adjacent to the output connector, or attach leads and measure the efficiency from the output connector itself. If the power supply is attached directly to the product that it is powering, cut the cord immediately adjacent to the powered product and connect output measurement probes at that point. If the product has more than two output wires, the tests should be conducted on the two output wires that supply the output power. The other output wires (sometimes used for battery monitoring) should be left electrically disconnected.

It is also possible to utilize this procedure to test the efficiency of a bare circuit board power supply prior to its incorporation into a finished housing and the attachment of its dc output cord. For example, a power supply manufacturer or component manufacturer may wish to assess the efficiency of a design that it intends to provide to an OEM for incorporation into a finished external power supply. However, the efficiency of the bare circuit board power supply may not be used to characterize the efficiency of the final product (once enclosed in a case and fitted with an output cord). Power supplies must be tested in their final, completed configuration in order to represent their measured efficiency on product labels or specification sheets.

b. Load Conditions

All single voltage external power supplies have a nameplate output current, as shown in Figure 1. This is the value used to determine the four active mode load conditions and the no load condition required by this test procedure. The UUT shall be tested at the following load conditions:

Table 1 – Load Conditions for UUT

Percentage of Nameplate Output Current	
Load Condition 1	100 % ± 2%
Load Condition 2	75% ± 2%
Load Condition 3	50% ± 2%
Load Condition 4	25% ± 2%
Load Condition 5	0%

The 2% allowance is of nameplate output current, not of the calculated current value. For example, a UUT at Load Condition 3 may be tested in a range from 48% to 52% of rated output current.

Additional load conditions may be selected at the technician's discretion, as described in IEEE 1515-2000, but are not required by this test procedure.

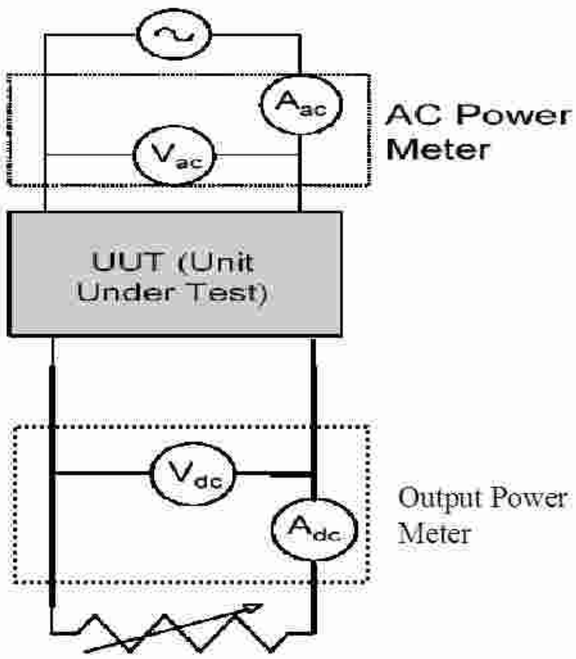
Figure 1– Example of Ac-Dc Power Supply Nameplate Output Voltage and Current

c. Loading Guideline

In order to load the power supply to produce all four active mode load conditions, a set of variable resistive or electronic loads shall be used. While these loads may have different characteristics than the electronic loads power supplies are intended to power, they provide standardized and readily repeatable references for testing and product comparison.

Note that resistive loads need not be measured precisely with an ohmmeter. A variable resistor is simply adjusted to the point where the ammeter confirms that the desired percentage of nameplate output current is flowing. Figure 2 shows a simplified schematic of an external power supply test set-up using variable resistance as the load. For electronic loads, the desired output current should be adjusted in constant current (CC) mode rather than adjusting the required output power in constant power (CP) mode.

Figure 2 - Generic Test Set-up Using a Variable Resistance Load



d. Testing Sequence

As noted in IEC 62301, instantaneous measurements are appropriate when power readings are stable in a particular load condition. The UUT shall be operated at 100% of nameplate current output for at least 30 minutes immediately prior to conducting efficiency measurements.

After this warm-up period, the technician shall monitor ac input power for a period of 5 minutes to assess the stability of the UUT. If the power level does not drift by more than 5% from the maximum value observed, the UUT can be considered stable and the measurements can be recorded at the end of the 5 minute period. Subsequent load conditions (see below) can then be measured under the same 5 minute stability guidelines. Note that only one warm-up period of 30 minutes is required for each UUT at the beginning of the test procedure.

If ac input power is not stable over a 5 minute period, the technician shall follow the guidelines established by IEC 62301 for measuring average power or accumulated energy over time for both ac input and dc output.

Efficiency measurements shall be conducted in sequence from Load Condition 1 to Load Condition 5 as indicated in Table 1 above. If testing of additional, optional load conditions is desired, that testing should be conducted in accordance with this test procedure and subsequent to completing the sequence described above.

e. *Efficiency Calculation*

Efficiency shall be calculated by dividing the UUT's measured active output power at a given load condition by the active ac input power measured at that load condition. Average efficiency shall also be calculated and reported as the arithmetic mean of the efficiency values calculated at Test Conditions 1, 2, 3, and 4 in Table 1. This is a simple arithmetic average of active mode efficiency values, and is not intended to represent weighted average efficiency, which would vary according to the duty cycle of the product powered by the UUT.

f. *Power Consumption Calculation*

Power consumption of the UUT at each Load Condition 1 – 4 is the difference between the active output power (W) at that Load Condition and the ac active input power (W) at that Load Condition. The power consumption of Load Condition 5 (no load) is equal to the ac active input power (W) at that Load Condition.

6. *Test Report*

The following information shall be reported once for each UUT: UUT manufacturer, UUT model number, UUT dc cord length (± 1 cm), whether a built-in switch is present on the UUT, product powered by the UUT if known, photo of UUT that a) clearly shows nameplate information and b) displays the size of the entire UUT with a centimeter rule for scale, UUT country of manufacture, name of test lab, name of technician performing the test, ambient temperature immediately surrounding the UUT (± 1 °C), date and location of test, and a description of test equipment used with most recent calibration date.

The key data (measured and calculated) to report for each input voltage and frequency combination at which was test conducted are found in Table 2 below.

Table 2 – Required Reported Data (Measured and Calculated)

Reported Quantity	***Description***
Rms Output Current (mA) Rms Output Voltage (V) Active Output Power (W)	Measured at Load Conditions 1 – 4
Rms Input Voltage (V) Rms Input Power (W) Total Harmonic Distortion (THD) True Power Factor	Measured at Load Conditions 1 – 5
Power Consumed by UUT (W)	Calculated at Load Condition 1 – 4, Measured at Load Condition 5
Efficiency	Calculated at Load Conditions 1 – 4
Average Efficiency	Arithmetic Average of Efficiency at Load Conditions 1 – 4

The test data are most usable and readily compared to other results if also presented in graphical form, as shown in the sample test report in Annex A. Note that the efficiency curve shown in Annex A is similar in format to that shown in IEEE 1515-2000, 4.3.1.2, Figure 10.

The "Input vs. Output Power" chart in Annex A provides an additional, useful means of conveying a power supply's relative efficiency that includes ac active input power and active output power at 100%, 75%, 50%, 25%, and 0% of nameplate current output on a single chart. The shaded area between the input and output power curves will be quite small with highly efficient power supplies. Note also that the output power curve will be close to a straight line in a regulated power supply, but may deviate from a straight line significantly in unregulated units where voltage is not stable across a range of load conditions.

Annex A

(Final report form generated by Microsoft Access and provided in separate document)

APPENDIX 16 UK Market Transformation Program Policy Brief

UK ENERGY CONSUMPTION OF DOMESTIC EXTERNAL POWER SUPPLIES

This is an abbreviated version of the policy brief. The information and analysis in the brief forms part of an integrated, public domain knowledge base managed by Defra's Market Transformation Programme. The policy scenarios and action plans are intended to stimulate discussion and do not imply commitment by Government nor by any other body. In particular, the symbol '?' indicates a proposal for adoption into this Policy Brief, pending further consultations.

SCOPE: This document relates to external power supplies (wall adaptors) for domestic applications such as mobile phones, video games consoles, etc.

Table 1: Essential Numbers

OVERVIEW: The stock of external powers supplies is somewhat difficult to quantify but all projections expect it to rise steadily. The major rise in recent years has been due to rapid rise in mobile technology which has now abated. Whilst MTP projections are believed to be robust, further work may be necessary to quantify the stock and usage patterns in future.

KEY POLICY INSTRUMENTS:

EU Code of Conduct;

Energy Saving Trust's Energy Efficiency Recommended scheme. A voluntary product endorsement scheme.

PRIORITIES:

Sector Review Priorities (abbreviated): To agree on the underlying assumptions and trends within the MTP projections;

To monitor UK manufacturers take-up of EU Code of Conduct.

TARGETS, STRATEGIES AND ACTION PLAN

***CP £k** is estimated cost of the policy to Government, industry and consumers (as an 'opportunity cost' – i.e. net cost compared to next best option). Covers set-up, implementation and directly resultant costs.
****CI** is Critical Issue – cross-reference to Table 3 Critical Issues
See Table 1 for definitions of **Status**: Ref, P1, P2.

OBJECTIVES AND TARGETS Market Transformation effects which are <u>necessary and sufficient</u> to deliver the MTP projected P1 and P2 outcomes (above)	**ACTION PLAN** Actions which are <u>necessary and sufficient</u> to deliver the market transformation target (left) *(Action owner in brackets)*	**CP £k ***	**Status (Ref, P1, P2)** **Start and Finish Dates**	**CI ****
Best Practice				
EU Voluntary CoC <u>Briefing Note</u>: BNPS2 <u>Target Date</u>: 2005 <u>Target/Effect:</u> UK sales of 1W standby external power supplies to be 60% of total sales of power supplies. UK sales of 0.75W standby power supplies to be 70% of total sales of power supplies. UK sales of 0.3W standby power supplies to be 80% of total sales of low Wattage output power supplies. UK sales of 0.50W standby power supplies to be 80% of total sales of medium Wattage output power supplies. UK sales of 0.75W standby power supplies to be 80% of total sales of high wattage output power supplies.	• Verify that manufacturers supplying 40% of total UK sales of wall packs have signed up to EU voluntary Code of Conduct agreement by 2003 (EC) for 60% of their sales. *Potential source: GFK data.*		2000- 2003 P1	
	• Encourage additional manufacturers to sign up. Target: raise level of signatories to 75%? (MTP?)		2003- 2005 P1	

2.9.1.1.1 Table 2: Target and Action Plan for Consumer Electronics – External Power Supplies

CRITICAL ISSUES:

The following issues have been identified as important to the development of reliable and effective policy in this sector. The most important issues are near the top of the list. Reference numbers link back to the related strategies.

2.9.1.1.2 Table 3: Critical Issues

Ref	**Issues** Unresolved issues critical to policy decisions	Action	Action completion date
01	OEMs and procurers for external power supplies in sectors other than mobile phones and laptops have not signed the CoC.	Contact these companies and encourage to sign *(MTP? EC?)*	2003
02	Companies are not interested in energy efficiency	Continue to promote and educate *(MTP/EC?)*	Ongoing
03	New technology shows that 0.1W standby is possible for small and medium output power supplies	Identify and encourage manufacturers to adopt this technology *(MTP/EC?)*	2003
04	Many manufacturers suffering from reductions in sales	Identify companies committed to technological advances which include reduction in standby power *(MTP/EC?)*	2003
05	Large procurement contracts have opportunities to specify EE external power supplies	Promote the need to government sponsored and influenced procurement contracts: e.g. D-A TV adaptors *(DTI?/EST?/MTP?)*	2003

APPENDIX 17 Amendments to AS/NZS4665 2005

Revise date to October 2008.

Registration - Subject to the outcome of the working group, amend the registration requirements.

Remove no-load requirement for AC-AC external power supplies.

Revise definition of family of models.

<u>Family of models definition</u>

An EPS model family would be defined as a group of switchmode external power supplies that feature the same design (e.g. circuitry components), transformer, and output wattage, but differ in rated output voltage."

In addition, the standard will require amendment to specify test and data requirements as follows. Testing and reporting of efficiency data for the highest and lowest output voltage members of the EPS model family that meets the part 2 of the standard.

<u>Test voltage</u>

Amend the standard to remove testing and marking requirement for 115Vac. Instructions on how to test for 115Vac will remain in the standard for those who want to export these products from Australia and New Zealand to 115Vac markets. Exporters must note that other jurisdictions may require that AC-AC external power supplies meet the no load requirements that apply to AC-DC external power supplies.

Expand exemptions to include replacement and medical use EPS

<u>Replacement external power supplies</u>

The Trade Practices Act 1974 requires a part to be "reasonably available" after the acquisition of the goods by a consumer. Therefore an external power supply that is made available by a manufacturer directly to a consumer or to a service or repair facility after and separate from the original sale of the product requiring the external power supply as a service part or spare part shall be exempt from meeting the above MEPS requirements for a period of 5 years from the date of introduction of MEPS.

<u>Medical use EPS</u>

Therapeutic devices in the Australian Register of Therapeutic Goods in accordance with the Therapeutic Goods Act 1989 as amended by the Therapeutic Goods Amendment (Medical Devices) Bill 2002, the Therapeutic Goods (Medical Devices) Regulations 2002 and any subsequent amendments are exempt from meeting the above MEPS requirements. For further information use the following link. http://www.tga.gov.au/devices/devices.htm#guidelines

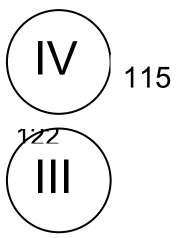
Amend marking requirements

If the EPS has only been tested at 230 Vac, then the EPS marking shall be marked with the 230 Vac qualifier.

Dual marking

If the external power supply has a different energy performance for different AC supply voltages, then the external power supply may voluntarily be marked with its performance mark qualified by voltage at which it applies, with the appropriate voltage marked immediately beside the mark. Figure 3 provides an example of dual marking, where the external power supply meets performance mark IV at 115 Vac and mark III at 230 Vac.

Example of Dual Marking



If only one mark is applied, then it shall be the lowest mark attained when tested at 115 Vac and 230 Vac. For example, if the performance is mark III at 115Vac and mark II at 230 Vac, then the single mark shall be II.