



## Equipment Energy Efficiency Committee Cost-Benefit Analysis

Minimum Energy Performance Standards  
and Alternative Strategies for  
Home Entertainment Products

Discussion draft for stakeholder comment issued under the auspices of the Ministerial Council on Energy



JULY 2007

Prepared by EnergyConsult Pty Ltd for AGO

This Cost-Benefit Analysis was prepared by EnergyConsult Pty Ltd for the Australian Greenhouse Office, representing the Equipment Energy Efficiency Committee (E3 Committee) under the Ministerial Council on Energy of the Australian federal, state and territory governments and the New Zealand Government.

Shane Holt  
Chair, Equipment Energy Efficiency Committee  
Australian Greenhouse Office

Please address your written submissions to:

Australia	New Zealand
Ms Simone Tiele Equipment Energy Efficiency Team Australian Greenhouse Office Department of the Environment and Water Resources GPO Box 787 CANBERRA ACT 2601 AUSTRALIA  Or via email to: <a href="mailto:energy.rating@environment.gov.au">energy.rating@environment.gov.au</a>	Ms Heidi Irion Programme Administrator Energy Efficiency and Conservation Authority PO Box 388 WELLINGTON NEW ZEALAND  Or via email to: <a href="mailto:Heidi.Irion@eeca.govt.nz">Heidi.Irion@eeca.govt.nz</a>



655 Jacksons Track  
Jindivick, Victoria 3818  
Australia  
ABN: 18 090 579 365  
Tel: +613 5628 5449  
Fax: +613 9923 6175  
Email: [info@energyconsult.com.au](mailto:info@energyconsult.com.au)

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## *Contents*

<i>1</i>	<i>Scope</i>	<i>1</i>
1.1	National policy responses to global warming	1
1.2	Home Entertainment Products	7
1.3	Australian/New Zealand Policies and Programs	8
1.4	Home Entertainment Product Market	10
1.5	Australian Market Players	12
<i>2</i>	<i>The Problem</i>	<i>14</i>
2.1	Energy and Greenhouse Gas Emissions	15
2.2	Contribution of Home Entertainment Products to Energy Use and Emissions	16
2.3	Home Entertainment Technologies and Energy Efficiencies	20
2.4	Assessment of Market Deficiencies and Failures	31
<i>3</i>	<i>Objectives of Strategies</i>	<i>34</i>
3.1	Objective	34
<i>4</i>	<i>Proposed Strategies</i>	<i>35</i>
4.1	Status Quo (BAU)	35
4.2	Voluntary Efficiency Standards	37
4.3	Voluntary Certification Program	38
4.4	Dis-endorsement Label	39
4.5	Levies and Emissions Trading	39
4.6	Mandatory Energy Labelling	41
4.7	Mandatory Minimum Energy Performance Standards	42
4.8	Conclusions	44
<i>5</i>	<i>Cost-Benefit and Other Impacts</i>	<i>45</i>
5.1	Costs to the Taxpayer	45
5.2	Business Compliance Costs	45
5.3	Industry, Competition and Trade Issues	47
5.4	Consumer Costs and Benefits	55
5.5	Impact on Energy Use and Greenhouse Gas Emissions	58
5.6	National and State Costs and Benefits	68
<i>6</i>	<i>Consultations and Comments</i>	<i>75</i>
6.1	Summary of Comments	76
6.2	Responses to Comments	76
<i>7</i>	<i>Evaluation and Recommendations</i>	<i>77</i>
7.1	Assessment	77
7.2	Recommendations (Draft)	78
<i>8</i>	<i>Implementation and Review</i>	<i>79</i>

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## *Appendices*

Appendix 1: References	A-2
Appendix 2: Stock and Sales	A-4
Appendix 3: Overseas Policies, Programs and Measures	A-17
Appendix 4: Energy Prices and Factors	A-20
Appendix 5: Calculation Methodology	A-20
Appendix 6: ETS Provisional Benefits to be Included in Future	A-20
Appendix 7: Greenhouse Gas Emissions Factors	A-20
Appendix 8: Population and Household Numbers	A-20
Appendix 9: BAU and MEPS Power Consumption Values	A-20
Appendix 10: Annual Benefit and Cost Data	A-20

## *List of Tables*

Table 1: Net annual BAU energy consumption of all HE products by States, Australia and NZ (GWh)	17
Table 2: Definition of Power Modes	23
Table 3: Home Entertainment Product Measurements Average: Survey 2005/06	24
Table 4: BAU Usage and Power Consumption by Category, Mode and Year for Australia	36
Table 5: Proposed MEPS: Maximum Standby Power Levels	43
Table 6: Business Cost Calculation Inputs	46
Table 7: Business Compliance Costs for Home Entertainment MEPS	47
Table 8: Incremental Price Increase Range and Sources	48
Table 9: Incremental Price Increase Due to MEPS Requirements by Year	48
Table 10: MEPS Stage 1: Home Entertainment Products excluded when applied to Store Survey Data from 2001 to 2006	51
Table 11: MEPS Stage 2: Home Entertainment Products excluded when applied to Store Survey Data from 2001 to 2006	53
Table 12: Present Value Costs and Savings – HE Product MEPS, 7.5% Disc Rate	57
Table 13: Present Value Costs and Savings: Varying Usage - MEPS, 7.5% Disc Rate	58
Table 14: Financial Analysis – Australia Base Sales Growth	69
Table 15: Financial Analysis – Australia Low Sales Growth	69
Table 16: Financial Analysis – NZ Base Sales Scenario	70
Table 17: Financial Analysis – NZ Low Sales Scenario	71
Table 18: Benefit-Cost Ratio for States by Discount Rate: Base Sales Scenario	72
Table 19: Benefit-Cost Ratio for States by Discount Rate: Low Sales Scenario	72
Table 20: Summary Data for Alternative BAU Sales Australia – 7.5% Discount Rate	74
Table 21: Summary Data for Alternative BAU Sales New Zealand – 10% Discount Rate	74
Table 22: Total annual sales of home entertainment products 2000-2020, by States, Australia and New Zealand	A-9
Table 23: Stock of home entertainment products 2000-2020, by States, Australia as a whole and New Zealand	A-15
Table 24: Energy consumption efficiency level for VCRs	A-20
Table 25: Energy consumption efficiency level for DVD Recorders	A-20
Table 26: Summary of Testing Standards	A-20
Table 27: Brief Overview of Energy Efficiency Programs	A-20
Table 28: Detailed Summary of Energy Efficiency Programs	A-20
Table 29: Marginal Electricity Tariffs 2005-06	A-20
Table 30: Avoided Marginal Costs of Electricity	A-20
Table 31: Hours of Operation by Product by Mode (hrs/day) Low, Base & High Usage Scenario	A-20
Table 32: Indirect Energy Use Calculation Parameters by State & NZ	A-20
Table 33: Carbon Permit Sensitivity Analysis – Australia Base Sales Growth	A-20
Table 34: Projected Marginal Emissions Factors: Electricity by State 2000-2020	A-20
Table 35: Annual Consumer Energy, Benefits and Costs by State for Australia & NZ: Base Sales Scenario	A-20
Table 36: Annual Consumer Energy, Benefits and Costs by State for Australia & NZ: Low Sales Scenario	A-20

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## *List of Figures*

Figure 1: Annual Sales of Product by Category – Australia	11
Figure 2: Annual Sales of Product by Category – New Zealand	11
Figure 3: Total Installed Stock of Product by Category – Australia	12
Figure 4: Total Installed Stock of Product by Category – New Zealand	12
Figure 5: Product Brand shares in Australia	13
Figure 6: Australian Greenhouse Gas Emissions by Sector 2004 (Source: NGGI 2004)	15
Figure 7: Net annual BAU energy consumption by Product Categories - Australia	18
Figure 8: Net annual BAU energy consumption by Product Categories – New Zealand	18
Figure 9: Annual BAU GHG emissions by Product Categories – Australia	19
Figure 10: Annual BAU GHG emissions by Product Categories – New Zealand	19
Figure 11: Average Model Weighted Power Measurements by Mode: All Home Entertainment Product	30
Figure 12: Average Product by Mode: Per Unit Energy Consumption	32
Figure 13: MEPS Compliant Product by Mode: Per Unit Energy Consumption	33
Figure 14: MEPS Stage 1 Percentage Excluded by Product and Year	52
Figure 15: MEPS Stage 2 Percentage Excluded of all Product by Survey Year	54
Figure 16: Consumer Cost-Benefit of MEPS (Aus)	55
Figure 17: Consumer Cost-Benefit of MEPS (NZ)	56
Figure 18: Forecast Sales of HE Product - Base Sales Scenario Australia	59
Figure 19: Forecast Sales of HE Product - Base Sales Scenario New Zealand	60
Figure 20: Forecast Sales of HE Product - Low Sales Scenario Australia	61
Figure 21: Forecast Sales of HE Product - Low Sales Scenario New Zealand	61
Figure 22: Net Annual Energy - BAU and MEPS: Australia Base Sales Scenario	62
Figure 23: Net Annual Energy - BAU and MEPS: NZ Base Sales Scenario	63
Figure 24: Net Annual Energy - BAU and MEPS: Australia Low Sales Scenario	64
Figure 25: Net Annual Energy - BAU and MEPS: New Zealand Low Sales Scenario	64
Figure 26: GHG Emissions - BAU and MEPS: Australia Base Sales Scenario	65
Figure 27: GHG Emissions - BAU and MEPS: NZ Base Sales Scenario	66
Figure 28: GHG Emissions - BAU and MEPS: Australia Low Sales Scenario	67
Figure 29: GHG Emissions - BAU and MEPS: NZ Low Sales Scenario	67
Figure 30: Benefit-Cost Ratio as a Function of Incremental Price Increase (Australia)	70
Figure 31: Benefit-Cost Ratio as a Function of Incremental Price Increase (New Zealand)	71
Figure 32: Annual Net Benefit \$M: Base Sales Growth Scenario	73
Figure 33: Annual Net Benefit \$M: Low Sales Growth Scenario	73
Figure 34: Forecast Sales of home entertainment product - Base Sales Scenario Australia	A-5
Figure 35: Forecast Sales of home entertainment product - Low Sales Scenario Australia	A-6
Figure 36: Forecast Sales of home entertainment product - Base Sales Scenario New Zealand	A-7
Figure 37: Forecast Sales of home entertainment product - Low Sales Scenario New Zealand	A-8
Figure 38: Annual sales of home entertainment products by State, Australia and NZ	A-10
Figure 39: Survival Function of home entertainment products for Australia and New Zealand	A-11
Figure 40: Forecast Stock of home entertainment product - Base Sales Scenario Australia	A-12
Figure 41: Forecast Stock of home entertainment product - Low Sales Scenario Australia	A-12
Figure 42: Forecast Stock of home entertainment product - Base Sales Scenario New Zealand	A-13
Figure 43: Forecast Stock of home entertainment product - Low Sales Scenario New Zealand	A-14
Figure 44: Trend - Stock of home entertainment products 2000 – 2020	A-16

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## *Glossary and Abbreviations*

ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
AS/NZS	Australian Standards and New Zealand Standards
BAU	Business-as-usual
CEC	California Energy Commission
CESA	Consumer Electronics Suppliers Association (Australia)
CO <sub>2</sub> -e	Carbon dioxide equivalent units
COAG	Council of Australian Governments
DEW	Department of Environment and Water Resources
DoE	Department of Energy (USA)
EC	European Commission
EECA	Energy Efficiency and Conservation Authority – New Zealand
EEEP	Equipment Energy Efficiency Program (formerly NAEEEP)
ETS	Emissions Trading Scheme
EPA	Environment Protection Agency (USA)
EPS	External Power Supply
EU	European Union
E3 Committee	Equipment Energy Efficiency Committee (formerly NAEEEEC)
E3	Equipment Energy Efficiency Program (formerly NAEEEP)
GATT	General Agreement on Tariffs and Trade
GWA	George Wilkenfeld & Associates
GWh	Giga Watt hour – 1 million Watt hours
HD	Hard Drive
HE	Home Entertainment
IEC	International Energy Commission
kt	Kilo Tonnes – 1 thousand Tonnes
kWh	Kilo Watt hour – 1 thousand watt hours
LCD	Liquid crystal display
MEPS	Minimum Energy Performance Standards
MRET	Mandatory Renewable Energy Target
Mt	Mega Tonnes – 1 million Tonnes
NAEEEC	National Appliance Equipment and Energy Efficiency Committee (now E3 Committee)
NAEEP	National Appliance Equipment and Energy Efficiency Program (now E3)
NPV	Net Present Value
NZ	New Zealand
RIS	Regulatory Impact Statement
STB	Set Top Box
TTMRA	Trans Tasman Mutual Recognition Arrangement

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## *This Document Seeks Industry Comments & Data*

Australian and New Zealand government agencies responsible for product energy efficiency are currently investigating whether to mandate the energy performance of Home Entertainment (HE) equipment that are imported and sold in Australia and New Zealand.

This document aims to communicate to stakeholders the most important issues and questions relating to the regulatory proposal and to seek stakeholder comment and industry/market data to better inform the development of the regulatory proposal.

This document is called a “Cost-Benefit Analysis” (CBA) and has been issued by the Equipment Energy Efficiency Committee (E3 Committee) reporting to the Ministerial Council on Energy of the Australian federal, state and territory governments and the New Zealand Government. The CBA is a discussion draft providing the rationale for the regulatory proposal. The CBA and stakeholder responses to it will be used to prepare a regulatory impact statement (RIS) (see <http://www.obpr.gov.au> for RIS requirements) on the introduction of Minimum Energy Performance Standards (MEPS) for home entertainment products imported and sold in Australia and New Zealand. The proposal will be considered by the Ministerial Council on Energy and, if endorsed, will result in Australian state and territory legislation and New Zealand legislation being amended to prohibit from sale products that do not meet the standards.

Stakeholders are invited to make written comments on the proposal. The Australian Greenhouse Office (AGO) in Australia and the Energy Efficiency and Conservation Authority (EECA) in New Zealand are managing the process of obtaining stakeholder views and data on the regulatory proposal. The AGO and EECA will accept written submissions from stakeholders until close of business Friday 28 September 2007 on any of the issues raised in the document. If required, public meetings addressing the proposal will be held in Sydney, Melbourne and Auckland at dates to be determined.

In particular, this CBA document contains various assumptions on home entertainment product technologies, sales, industry and market structure, etc. In the absence of other data from stakeholders, these assumptions will form the basis of the next phase in the regulatory process, which is the Consultation RIS. The Consultation RIS and any further stakeholder responses will then be used to prepare the Decision RIS considered by the Ministerial Council on Energy.

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Please address your written submissions to:

Australia	New Zealand
<p>Ms Simone Tiele Equipment Energy Efficiency Team Australian Greenhouse Office Department of the Environment and Water Resources GPO Box 787 CANBERRA ACT 2601</p> <p>Or via email to: <a href="mailto:energy.rating@environment.gov.au">energy.rating@environment.gov.au</a></p>	<p>Home Entertainment Submissions Products Programme Energy Efficiency and Conservation Authority PO Box 388 WELLINGTON</p> <p>Or via email to <a href="mailto:regs@eeeca.govt.nz">regs@eeeca.govt.nz</a></p>

## *Executive Summary*

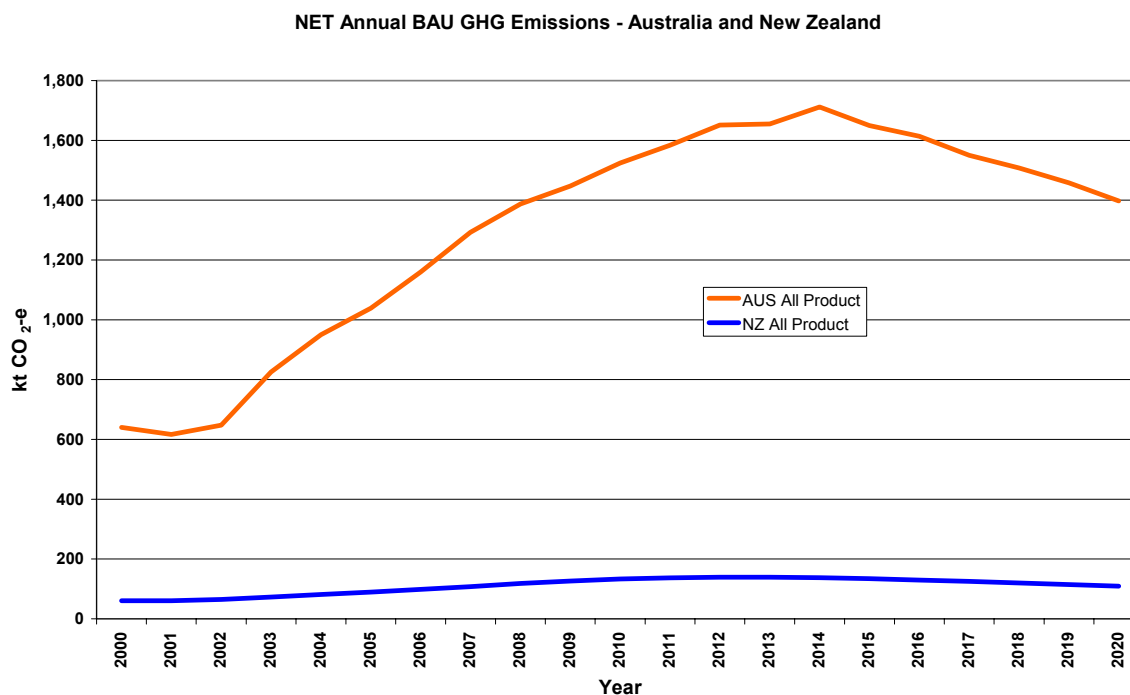
This is a Cost-Benefit Analysis (CBA) of a proposal to introduce Minimum Energy Performance Standards (MEPS) for home entertainment (HE) products that are imported and sold in Australia and New Zealand. It has been prepared and issued by the Equipment Energy Efficiency Committee (E3 Committee) under the Ministerial Council on Energy of the Australian federal, state and territory governments and the New Zealand Government.

Home entertainment products were among a group of products identified for immediate action under the standby power strategy. As very few of these products have an “off” switch, significant power is wasted even when the device is put into passive standby mode by the remote control. Even more power is wasted when the device is not in use but left to operate in active standby mode. A plan was published by the Australian government in March 2004 for reducing the standby power of various home entertainment products. Comments received on this plan suggested that mandatory regulations might better meet the Australian and New Zealand governments’ efficiency goals.

### *The Problem*

Home Entertainment products are a general classification of consumer electronic devices that include home video and audio playing/recording and amplification functions. Millions of these devices are sold every year and most use energy while in standby or sleep mode. DVD players, stereos, receivers, home theatre systems and speakers are some of the products defined in this study. The sales of these products have increased rapidly from around 2.3 Million in 2000 to over 4.2 Million in 2006.

The annual direct and indirect electricity consumption of all these products for the year 2006 has been estimated to be 1,100 GWh/yr in Australia and 164 GWh/yr in New Zealand. The net energy resulting from the use of home entertainment product is projected to grow to over 1,700 GWh in Australia and 224 GWh in New Zealand by the year 2015. Currently the overall electricity used by home entertainment product accounts for nearly 2.4% of total household electricity usage. The share of home entertainment product energy use of overall household energy consumption is expected to rise to 3.5% by 2015. Similarly the share of home entertainment product of overall electricity-related GHG emissions is expected to grow from 0.6% in 2006 to 0.85% in 2014. The figure following provides the estimated annual BAU GHG emissions by home entertainment products in Australia and New Zealand to 2020.



The majority of household consumers do not make lifecycle cost analysis when purchasing household equipment and appliances. This is especially the case with consumer electronic equipment due to quick turnover between rapidly changing old and new technologies and consistently declining prices. Price and features are often the key purchasing criteria for these consumer electronic products. Consequently there is little or no incentive for suppliers to give any serious consideration to energy efficiency.

As home entertainment products mature into “high volume low profit” products, energy considerations are often not the major focus in the design of the product. In order to maximize their market share and hence their profitability, the manufacturers will focus on providing key technical features for as low a price as possible, often at the expense of power management features that are not high on consumer criteria. This has been evident in the Australian market, where average active standby power use has been increasing over the last 3 years. Some products do have available the auto-power management functions that return the product to the passive standby mode after periods of inactivity but do not implement the software function as a default setting (EC 2007).

### *The Objective*

The objective of the proposed strategies for home entertainment products is to bring about reductions in Australia’s and New Zealand’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. Within the objective, it must also provide a broad positive financial benefit to end consumers, without compromising appliance quality or functionality.

## *The Proposal*

The proposed strategy involves introducing mandatory Minimum Energy Performance Standards (MEPS) that cover all home entertainment products from October 2008. The regulation would stipulate the maximum power levels for these products in order to be sold in the Australian and New Zealand market. MEPS aims to remove the worst performing products from the marketplace, rather than promoting the best. This Australia/ New Zealand MEPS is tailored to mirror international requirements, while being moderated to address local industry technical issues. In this regard, the proposed MEPS provides a two stage implementation schedule, with the Stage 1 MEPS removing approximately 20 - 30% of the worst performing products currently on the market by late 2008 and Stage 2 MEPS implementing the IEA target of 1W by 2012. Consultation has been conducted with the consumer electronics industry over the period 2004 to 2007 on the proposed strategies.

The proposed MEPS includes requirements for maximum power levels for passive standby and OFF modes where the product has an OFF function. In addition, products are required to automatically power down to passive standby after 30 minutes of no AV input or inactivity in the Stage 2 MEPS ( i.e., after a DVD player has finished playing and is no longer providing AV output).

## *Assessment*

In the analysis two annual sales growth scenarios have been analysed

- a base sales scenario that is used for the CBA with product sales declining from 2007; and
- a low sales scenario that considers increasing shares of integrated and converged technologies

## **Australia**

The following table summarises the analyses for Australia for the period 2008 to 2020. The data presented is based upon Net Present Value calculations at a discount rate of 7.5%.

### **Summary Data for Alternative BAU Sales Australia – 7.5% Discount Rate**

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	7,040 GWh	4,685 GWh
GHG Emission Reduction (cumulative)	6.5 Mt CO <sub>2</sub> -e	4.4 Mt CO <sub>2</sub> -e
Total Benefit	\$176M	\$120M
Total Investment	\$14M	\$11M
Benefit-Cost Ratio	12.2	11.2

Even at a higher discount rate of 10%, for the base and low sales scenario, benefit-cost ratios are positive at 11.6 and 10.6 respectively. If the incremental costs of improved product to meet the MEPS are increased to 3 times the values assumed in the CBA

analysis, the benefits are still approximately five times the costs. The benefit-cost ratio increases to 14.9 for the base sales scenario if the benefits of reducing GHG emissions under the forthcoming Australian emissions trading scheme are included from 2012 (see Appendix 6).

## New Zealand

The following table summarises the analyses for New Zealand for the period 2007 to 2020. The data presented is based upon Net Present Value calculations at a discount rate of 10%.

### Summary Data for Alternative BAU Sales New Zealand – 10% Discount Rate

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	886 GWh	640 GWh
GHG Emission Reduction (cumulative)	526 kt CO <sub>2</sub> -e	384 kt CO <sub>2</sub> -e
Total Benefit	\$20M	\$15M
Total Investment	\$2M	\$1.6M
Benefit-Cost Ratio	9.6	9.2

At the individual application level, the mix of benefits and costs depends on usage patterns. The analysis indicates that, in all usage cases, consumers will benefit from the proposed regulation. New Zealand's benefit-cost ratio differs from the Australian average due to the higher marginal electricity tariffs.

## Alternative Options

The other options considered for achieving the objective were:

- voluntary efficiency standards;
- levies and emissions trading;
- a certification program;
- dis-endorsement labelling;
- mandatory energy 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 cannot be considered 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. This could eventually lead to the full cost of GHG 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 appliances such as home entertainment products. Moreover, consumers would still lack information on the energy usage of the home entertainment products even if they did become more concerned.

Certification is unlikely to succeed as the energy efficiency certification of a home entertainment product is unlikely to be the primary driver of the purchase decision for the vast majority of consumers.

A dis-endorsement labelling scheme is likely to confuse the consumer and reduce the effectiveness of other labelling schemes. It would therefore appear to be unjustified and inappropriate in Australia and New Zealand.

If a mandatory energy label were applied to home entertainment product, the benefit to the consumer of selecting a higher star rated product compared to the standard product may not be sufficient to influence the decision.

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.

### *Recommendations (draft)*

It is recommended that the Ministerial Council on Energy (MCE) agree:

1. To implement mandatory energy performance standards in two stages for home entertainment products in regulation.
2. That products covered by this CBA include all those defined as any piece of equipment that produces, records or assists in producing an audio or video signal/output, excluding those designed for professional use (i.e., studio equipment).
3. To use the test method AS/NZS 62087:2004 which specifies methods of measurement of the power consumption of home entertainment equipment for consumer use.
4. That home entertainment products must meet or surpass the energy performance requirements that are proposed in this document and will be set down in Australian and New Zealand Standard AS/NZS 62087.xx (MEPS requirements for home entertainment products).
5. That the amendments take effect not earlier than 1 October 2008.
6. To have all jurisdictions take the necessary administrative actions to ensure that the suite of regulations can take effect from not earlier than 1 October 2008.

# 1 Scope

## 1.1 National policy responses to global warming

### IEA sees improving energy efficiency as top priority

*“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.

### The MCE moves beyond “no regrets” energy efficiency measures

In October 2006, an important change in the criteria for assessing new energy efficiency measures was made by the Ministerial Council on Energy (MCE) of Australian federal, state and territory and New Zealand government energy ministers. 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 means the MCE will consider new measures that may have net up-front costs but have greater private economic and greenhouse benefits over the long term on the basis that prudent investment now may avoid more costly intervention later. More detail of this decision is provided below.

### Australia’s response to climate change

The development of Australia’s climate change policies is described in this section.

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’”,

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<sup>1</sup> 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*

*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*. 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

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*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.

scheme, and the Australian Government holding a nuclear energy enquiry and announcing its own emissions trading inquiry by the *Task Group on Emissions Trading*.

On 3 June 2007, the Prime Minister announced that the Australian Government will implement a domestic emissions trading system beginning no later than 2012, and will set a long term aspirational target for reducing national emissions in 2008. The Australian Government is beginning to develop the system now.

MEPS will complement the emissions trading scheme, as concluded in the report of the *Task Group on Emissions Trading*:

- *“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)*

Further, on 17 July 2007, the Prime Minister released *Australia’s Climate Change Policy – our economy, our environment, our future*, in which energy efficiency is a key element:

- *“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 CO<sub>2</sub> – 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 change**

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 the period 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 household

appliances continues to form part of New Zealand's climate change strategy, as part of implementing the National Energy Efficiency and Conservation Strategy (NEECS).

As it has been in place since 2001, the NEECS was recently reviewed. The review concluded a replacement Strategy was both necessary and timely. In December 2007 the New Zealand Minister of Energy released the Draft 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/about/national-strategy/release-of-draft-nzeecs.html>

The draft strategy is a key part of the Government's response to global climate change, the need for enhanced security of energy supply and rising energy prices. The draft NZEECS is being developed within the framework of the Draft New Zealand Energy Strategy.

It presents sector-based action plans that would support the energy efficiency, energy conservation and renewable energy objectives set out in the draft New Zealand Energy Strategy, which are: 1. maximising how efficiently we use our energy to safeguard affordability, economic productivity and our environment; and 2. maximising the proportion of energy that comes from our abundant renewable energy sources.

### **Equipment Energy Efficiency Program (E3)**

In Australia, the first large-scale government intervention in the market for energy-using products was the introduction of 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) via the MCE. Regulatory interventions such as mandatory labelling and MEPS have been regarded as necessary to achieve the objectives of both increasing energy efficiency and reducing greenhouse gas emissions from the use of appliances. Such interventions also are needed to address market failure in the provision of life-time cost information for appliances.

The proposed regulation is an element of the Equipment Energy Efficiency Program (referred to as just "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.

E3 is a collection of coordinated end-use energy efficiency programs that deliver economic and environmental benefits to the community, typically via market intervention programs. The main tools of the program are mandatory energy efficiency labelling and MEPS, but it also employs voluntary measures such as endorsement labelling, training and support to promote the best available products. As noted above, mandatory labelling and MEPS overcome market failure in the provision of whole-of-life costs of appliances, increase energy efficiency and reduce greenhouse gas emissions. Analysis of E3’s achievements during 2004 has shown significant reductions in greenhouse gas emissions at a net present value of minus \$23 per tonne of CO<sub>2</sub>-e (i.e., a net benefit of \$23/t CO<sub>2</sub>-e of electricity savings benefits less increased manufacturing costs).

The broad policy directions of E3 were reviewed in 1998/99 and again in 2000/01, with recommendations brought together in two ‘Future Directions’ documents (NAEEEC 1999 and NAEEEC 2001). The MCE subsequently endorsed certain changes, directing the E3 Committee to adopt specific policies with respect to product coverage, communication and procedures for developing and implementing new measures.

This mandate was refreshed in 2004 under Stage 1 of the NFEE to include products using a wider range of fuel types, including gas, and is likely to be expanded further under Stage 2 of the NFEE.

At its October 2006 meeting, the MCE provided guidance on the overall mandate for NFEE Stage Two (including MEPS):

*... 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*

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*economy. ... The next stage of NFEE implementation may include measures that go beyond those used so far in pursuing the adoption of cost-effective energy efficiency and greenhouse abatement measures.*

## **Product coverage**

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 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.

For many years E3 and its predecessor<sup>2</sup> focused on electrical appliances and equipment. In 2004 the Australian Government announced an expansion of the program to include gas appliances and some commercial equipment – *Securing Australia's Energy Future* (DPMC 2004: page 111). Subsequently, MCE released its strategy for improving the energy efficiency of gas appliances – *Switch on Gas: 2005-2015* which signalled the intention of all Ministers to bring gas appliances and equipment into E3.

## **Communication and procedures**

E3 provides stakeholders with opportunities to comment on specific measures as they are developed.

## **Cost-benefit analysis and regulatory impact statement**

This Cost-Benefit Analysis (CBA) is being released by the E3 Committee to seek initial industry comment and data related to the regulatory proposal, as a precursor to the preparation of a consultation regulatory impact statement (RIS).

RISs are prepared whenever new mandatory measures are proposed for E3, if it is proposed to make existing mandatory measures more stringent, or if existing regulations are to be retained beyond their 'sunset'. The document must be prepared (or commissioned) by the department, agency, statutory authority, or board responsible for a regulatory proposal, and it must set out the costs and benefits of each option and make recommendations. National product regulation can only be justified 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.

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<sup>2</sup> The Equipment Energy Efficiency Program (E3) was previously called the National Appliance and Equipment Energy Efficiency Program (NAEEEP) and the committee was the National Appliance and Equipment Energy Efficiency Committee (NAEEEC). Its reconstitution as E3 includes a formal partnership with New Zealand.

## ***1.2 Home Entertainment Products***

Home entertainment products have become increasingly popular for the superior sound and associated picture quality, which allow the consumer to have a “cinema-like” experience from home. The home entertainment area is constantly undergoing changes as the development and uptake of new technology proceeds at a rapid rate. While individual product categories have been detailed below, the home entertainment product category as it pertains to this study applies to any piece of equipment that produces, records or assists in producing an audio or video signal/output. This includes multi-function devices such as DVD/VCR players. However it does not include devices that display video output such as monitors or televisions or any device that is primarily a Personal Computer (PC). These products are currently under consideration for separate Minimum Energy Performance Standards. Currently the home entertainment product group can be divided into the 9 sub categories listed below.

- AV Components & Receivers
- DVD Players
- DVD/HD Recorders (DVD Recorders, Hard Disk Recorders, PVRs or combinations of these, including those with digital tuners)
- Home Theatre Systems
- Integrated Stereo
- Portable Stereo
- Sub Woofers & Speakers
- VCRs (Video Cassette Recorders)
- Other Home Entertainment (audio visual products that are not included above)

Energy consumption from these home entertainment (HE) products in 2012 is estimated to be over 1,600 GWh/yr in Australia and over 230 GWh/yr in New Zealand with current business-as-usual (BAU) conditions. This level of energy consumption is about twice the projected consumption of other household appliances such as clothes washers, clothes dryers or dishwashers.

DVD players and other home entertainment products were among a group of products identified for immediate action in the standby power program (see below). As very few home entertainment product have an “off” switch, significant power is wasted even when the device is put into passive standby mode by the remote control. Even more power is wasted when the device is not in use but left to operate in active standby mode. A plan was published by the Australian government in March 2004 for reducing the standby power of home entertainment products, however comments received on this plan suggested that mandatory regulations might better meet the Australian governments’ efficiency goals.

### ***1.3 Australian/New Zealand Policies and Programs***

In late 2002 the Ministerial Council on Energy in Australia launched a 10-year strategy to deal with excessive standby. Consumer Electronic equipment was initially identified with voluntary targets for standby power consumption. DVD players and recorders were identified as a priority product. Other Audio/Video equipment was also identified as needing action on MEPS at the earliest time possible.

These targets were initially intended to be voluntary but industry groups requested the government consider mandatory requirements. The reason for this will be discussed later. Further, the regulation of active standby power consumption was identified as a priority due to the large number of home entertainment products that are left in this mode.

#### ***Energy Star***

Australia and New Zealand are international ENERGY STAR partners for 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 United States. These criteria currently refer only to standby modes, although the latest criteria for monitors and imaging technologies include criteria for in-use mode.

#### ***Standby Power Plan***

In 2003 and 2004, NAEEEEC published a series of Standby Profiles, indicating the Government's plans for a range of appliances. Some of these products included:

- 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 for all products, Standards Australia published AS/NZS 62301 Household Electrical Appliances—Measurement of Standby Power (a clone of IEC Standard 62301). Subsequently, AS/NZS 62087:2004, the test method specifically for measurement of standby and in-use power for Audio and Video and related consumer products was published in 2004. It is also planned to add separate parts to the standard with test procedures specific to individual products.

Further, in November 2006, the Australian Government announced that it will work with state governments and industry to ensure that by 2012 all electrical appliances will be regulated to meet a standby mode ‘one watt target’.

In the development of Australian greenhouse gas reduction programs, home entertainment products have become a high priority due to their increasing ownership and sales. In addition, a growing international focus has provided an opportunity to establish harmonised standards amongst the major trading countries. International working groups of experts, government offices and suppliers have been established under “Communities of Practice” to ensure consistent treatment of measurement standards and efficiency policies. These communities of practice communicate electronically and meet at major international events.

The New Zealand Government has committed to implementing a MEPS and labelling regime in alignment with Australia. This means that any regulatory interventions in New Zealand will be done in alignment with Australian States and Territories to the same stringency and at the same time. This reflects both the New Zealand Government’s energy efficiency policies and obligations under the Trans Tasman Mutual Recognition Arrangement.

The benefits of this partnership include avoiding barriers to trans-Tasman trade, reduced programme costs and avoiding the undermining of either country’s energy efficiency strategies. To achieve this, the New Zealand Government has joined with Australian Federal, State and Territorial government agencies as a partner in the E3. This has led to the development of a consistent approach to implementation, compliance and enforcement of minimum energy performance standards, labelling requirements and other agreed related projects.

The current 2005-08 joint E3 work program identifies a range of energy using products to be assessed for possible regulatory action. This includes intervention for standby power consumption of home entertainment products.

### ***1.4 Home Entertainment Product Market***

Home Entertainment products are a general classification of consumer electronic devices that include home video and audio playing/recording and amplification functions. Millions of these devices are sold every year and most use energy while in standby or sleep mode. DVD players, stereos, receivers, home theatre systems and speakers are some of the products defined in this study.

The sales of these products have increased rapidly. In Australia the sales of home entertainment products increased from around 2.3 Million in 2000 to over 4.2 Million in 2006 (GFK 2007). Correspondingly the sales increased from just over 550,000 to 737,000 in New Zealand (GFK 2007).

In Australia the vast majority of the increase in sales of these products is due to the need by consumers to use video playing (DVDs) or recording functions. As more TVs and monitors with high definition or flat screens are sold into the market, more sales of video playing/recording devices are likely. Increasing sales of these devices are now also occurring with integrated digital TV receivers and set-top boxes. Figure 1 presents the annual sales of home entertainment products over the period 2000 – 2006 in Australia.

In New Zealand similar trends are occurring with the rapid increase in sales of products such as DVD players. Figure 2 presents the annual sales of home entertainment products over the period 2000 – 2006 in New Zealand.

Figure 1: Annual Sales of Product by Category – Australia

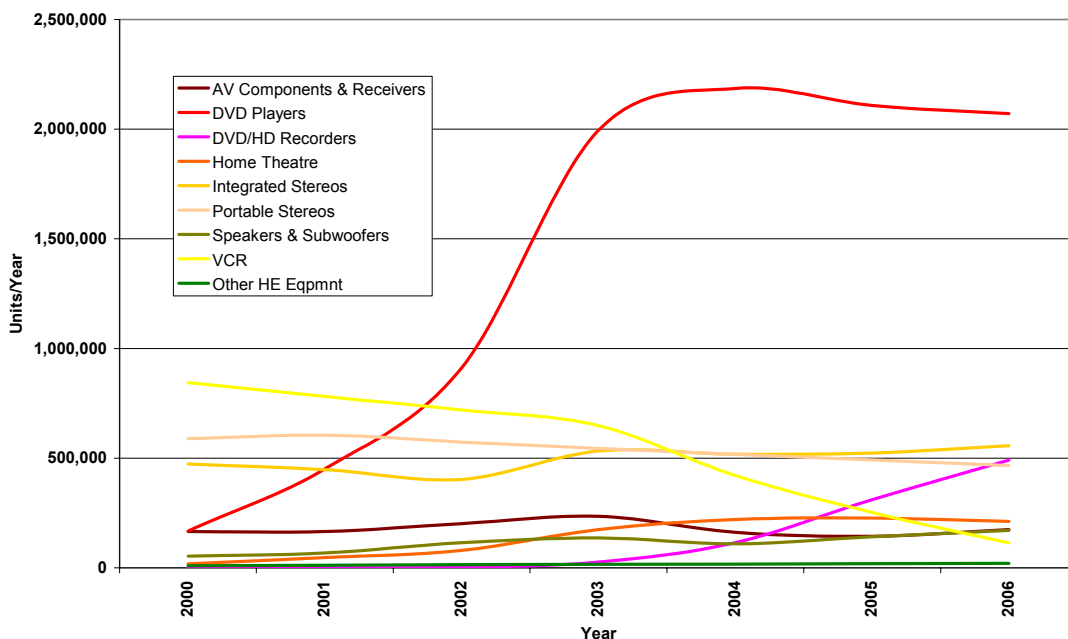
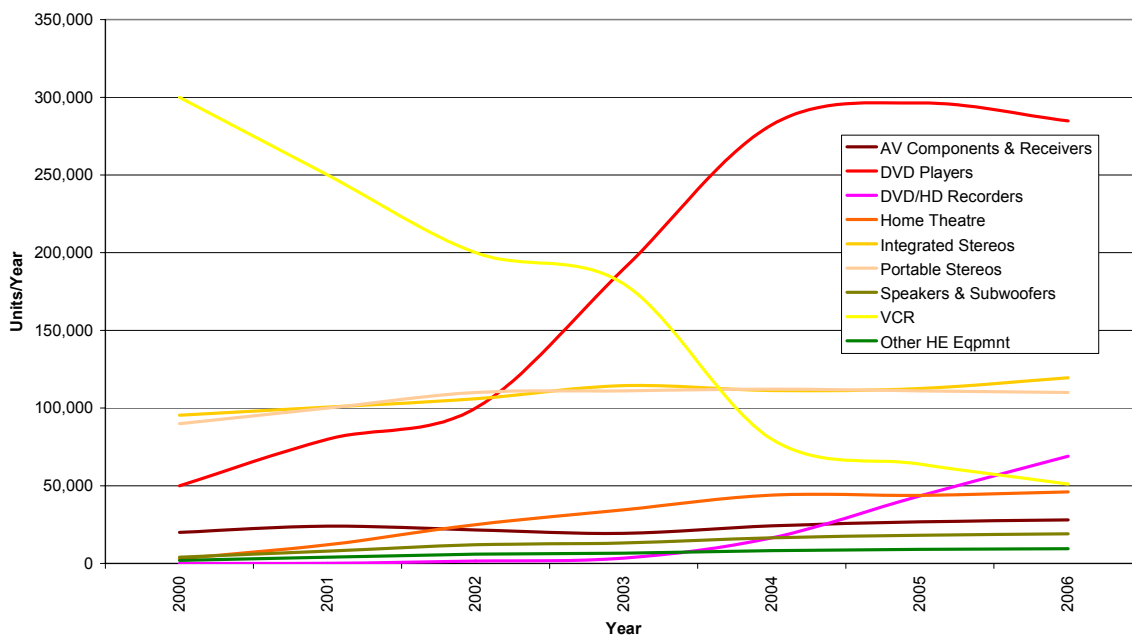


Figure 2: Annual Sales of Product by Category – New Zealand



The total installed stock of home entertainment products by category in Australia is shown in Figure 3, and for New Zealand in Figure 4.

Figure 3: Total Installed Stock of Product by Category – Australia

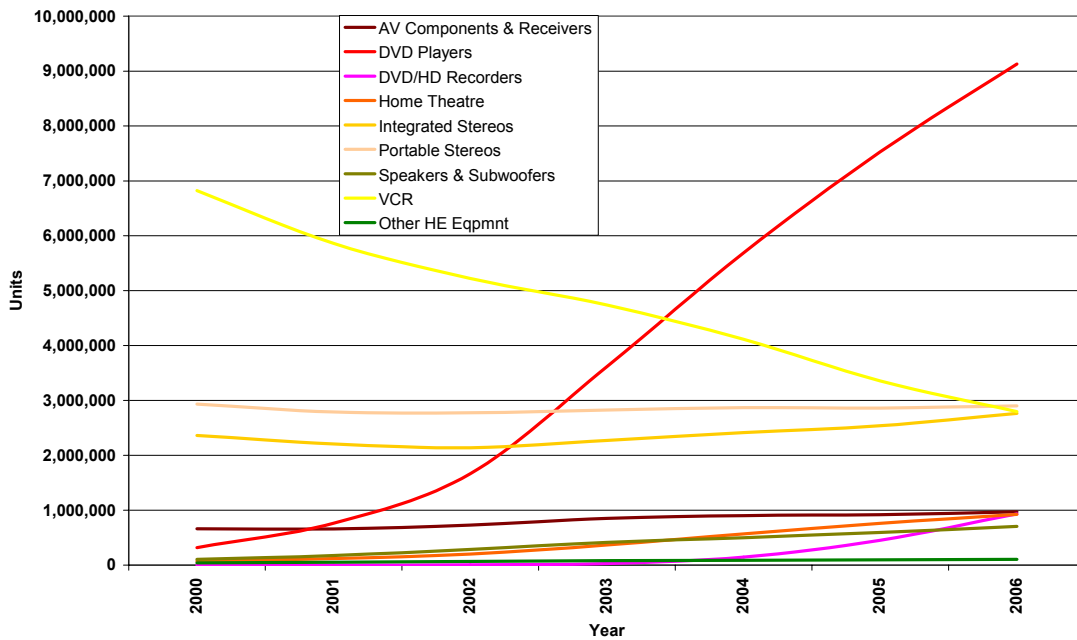
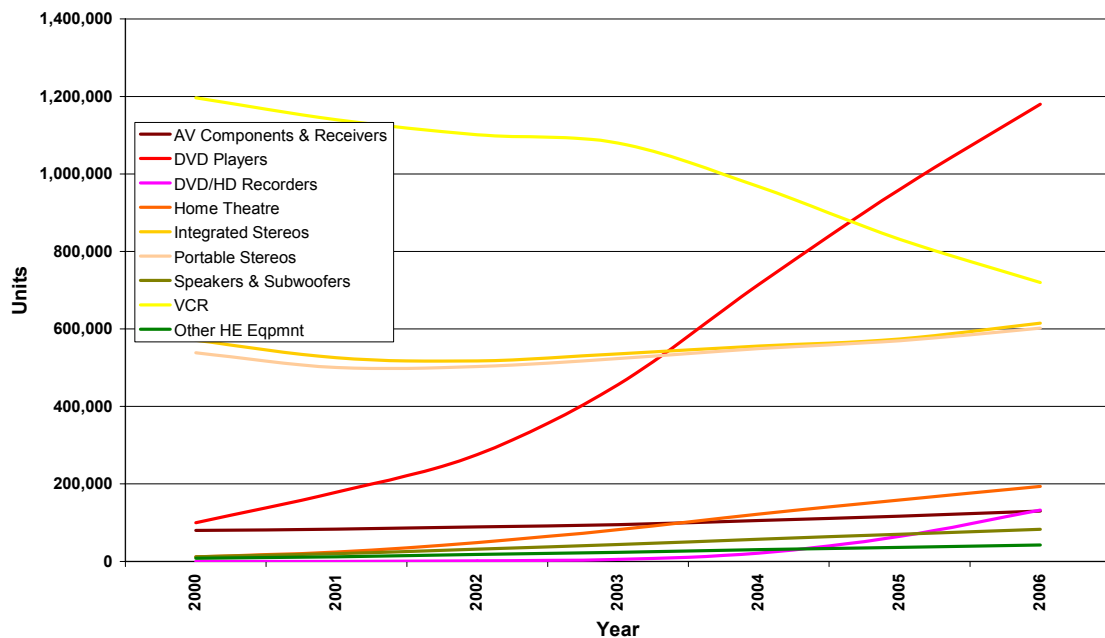


Figure 4: Total Installed Stock of Product by Category – New Zealand

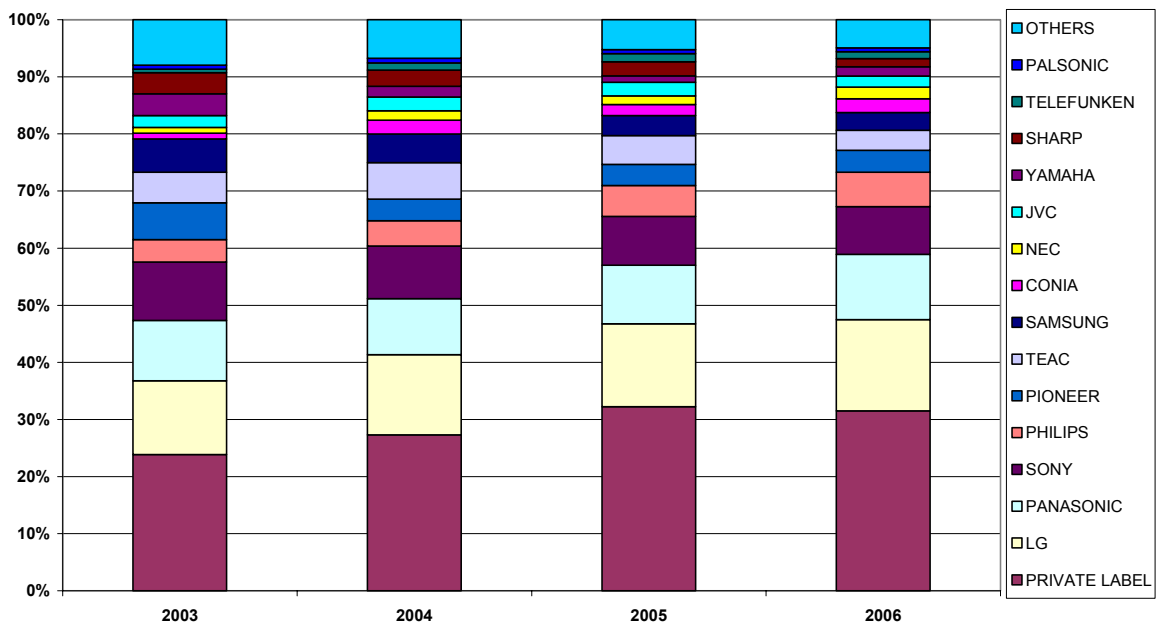


### 1.5 Australian Market Players

In general the major companies supplying home entertainment products in the Australian market are the established brand names such as LG, Panasonic, Sony, Phillips, Pioneer,

TEAC and Samsung. The structure of the market in Australia is changing in line with international trends and a larger number of smaller suppliers are increasing market share. The market share of the known suppliers is shown in Figure 5, however there are a large percentage of models that are not identified and shown as “Private Label”. These models sold direct to the retailers and the brand is not identified for marketing purposes.

**Figure 5: Product Brand shares in Australia**



Source: GfK. March 2007

From Figure 5 it is evident that 64% of the market is supplied by 14 suppliers. The “private label” models make up approximately 30% and it is not known if these models are from the 14 major brands or other suppliers. Many of these “private label” suppliers could be traders who source existing product from various OEM (original equipment manufacturer) companies or retailers with their own branded models. The figures for New Zealand from the GfK data are almost identical to Australia in the representation of the various suppliers.

## 2 The Problem

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, including New Zealand and Australia, which are collectively referred to as Annex 1 countries. 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 announced its reasons for not ratifying the Kyoto protocol though it is committed to meeting the greenhouse reduction target for 2008–2012 (*Kemp 2003*). The Australian Commonwealth, State and Territory governments adopted a National Greenhouse Strategy to give effect to this objective (NGS 1998).

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 the period 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 household appliances continues to form part of Australia and New Zealand's climate change strategy.

Traditionally the focus of regulatory interventions, aimed at introducing minimum energy performance standards for household appliances, has been the major household appliances such as refrigerators, air conditioners, washing machines, dish washers and clothes dryers which consume a large proportion of electricity used in households. Smaller appliances, especially electronic appliances, were ignored due to their significantly lower share in total household electricity.

More recently enhanced technical features, coupled with increasing saturation (often in excess of 100%) due to declining prices, have resulted in multi-fold growth in the share of energy consumption of such small appliances in total household electricity. For example it is estimated that by 2012 the energy consumed by all home entertainment products will be over 1,600 GWh/yr in Australia and over 230 GWh/yr in New Zealand with current business as usual conditions. This level of energy consumption is about twice the projected electricity consumption of other household appliances such as clothes washers, clothes dryers or dishwashers. This trend is expected to continue as saturation of smaller electronic appliances continues to increase. Consequently it is becoming important to promote end-use efficiency and avoid substantial GHG emissions.

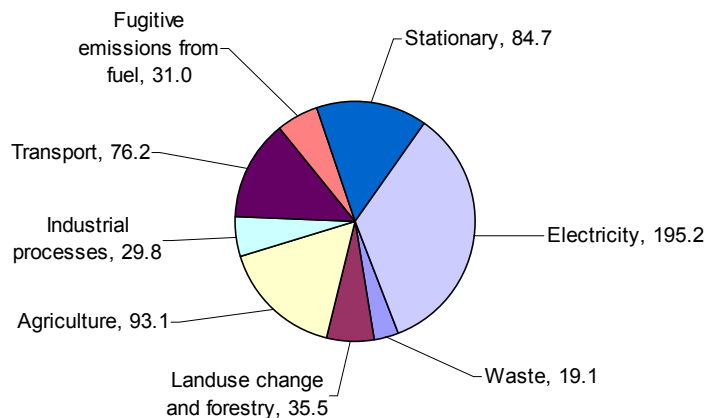
In late 2002 the Ministerial Council on Energy in Australia launched a 10-year strategy to deal with excessive standby electricity consumption (MCE 2002). As part of this strategy, various home entertainment products were initially identified for voluntary targets for standby power consumption; however industry groups requested that the government consider mandatory requirements. Furthermore, to enhance the Australian Government's

action to reduce greenhouse gas emissions, Minister for the Environment and Heritage, Senator Ian Campbell and Minister for Industry, Tourism and Resources, Ian Macfarlane announced that Australia will lead the world in reducing greenhouse gas emissions from ‘standby’ power in electrical appliances (Australian Government 2006). The ministers state that the Australian Government will work with state governments and industry to ensure, by 2012, all electrical appliances would be regulated to meet the ‘one watt target’.

## *2.1 Energy and Greenhouse Gas Emissions*

Figure 6 shows estimated Australian greenhouse gas emissions by sector for 2004. The estimated total greenhouse gas emissions for 2004 are 564.7 million tonnes of CO<sub>2</sub>-e (NGGI 2004). The electricity sector represents the greatest contribution to Australia’s greenhouse gas emissions, as illustrated in Figure 6.

**Figure 6: Australian Greenhouse Gas Emissions by Sector 2004 (Source: NGGI 2004)**



Electricity generation accounted for 195.2 Mt CO<sub>2</sub>-e or 34.6% of national emissions in 2004. Electricity generation emissions increased by 5.9 Mt (3.1%) from 2003 to 2004, and by 65.8 Mt (50.8%) from 1990 to 2004.

The Australian Bureau of Agricultural and Resource Economics projects total electricity use to increase by an average of 2.2% p.a. between 2004/05 and 2010/11 (ABARE 2006). Electricity use in the residential sector is projected to account for around 23 per cent of the increase in total electricity use over the period to 2030. Slowing, and ultimately reversing, the growth in electricity-related emissions is thus a high priority in Australia’s greenhouse gas reduction strategy.

In New Zealand, thermal electricity generation accounted for 24.5% of CO<sub>2</sub> emissions from the energy sector in 2005. In 2005, emissions from this source increased

significantly by 35.2% compared with 2004 due to increased consumption of coal (MED NZ 2006). In total, thermal electricity generation produced almost 8 Mt CO<sub>2</sub>-e in 2005. Total greenhouse gas emissions from the energy sector is projected to grow by about 30% between 2005 and 2030 (MED NZ 2006b).

## ***2.2 Contribution of Home Entertainment Products to Energy Use and Emissions***

Like any electrical appliance, the contribution of home entertainment products to energy use and emissions is a function of number of units in operation, technical attributes of the units, and usage behaviour of the users.

There are an estimated 21 million home entertainment products (excluding TVs and set-top boxes), operating in Australian households. Another 3.7 million are operating in New Zealand. This number is expected to reach a plateau of around 24.6 million in Australia and 4.6 million in New Zealand by the year 2012. After 2012 it is expected the stock of home entertainment products will decline due to the convergence of many similar products, such as DVD players/recorders and set-top boxes (STB) with integrated systems (such as receivers/amplifiers and home theatre systems). These factors are discussed in more detail in Section 5.5 under Sales Forecasts, where a Low Sales scenario is also modelled.

The net annual energy consumption of all home entertainment products for the year 2006 has been estimated to be over 1,100 GWh/yr in Australia and over 160 GWh/yr in New Zealand. The net energy resulting from the use of home entertainment product is projected to grow to over 1,700 GWh in Australia and 220 GWh/yr in New Zealand by the year 2015. The net energy consumption is the arithmetic sum of the direct and indirect energy. *Direct* energy use is the energy used by the product, while *indirect* energy is the energy used or displaced by the heating/cooling systems as a result of the heat generated from the product in the buildings that products operate. The proportion of indirect energy usage is relatively small and estimated to be approximately 4% of the direct energy use (see Appendix 5 for indirect calculation parameters).

Table 1 provides the estimated net energy consumption for all Australian states and territories, Australia as a whole, and New Zealand for the years 2000 to 2020 under the BAU conditions. The total estimated net energy consumption by type of home entertainment products is shown in Figure 7 for Australia and Figure 8 for New Zealand. Figure 9 provides the estimated GHG emissions by product category in Australia and Figure 10 for New Zealand.

**Table 1: Net annual BAU energy consumption of all HE products by States, Australia and NZ (GWh)**

<b>YEAR</b>	<b>NSW &amp; NT ACT</b>	<b>QLD</b>	<b>SA</b>	<b>TAS</b>	<b>VIC</b>	<b>WA</b>	<b>AUST</b>	<b>NZ</b>	
<b>2000</b>	175	8	152	69	11	137	98	<b>649</b>	<b>101</b>
<b>2001</b>	169	7	146	66	10	132	94	<b>625</b>	<b>102</b>
<b>2002</b>	179	8	155	70	11	140	100	<b>662</b>	<b>109</b>
<b>2003</b>	212	9	183	83	13	165	118	<b>784</b>	<b>121</b>
<b>2004</b>	245	11	212	96	15	191	137	<b>907</b>	<b>136</b>
<b>2005</b>	274	12	237	107	17	214	153	<b>1,015</b>	<b>149</b>
<b>2006</b>	306	13	265	120	19	239	171	<b>1,135</b>	<b>164</b>
<b>2007</b>	337	15	291	132	21	263	188	<b>1,247</b>	<b>181</b>
<b>2008</b>	366	16	316	143	23	286	205	<b>1,354</b>	<b>197</b>
<b>2009</b>	393	17	340	154	24	307	220	<b>1,456</b>	<b>211</b>
<b>2010</b>	418	18	362	164	26	326	234	<b>1,547</b>	<b>222</b>
<b>2011</b>	439	19	380	172	27	343	246	<b>1,627</b>	<b>229</b>
<b>2012</b>	455	20	394	178	28	355	255	<b>1,685</b>	<b>232</b>
<b>2013</b>	466	20	403	182	29	364	261	<b>1,727</b>	<b>232</b>
<b>2014</b>	472	21	409	185	29	369	264	<b>1,749</b>	<b>230</b>
<b>2015</b>	472	21	409	185	29	369	264	<b>1,749</b>	<b>224</b>
<b>2016</b>	468	20	405	183	29	365	262	<b>1,733</b>	<b>217</b>
<b>2017</b>	461	20	398	180	29	360	258	<b>1,705</b>	<b>209</b>
<b>2018</b>	451	20	390	176	28	352	252	<b>1,669</b>	<b>200</b>
<b>2019</b>	440	19	380	172	27	343	246	<b>1,627</b>	<b>191</b>
<b>2020</b>	428	19	370	167	26	334	239	<b>1,583</b>	<b>182</b>

Figure 7: Net annual BAU energy consumption by Product Categories - Australia

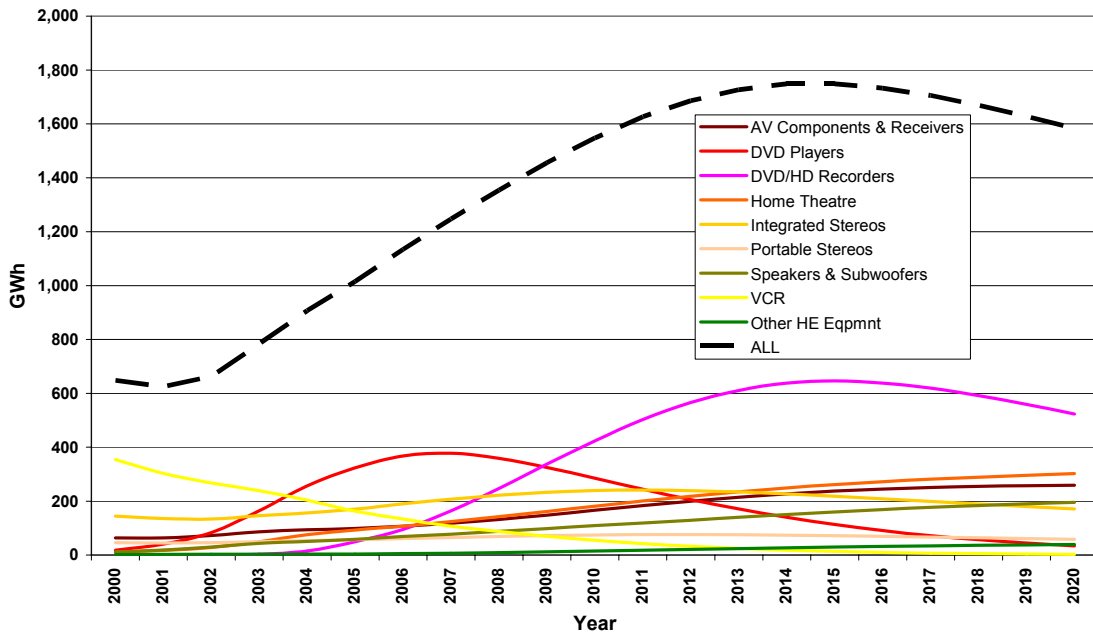
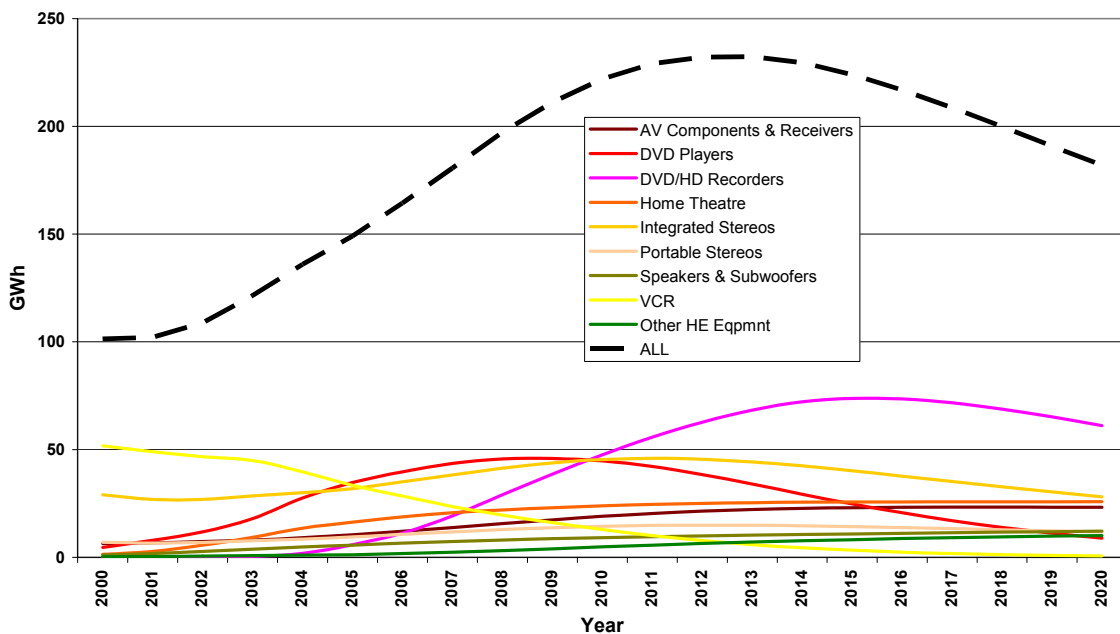


Figure 8: Net annual BAU energy consumption by Product Categories – New Zealand



It is evident from Figure 7 and Figure 8 that the rapid growth in net annual energy, which is closely related to annual sales, starts building up from 2002 and matures around 2013 -

2016, when it is expected that most households will have an optical or hard disk video recording product.

Figure 9: Annual BAU GHG emissions by Product Categories – Australia

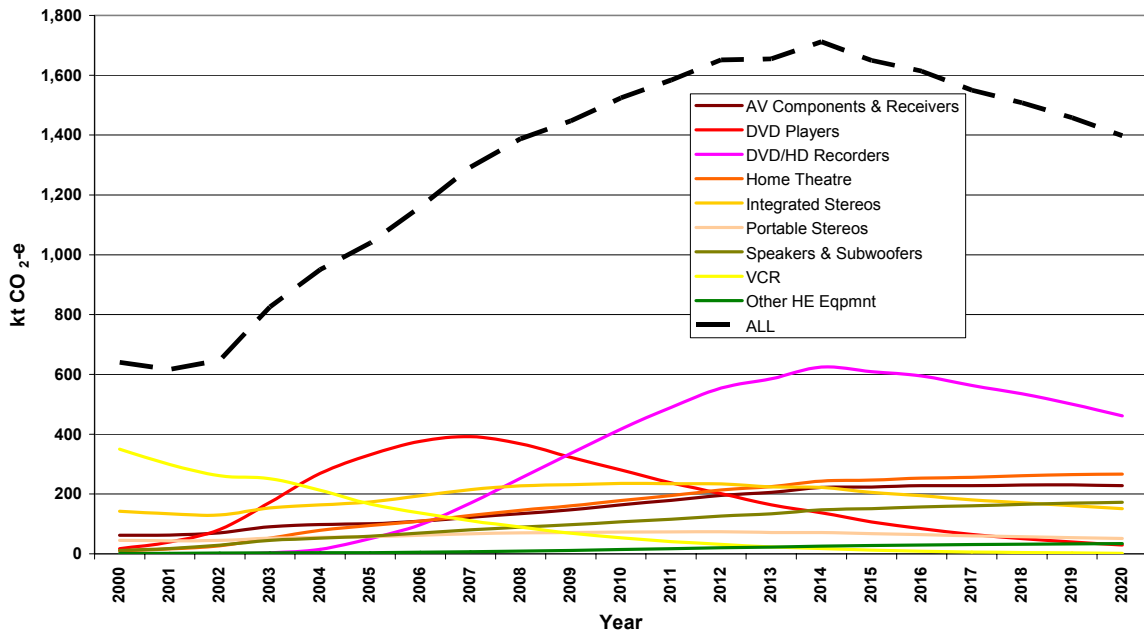
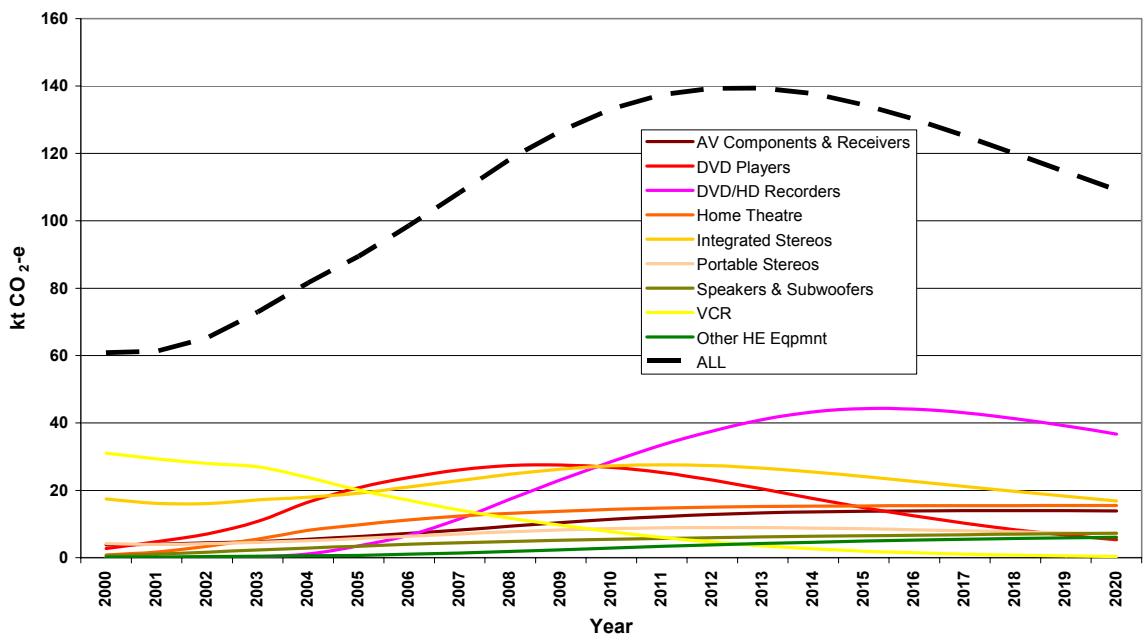


Figure 10: Annual BAU GHG emissions by Product Categories – New Zealand



Currently the overall electricity used by home entertainment product accounts for nearly 2.4% of total household electricity usage in Australia. The share of home entertainment product energy use of overall household energy consumption is expected to rise to 3.5% by 2015. Similarly, for Australia the share of home entertainment product of overall electricity-related GHG emissions is expected to grow from 0.6% in 2006 to 0.85% in 2014.

In New Zealand the overall electricity used by home entertainment product accounts for nearly 1.3% of total household electricity usage in 2005 (EECA 2007). Therefore, the share of total electricity related GHG emissions in New Zealand from home entertainment products is approx 0.45% in 2005.

## ***2.3 Home Entertainment Technologies and Energy Efficiencies***

### ***Home Entertainment Technologies***

The home entertainment area is constantly undergoing changes as the development and uptake of new technology proceeds at a rapid rate. While individual product categories have been detailed below, the home entertainment product category as it pertains to this study applies to any piece of equipment that produces, records or assists in producing an audio or video signal/output. This includes multi-function devices such as DVD/VCR players. However it does not include devices that display video output such as monitors or televisions or any device that is primarily a Personal Computer (PC), or a set-top box without internal recording facilities. These products are currently under consideration for separate Minimum Energy Performance Standards for both in-use and standby power usage. Currently the home entertainment product group can be divided into the 9 sub categories listed below.

#### **AV Components & Receivers**

Audio/Visual (AV) receivers are essentially an amplifier with a built-in radio tuner that functions as a control centre for other components such as TV, DVD player, stereo etc. AV receivers are also available with built-in DVD players and/or digital TV receivers or decoder's i.e. built-in digital set top boxes.

With the proliferation of the new home theatre packages and the introduction of DVD technology there has been a decline in the market of previously common audio equipment. However products such as stereo amplifiers, CD Players, Tape Decks, Tuners, and Turntables are still available, especially at the high end of the market. These products are also covered in this study, under this category.

#### **Home Theatre Systems**

Home theatre systems cover units that include an AV receiver and speaker system all powered by the single AC lead. This category of product nearly always has a built-in DVD player/recorder and can include other components such as digital TV receivers i.e.,

built in digital set-top boxes. The key characteristic that defines a home theatre system is that all components are powered from the one source lead. For the purposes of this report, the home theatre systems category includes all variations

It should be noted that manufacturers and retailers sometimes package individual components together, labelling them a “Home Theatre System”. These would not fall into the home theatre system category as each product has its own individual AC power source. Hence, each component would be covered by its own category i.e. AV receiver, DVD player etc.

### **Integrated Stereo**

Integrated stereos are non-portable units that combine various audio components with an internal amplifier. The most common combination on the market at present usually includes compact disc or DVD player, tape deck, amplifier and tuner. Older models used to have turntable components, while newer models may have a variety of options such as a multi stack CD device, karaoke functions, even a DVD player. All the components in an integrated stereo system are powered by one lead. It should be noted that the definition of integrated stereos is somewhat confusing given the multitude of names for this type of home entertainment equipment, such as “hi-fi system”, “mini system”, “micro system”, etc.

### **Portable Stereo**

Portable stereo units combine various audio components with an internal amplifier and speaker system. They can be run using mains electricity or battery operated. The most common combination on the market at present usually includes compact disk player and tuner. Some models also include DVD players, tape decks and multi stack CD devices. The simplest definition of a portable stereo as distinct from other stereo equipment is that portable stereos are able to be run using battery power and will usually include a carry handle. This definition of portable stereos does not include devices such as walkmans, or portable disk players.

### **Sub Woofers & Speakers**

Subwoofers are large speakers that amplify low-frequency (bass) sounds. There are two types of subwoofers: passive subwoofers rely entirely on the main amplifier for power while active subwoofers have their own AC source of power. It is the active types that are the focus of this report. A home theatre set up will generally have five or more speakers and a subwoofer, although not all packages necessarily include subwoofers.

Speakers have commonly been powered by the amplifier however there is an increasing number of speaker systems which are actively powered by an AC supply separate from the audio system. Additionally there are now cordless speaker systems on the market that have a central control box and audio terminals that direct sound to hard wired speakers both requiring direct connection to mains power. For the purposes of this study speakers

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have been categorised as any part of a speaker system that has its own lead requiring mains power to function.

### **DVD Players**

Digital Versatile Disc players, more commonly known as DVD (or Digital Video Disk) players, have become commonplace in the New Zealand and Australian markets. DVD players deliver superior sound and picture quality and compared to VCRs, offer much greater user convenience. DVD players are also able to play CDs and video games, and play home movies.

DVD players and DVDs themselves are subject to a regional zoning restriction that splits the world into a number of zones (Australia is zone 4). Discs are encoded with a region code and will only play on players with a matching region code (however some players are available that can read discs from all zones). In addition, new high definition players (Blue Ray and HD-DVD) are emerging. These technologies will possibly replace DVD players as the dominant video playing technology as more consumers purchase high definition video displays. This new optical disc format is not included in this category, however it is considered in the DVD/HD Recorder category below.

### **DVD/HD Recorders**

DVD technology is expanding rapidly and has seen the DVD/VCR and DVD recorders become more widely available. The DVD recorder market is somewhat more complicated. When first introduced, DVD recorders could be used to record DVD images from video (such as home movies) or from a computer. However since 2001 DVD recorders can also record television images and hence function similarly to a VCR. This innovation is likely to see a rapid increase in ownership of the DVD recorder and eventual replacement of the standard VCR. The complication for the consumer is that there are five different format types (DVD-R, DVD+R, DVD-RAM, DVD-RW and DVD+RW) available for DVD and the format your appliance uses will determine what can be made and viewed. There are now units available that are able to read/record more than one format type. The new high definition optical disc format recorders (Blue Ray and DVD-HD) are likely to become the dominant optical recording/playing technology over the next 5 years. These new high definition optical discs are considered part of this category.

Hard disk recorders (HDR) also known as Personal Video Recorders, Digital Video Recorders or DVD hard disk recorders are the latest development in the home entertainment product range. These units enable the user to record video images onto a hard disk from an external source such as a television, VCR or Video Camera or the internal tuner. Units are also available that incorporate a digital TV receiver (set-top box function).

## VCR's

VCRs are formally known as Video Cassette Recorders. In Australia and New Zealand, this means a conventional VHS video cassette recorder which uses the PAL broadcast system. Typically a VCR both converts a signal off a tape enabling a Television to transmit audiovisual images as well as recording Television transmissions for later playback. The advent of the VCR allowed viewers to have control of when and what they could watch on their TV's. VCRs are also sold as DVD/VCR combination units which allow the viewer to watch DVDs while using the VCR to record, however very few stand alone VCR's now exist on the market.

Unlike traditional "white goods" appliances, the "task efficiency" of most electronic equipment is in the order of less than 1% as very little energy is converted to output signals. Apart from the transformation of energy into electromagnetic fields, almost all electrical energy input to such devices is dissipated as waste heat.

### *Power Modes of Home Entertainment Products*

Home entertainment products available in Australia and New Zealand generally have four operational modes: ON mode, active standby mode, passive standby mode and OFF mode. The definitions shown in Table 2 are based on international definitions and are those used in Australia by AS/NZS 62087:2004.

**Table 2: Definition of Power Modes**

<b>Mode</b>	<b>Definition</b>
OFF	The device is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, or an external or internal signal.
Passive Standby	The device is connected to a power source, does not fulfill the main function but can be switched into another mode with the remote control unit or an internal signal.
Active Standby	The device is connected to a power source, does not fulfill the main function but can be switched into another mode with the remote control unit or an internal signal. It can additionally be switched into another mode with an external signal or it is receiving and processing a minimal level of data from an external source.
ON mode (in-use)	The device is connected to a power source and fulfils the main function, including the provision of signals to supported devices.

The **ON mode** power consumption and the hours of use are critical in determining total energy consumption of products. However, in the case of many home entertainment products, the way ON mode functions means the in-use status has similar power usage characteristics to the **active standby mode**. Home entertainment products can be left in this in-use or active standby mode for extended periods either while producing no audio/visual output or while the connected display device is turned off or in passive standby. The **passive standby mode** is a standard feature of many home entertainment products and allows the unit to be put 'to sleep' either via a remote control or manual

standby switch. The majority of normal functions of the device are disabled under this mode which results in lower power consumption by the device. The **OFF mode** in theory disconnects the mains from most electrical circuits in an appliance ('hard off'). Normally the appliance cannot be activated with a remote control while switched "off". However, while some home entertainment products have a hard off switch, not all have zero power consumption when in this mode.

### *Power Usage of New Products*

For the past six years, E3 has commissioned store surveys of products available for sale in major retail stores throughout Australia. The surveys collected the in-use, active standby, passive standby and off power measurements (where relevant) for a wide range of appliances for sale in retail outlets. However, due to the new product categories begin introduced to the market, some products will only have measurements in later years. Analysis of the GfK data from New Zealand shows that many of the models sold in Australia are also sold in New Zealand.

The average passive standby load for all home entertainment products was 3.3W in 2005/06, while active standby was 19.3W, as shown in Table 3. Home entertainment equipment uses much greater amounts of power in active standby than in passive standby mode. The amount of energy used in active varies greatly by product however; over half the home entertainment equipment types use a significant amount of energy in this mode.

**Table 3: Home Entertainment Product Measurements Average: Survey 2005/06**

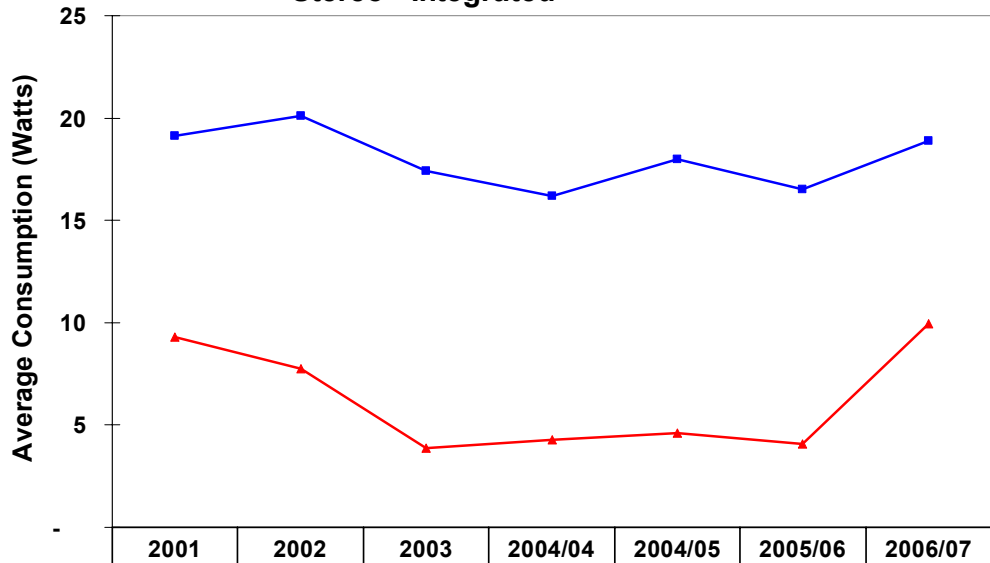
Home Entertainment Product	Mean Active Standby	Mean Passive Standby	Mean Off Mode
AV Receivers	44.2	1.8	0.2
Home Theatre Systems	24.1	2.5	0.0
Integrated Stereos	16.5	4.2	3.6
Portable Stereos	6.4	2.4	1.6
Audio Components	14.6	2.2	0.0
Sub Woofers & Speakers	11.0	5.5	2.0
DVD Players	8.8	2.0	0.1
DVD Recorders	21.5	7.3	NA
Hard Disk Recorders	27.8	5.6	NA
VCR's	7.3	2.6	NA
<b>Total for all Home Entertainment Products</b>	<b>19.3</b>	<b>3.3</b>	<b>1.4</b>

The power measurements over the last six years of passive standby and active standby mode of the various categories of home entertainment products are shown in the following pages. The graphs feature the average power and number of measurements for each survey year. Detailed results of the power use by mode are available in the E3 report released in late 2006 (EnergyConsult 2006).

These charts show the average of all the models on the market measured in the store surveys over the last six years; therefore they are an indication of the trends in power consumption by mode. The more accurate sale-weighted average power usage (available for the period 2003 – 2006 inclusive) has been used to develop the BAU energy consumption for the Cost Benefit Analysis shown later in this report.

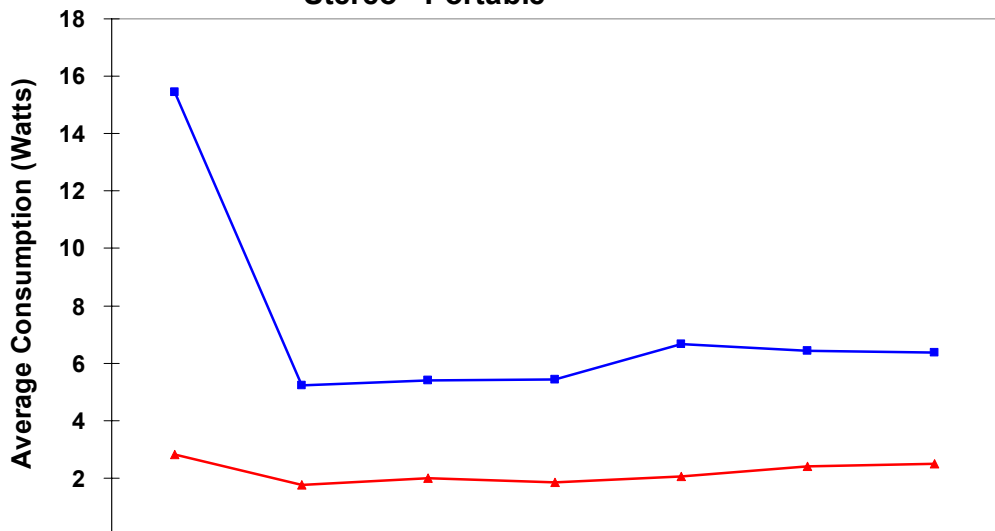
### Stereos- Integrated and Portable

**Stereo - Integrated**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
<b>Measurements</b>	<b>7</b>	<b>52</b>	<b>34</b>	<b>60</b>	<b>72</b>	<b>37</b>	<b>55</b>
<b>Active Standby (W)</b>	<b>19.1</b>	<b>20.1</b>	<b>17.4</b>	<b>16.2</b>	<b>18.0</b>	<b>16.5</b>	<b>18.9</b>
<b>Passive Standby (W)</b>	<b>9.3</b>	<b>7.8</b>	<b>3.9</b>	<b>4.3</b>	<b>4.6</b>	<b>4.1</b>	<b>9.9</b>

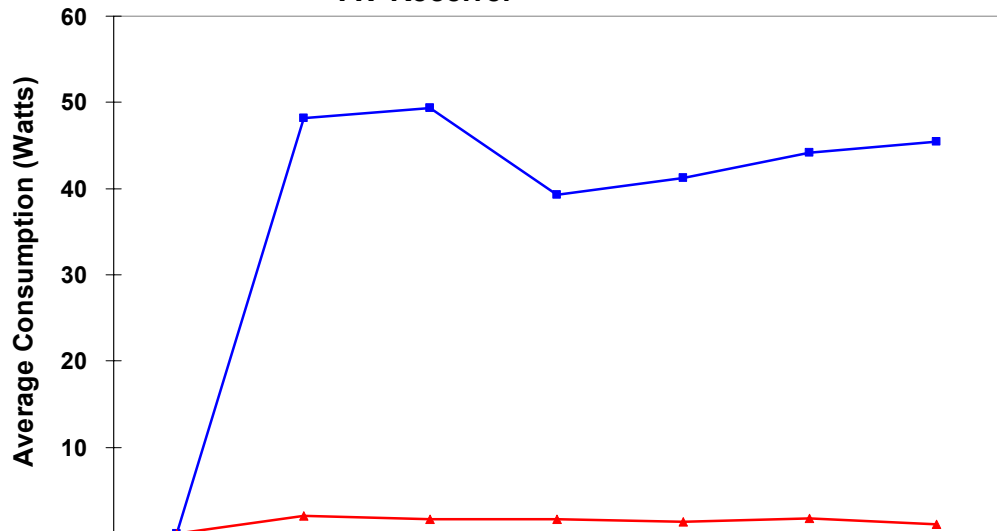
**Stereo - Portable**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
<b>Measurements</b>	<b>2</b>	<b>32</b>	<b>38</b>	<b>34</b>	<b>40</b>	<b>26</b>	<b>22</b>
<b>Active Standby (W)</b>	<b>15.5</b>	<b>5.2</b>	<b>5.4</b>	<b>5.4</b>	<b>6.7</b>	<b>6.4</b>	<b>6.4</b>
<b>Passive Standby (W)</b>	<b>2.8</b>	<b>1.8</b>	<b>2.0</b>	<b>1.9</b>	<b>2.1</b>	<b>2.4</b>	<b>2.5</b>

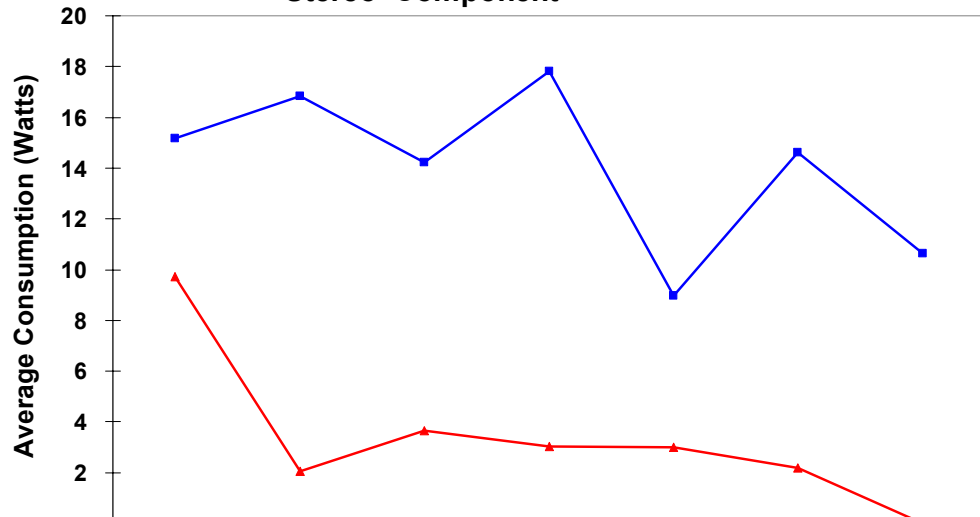
## AV Receivers and Components

**AV Receiver**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
Measurements	0	27	24	71	51	44	33
Active Standby (W)	-	48.2	49.4	39.3	41.2	44.2	45.5
Passive Standby (W)	-	2.0	1.6	1.7	1.3	1.8	1.0

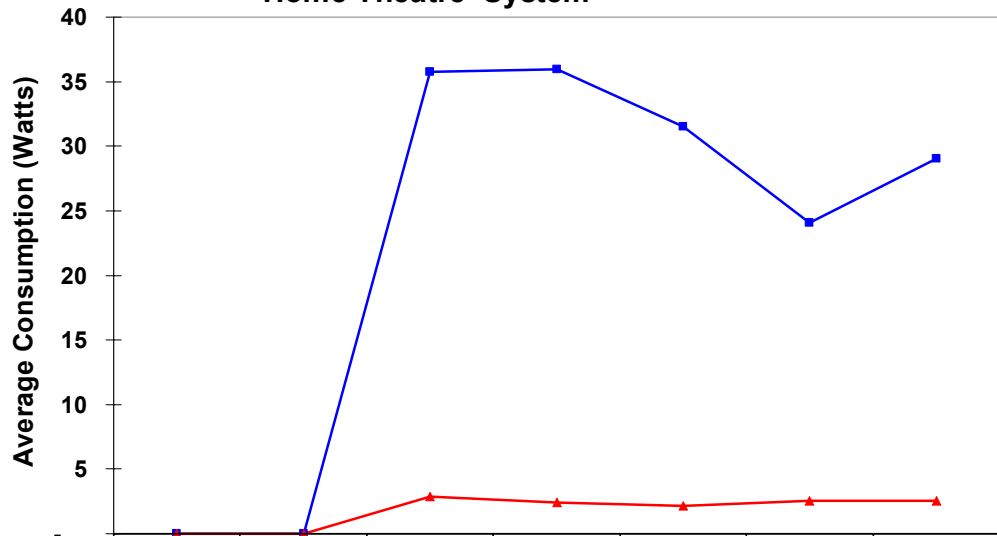
**Stereo Component**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
Measurements	19	32	5	20	12	4	3
Active Standby (W)	15.2	16.8	14.2	17.8	9.0	14.6	10.6
Passive Standby (W)	9.7	2.0	3.7	3.0	3.0	2.2	-

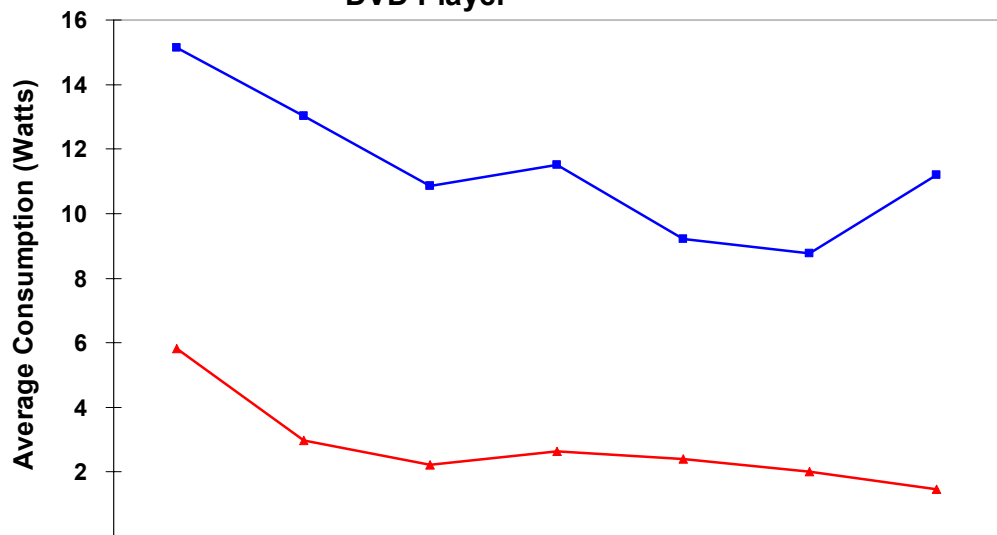
## Home Theatre Systems and DVD Players

### Home Theatre System



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
<b>Measurements</b>	0	0	16	33	60	28	27
<b>Active Standby (W)</b>	-	-	35.8	35.9	31.5	24.1	29.1
<b>Passive Standby (W)</b>	-	-	2.9	2.4	2.2	2.5	2.6

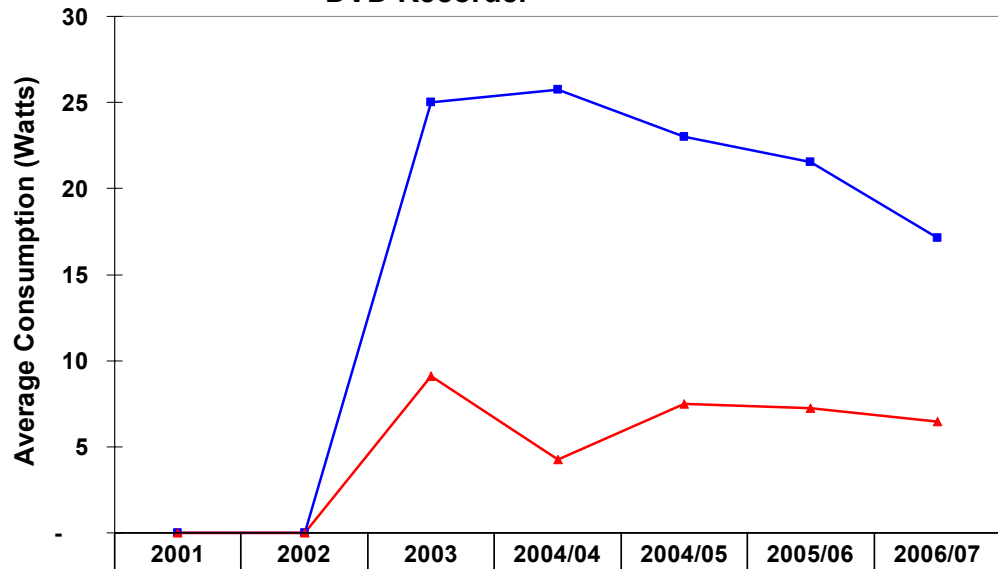
### DVD Player



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
<b>Measurements</b>	28	44	45	88	69	58	25
<b>Active Standby (W)</b>	15.1	13.0	10.8	11.5	9.2	8.8	11.2
<b>Passive Standby (W)</b>	5.8	3.0	2.2	2.6	2.4	2.0	1.5

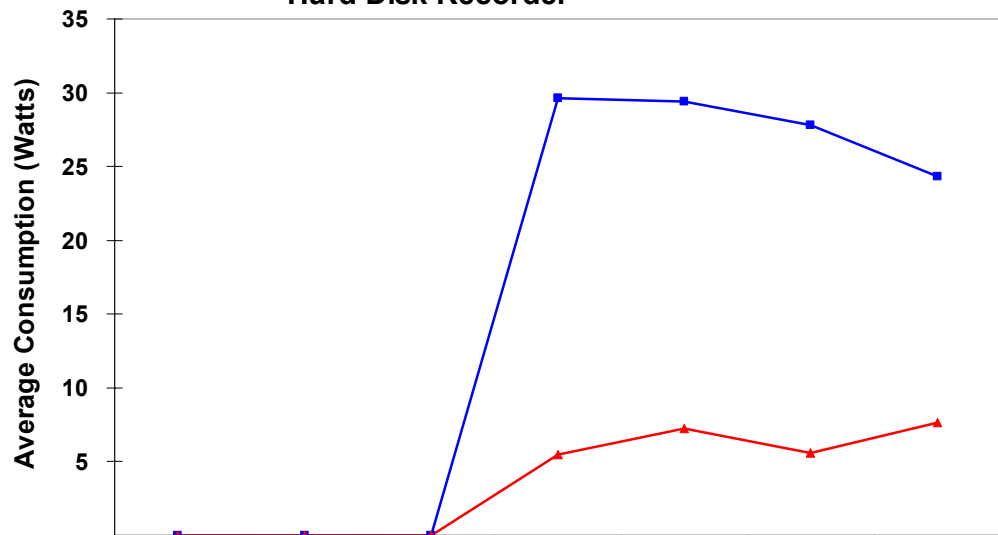
## HD/DVD Recorders

**DVD Recorder**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
Measurements	0	0	1	16	43	20	10
Active Standby (W)	-	-	25.0	25.7	23.0	21.5	17.1
Passive Standby (W)	-	-	9.1	4.3	7.5	7.3	6.5

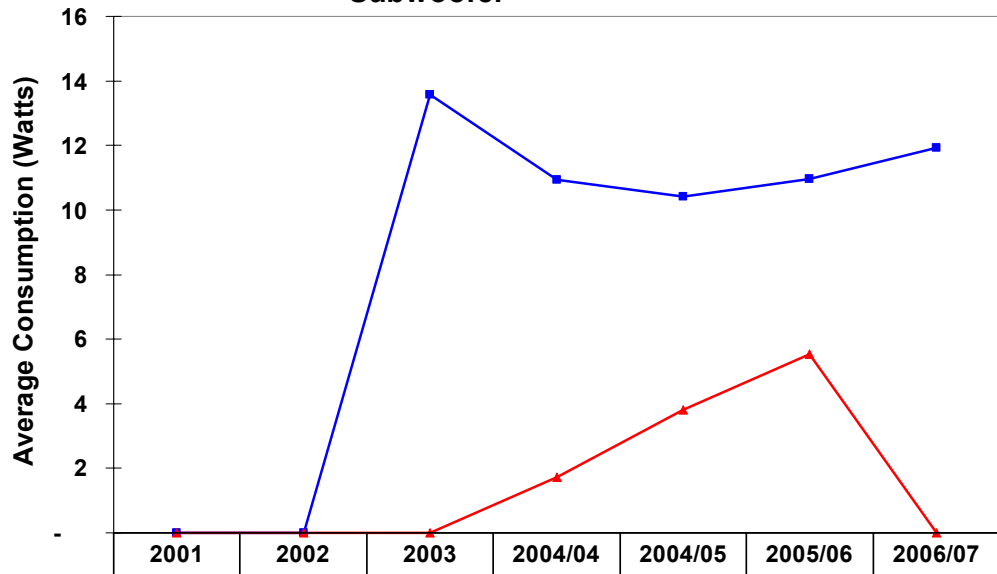
**Hard Disk Recorder**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
Measurements	0	0	0	4	20	28	3
Active Standby (W)	-	-	-	29.6	29.4	27.8	24.3
Passive Standby (W)	-	-	-	5.5	7.2	5.6	7.6

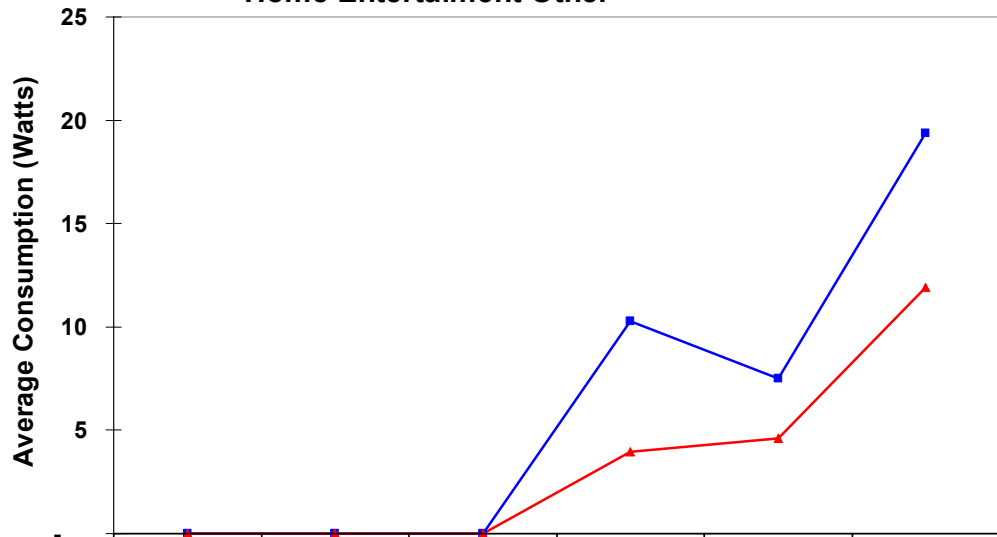
## Subwoofers and Other Home Entertainment

**Subwoofer**



	2001	2002	2003	2004/04	2004/05	2005/06	2006/07
Measurements	0	0	3	38	46	49	10
Active Standby (W)	-	-	13.6	10.9	10.4	11.0	11.9
Passive Standby (W)	-	-	-	1.7	3.8	5.5	-

**Home Entertainment Other**

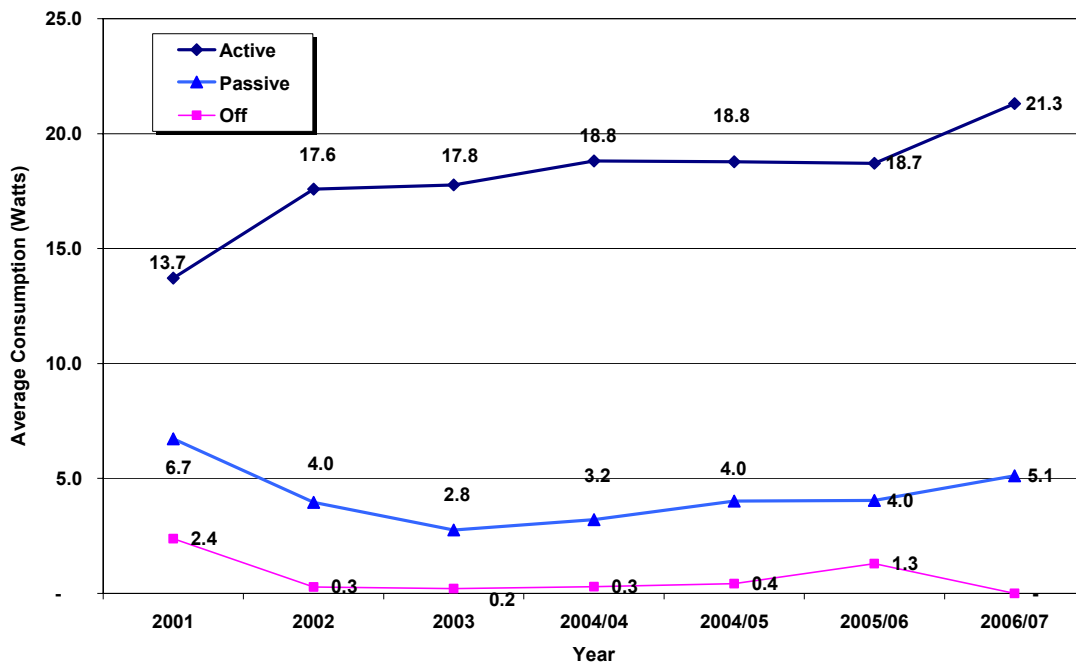


	2001	2002	2003	2004/04	2004/05	2005/06
Measurements	0	0	0	4	7	11
Active Standby (W)	-	-	-	10.3	7.5	19.4
Passive Standby (W)	-	-	-	3.9	4.6	11.9

In most electronic equipment key areas of energy loss are the power supply, electrical motors or other mechanical mechanisms, lighting and light emitting diodes (LEDs), electromagnetic components, e.g. speakers and repays, and electronic components such as integrated circuits and transistors, etc. A number of factors contribute to the energy consumption and energy loss by home entertainment products. This includes, technical features, complexity of circuitry, and design parameters such as decoding standards and use of different manufacturer provided integrated circuits/chips. In addition, the internal software/firmware can dramatically affect the overall energy consumption of the home entertainment products by power managing the supply to different circuits depending on conditions and external signals/controls. Consequently the power use of home entertainment products in active, passive and off mode varies significantly between different models as shown in the earlier graphs.

Figure 11 shows the average power consumption of all home entertainment products over the last six years of surveys. The average model-weighted power consumption of home entertainment product in active standby mode has been slowly trending higher, while this same trend is occurring in passive standby since 2003. OFF mode power consumption is not showing any particular trend; however there is decreasing product with an OFF mode. Preliminary results of the 2006/07 survey show that only 15% of home entertainment products have an OFF mode – compared to 30% in 2005/06.

**Figure 11: Average Model Weighted Power Measurements by Mode: All Home Entertainment Product**



The above model weighted trends present an increasing power consumption trend however the sales-weighted average power trend suggests that passive standby power is decreasing for all home entertainment products except integrated stereos, portable stereos and speakers. The sales-weighted trend for active standby mode is relatively stable for most products, but decreasing for DVD players and DVD/HD recorders. These trends however still lead to an increased overall energy usage of home entertainment products due to the increasing sales and the significant amount of time products are left in active standby mode. The power consumed in active standby mode is generally 10 to 20 times greater than passive standby mode hence it does not take long for products left in this mode to equal the energy consumption when in passive standby mode.

### ***Testing Standards for Home Entertainment Products***

A new standard that defines the methods of measurement for the power consumption of audio, video and related equipment has been published as AS/NZS 62087:2004. This standard is almost a direct copy of the international standard IEC 62087 and was published in May 2004. This standard specifies methods of measurement for the power consumption of TV receivers, VCRs, STBs, audio equipment and multi-function equipment for consumer use. Moreover the different modes of operation which are relevant for the power consumption are defined and the measuring conditions in this standard represent the normal use of the equipment.

## ***2.4 Assessment of Market Deficiencies and Failures***

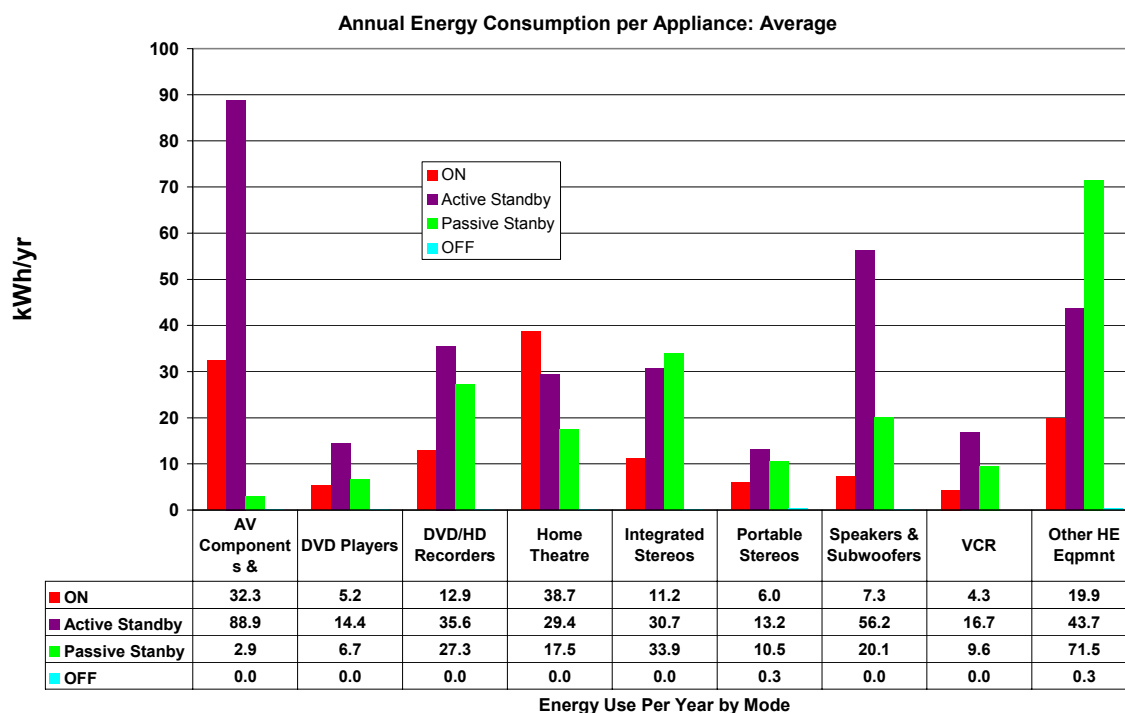
The majority of household consumers do not make lifecycle cost analysis when purchasing household equipment and appliances. This is especially the case with consumer electronic equipment due to quick turnover between rapidly changing old and new technologies and consistently declining prices. Price and features are often the key purchasing criteria for these consumer electronic products. Consequently there is little or no incentive for suppliers to give any serious consideration to energy efficiency.

DVD players, integrated stereos and portable stereos are “high volume low profit” products and several other categories of home entertainment products are moving into this market as they mature. In order to maximize their market share and hence their profitability, the manufacturers will focus on providing key technical features for as low a price as possible, often at the expense of power management features that are not high on consumer criteria. In addition, the focus on price has seen suppliers reduce design costs and not implement power management functions that are present in many of the integrated circuits of their product. A small percentage (<5%) of products for instance do have available the auto-power management functions that return the product to the passive standby mode after periods of inactivity while others do not implement the software function (EC 2007).

For the majority of consumer electronics, with the exception of portable appliances, consumers are not aware of the energy usage or running cost implications of their choice. They also assume that the device does not use energy when turned “off” by the remote

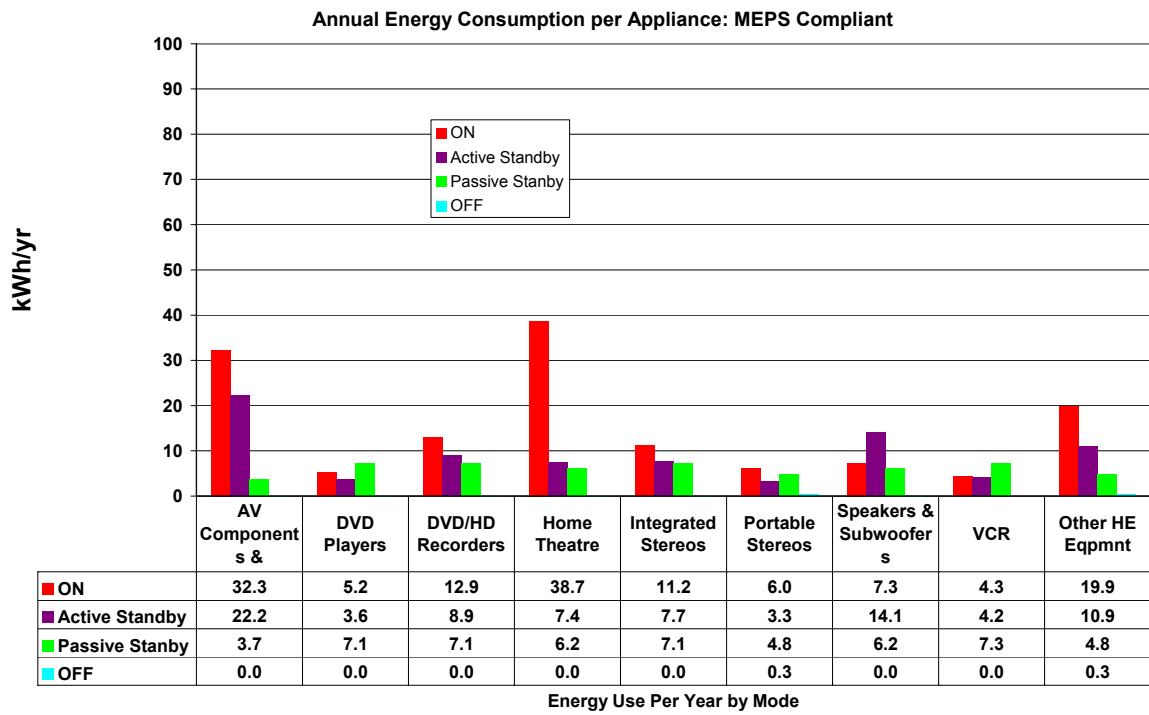
control. To inform the consumer that it is possible to save money by turning the device off at the wall switch is not an acceptable solution. In some cases the device will take too long to boot up essential features within a time that the consumer will find acceptable if the product is switched off at the wall. And in other cases, the product will need to be in a low power mode to record TV shows that have been scheduled. Figure 12 shows the energy consumption of the average home entertainment products when in-use, active and passive standby and off mode. As the figure demonstrates, 70% - 90% of the energy consumption occurs when the product is not being used. The MEPS-compliant product shown in Figure 13 saves between 40% - 70% of the total energy use compared to the average product.

**Figure 12: Average Product by Mode: Per Unit Energy Consumption**



These figures and the evidence from overseas markets shows the market deficiencies in the current home entertainment product market, where consumers are not able to consider the life cycle costs of the product (EC 2007).

Figure 13: MEPS Compliant Product by Mode: Per Unit Energy Consumption



## *3 Objectives of Strategies*

### *3.1 Objective*

The objective of the proposed strategies for home entertainment products 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.

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

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

## ***4 Proposed Strategies***

The range of potential strategies considered for achieving the objective of reducing the power consumption of home entertainment products included:

- Status Quo or business as usual;
- Voluntary efficiency standards;
- Voluntary certification program;
- Levies and emissions trading;
- Dis-endorsement labelling;
- Mandatory energy labelling
- Mandatory Energy Performance Standards.

These options will be discussed below.

### ***4.1 Status Quo (BAU)***

Net energy consumption from all types of home entertainment products in Australia is currently estimated to be approximately 1,130 GWh per annum, equivalent to annual greenhouse emissions of 1.1 Mt CO<sub>2</sub>-e in 2006. Correspondingly the net energy consumption from all types of home entertainment products in New Zealand have been estimated to be approximately 164 GWh per annum, equivalent to annual greenhouse emissions of 100 kt CO<sub>2</sub>-e in 2006. If the current market and technology trends continue, the net energy resulting from the use of home entertainment products is projected to grow to over 1,700 GWh in Australia and around 224 GWh in New Zealand by the year 2015. These estimated BAU projections of energy usage depend on assumptions and data regarding the sales, power consumption, and usage characteristics of home entertainment products. Detailed projections of sales are provided in section 5.5, while Appendix 5 and Appendix 9 provide the power consumption and usage characteristics. A summary of the power consumption and usage characteristics utilised in the development of the BAU scenario inputs are provided in Table 4. These power consumption figures are based on sales weighted average power consumption derived from sales data for the period 2003 – 2006 (GfK 2007) inclusive and the standby store surveys (EnergyConsult 2002-2006).

Usage is based on various Australian survey data (EES 2006) and USA (PG&E 2006) and European studies (EC 2007). However, the usage data is considered the least accurate of the CBA input variables as only limited direct measurement has been undertaken (in Sweden), while the sources of such data in Australia are from observation and survey interviews. Alternative analysis of the usage data is conducted to test the degree of sensitivity these inputs have on the CBA.

**Table 4: BAU Usage and Power Consumption by Category, Mode and Year for Australia**

Category by Mode of Operation	Hours Usage	Weighted Average Power Consumption (W)				
Year	All	2000	2005	2010	2015	2020
AV Components & Receivers - (ON)	2	30.8	39.5	47.1	40.0	35.0
AV Components & Receivers - (Active Stdby)	5.5	30.8	39.5	47.1	40.0	35.0
AV Components & Receivers - (Passive Stdby)	15.4	1.3	0.9	0.5	0.5	0.5
AV Components & Receivers - (OFF)	1.1	0.3	0.1	0.1	0.1	0.1
DVD Players - (ON)	2	13.7	8.9	7.3	7.0	7.0
DVD Players - (Active Stdby)	5.5	13.7	8.9	7.3	7.0	7.0
DVD Players - (Passive Stdby)	15.4	2.7	2.1	1.2	1.1	1.0
DVD Players - (OFF)	1.1	0.1	0.1	0.1	0.1	0.1
DVD/HD Recorders - (ON)	2	26.5	24.3	19.5	15.0	12.0
DVD/HD Recorders - (Active Stdby)	5.5	26.5	24.3	19.5	15.0	12.0
DVD/HD Recorders - (Passive Stdby)	15.4	7.3	7.5	5.4	4.0	3.0
DVD/HD Recorders - (OFF)	1.1	0.1	0.1	0.1	0.1	0.1
Home Theatre - (ON)	5	35.0	24.4	22.0	20.0	20.0
Home Theatre - (Active Stdby)	3.8	35.0	24.4	22.0	20.0	20.0
Home Theatre - (Passive Stdby)	14.25	4.5	3.1	3.6	3.0	2.5
Home Theatre - (OFF)	0.95	0.1	0.1	0.1	0.1	0.1
Integrated Stereos - (ON)	2	15.6	16.1	16.2	14.0	14.0
Integrated Stereos - (Active Stdby)	5.5	15.6	16.1	16.2	14.0	14.0
Integrated Stereos - (Passive Stdby)	15.4	2.8	4.5	6.0	6.0	6.0
Integrated Stereos - (OFF)	1.1	0.1	0.1	0.1	0.1	0.1
Portable Stereos - (ON)	2	4.0	6.7	8.4	8.0	8.0
Portable Stereos - (Active Stdby)	4.4	4.0	6.7	8.4	8.0	8.0
Portable Stereos - (Passive Stdby)	9.9	1.4	2.1	2.9	3.0	3.0
Portable Stereos - (OFF)	7.7	0.1	0.1	0.1	0.1	0.1
Speakers & Subwoofers - (ON)	2	15.2	10.4	10.0	10.0	10.0
Speakers & Subwoofers - (Active Stdby)	15.4	15.2	10.4	10.0	10.0	10.0
Speakers & Subwoofers - (Passive Stdby)	5.5	3.0	10.0	10.0	10.0	10.0
Speakers & Subwoofers - (OFF)	1.1	0.1	0.1	0.1	0.1	0.1
VCR - (ON)	2	8.5	7.7	6.6	5.0	5.0
VCR - (Active Stdby)	7.7	8.5	7.7	6.6	5.0	5.0
VCR - (Passive Stdby)	14.3	3.8	2.9	1.9	1.8	1.8
VCR - (OFF)	0	0.1	0.1	0.1	0.1	0.1
Other HE Eqpmnt - (ON)	2	10.0	7.5	25.4	30.0	30.0
Other HE Eqpmnt - (Active Stdby)	4.4	10.0	7.5	25.4	30.0	30.0
Other HE Eqpmnt - (Passive Stdby)	9.9	4.0	4.6	19.6	20.0	20.0
Other HE Eqpmnt - (OFF)	7.7	0.1	0.1	0.1	0.1	0.1

The BAU scenario assumes that usage does not change over the forecast period and the sensitivity of this variable is tested in Section 5.4. BAU power consumption is forecast to decline by 10% to 50% in Active/ON mode for most products, except for portable stereos. In passive standby mode, the BAU power consumption of most home

entertainment products is forecast to decline by 20% to 50%. The BAU power consumption of integrated stereos is forecast to increase over the period 2005 -2020. These declines in BAU power consumption reflect the natural rate of technology improvements for these devices and are based on the sales weighted power consumption undertaken for this CBA. The BAU forecasts are based on conservative assumptions as the annual improvement in efficiency is between 1% and 4% pa and is at the higher end of assumptions compared to similar studies.

Table 1, page 17, provides the estimated net energy consumption for all Australian states and territories, Australia as a whole, and New Zealand for the years 2000 to 2020 under the BAU conditions.

## ***4.2 Voluntary Efficiency Standards***

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

This option can be effective when there are a relatively small number of suppliers and they are willing to agree to the introduction of the voluntary efficiency standards for a product. This may occur when the few suppliers perceive there will be advantages in meeting such standards in terms of public relations and brand positioning. However, when there are large numbers of suppliers it is more difficult to obtain agreement to the voluntary efficiency standards from a sufficient number of suppliers for the voluntary efficiency standards to have a significant impact on the energy efficiency of the products entering the market. In 2006 there were over 200 home entertainment products suppliers in Australia and nearly 100 in New Zealand. The number of suppliers in both Australia and New Zealand is expected to grow as the market expands, so the likelihood is very low of getting the majority to agree to abide by the voluntary efficiency standards.

Another impediment to the introduction of the voluntary efficiency standards is suppliers may be required to decrease their model ranges to eliminate less efficient models, or to upgrade these models to meet the voluntary efficiency standards. There are few commercial incentives for suppliers to do this, and the incentives are not likely to affect all suppliers, so it is unlikely that suppliers would willingly make these changes without significant government incentives. Also suppliers that agree to meet the standard may be placed at a commercial disadvantage compared to suppliers that do not participate, as non-participants may be able to sell their appliances at a price advantage, thus potentially increasing the net energy consumption of home entertainment products.

There are two major international examples of voluntary efficiency standards – US Energy Star and the European Agreements with EICTA which are discussed in further detail in Appendix 3: Overseas Policies, Programs and Measures. These two programs could potentially be models of the voluntary efficiency standards approaches that Australia and New Zealand could follow. 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. In Europe home entertainment products that do not meet the requirements of the EICTA Agreement are available on the market, despite the agreement been in place since 2003. In fact the European Commission is now investigating mandatory measures to reduce the power requirements of these appliances (EC 2007).

### ***4.3 Voluntary Certification Program***

A voluntary electrical performance certification program involves suppliers submitting their products for objective testing and, if the products perform satisfactorily, then the products can be labelled as 'certified' to fulfil the required energy efficiency performance requirements or listed as certified products on a relevant website etc. The intention is that this provides information and encouragement for consumers to purchase more efficient products and motivates suppliers to improve the efficiency of their products. A voluntary electrical performance certification program would require the establishment and approval of a third party test centre and a complementary education programme.

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 actively looking for efficient products, but the energy efficiency of home entertainment products is unlikely to be the primary driver of the purchase decision for the vast majority of consumers. For a voluntary certification program for home entertainment products to be effective in Australia the certification would need to become highly recognised in the market, which would require considerable government support to occur, and a significant proportion of consumers would need to regard such certification as an important or very important part of their purchase decision-making. Given the nature of home entertainment products, it is unlikely that consumers will regard such energy efficiency certification as an important or very important part of their purchase decision-making for these products, even if the certification program was well publicised.

Participation in voluntary certification program is often a marketing strategy for product suppliers rather than a community service. Participation in a voluntary certification program can be a low cost marketing strategy for suppliers which they can use to focus on some specific market segments, e.g. environmentalists, as often the certification entity is well known within such target segments. Participation in voluntary certification programs largely depend on overall market size and the size of target segments as the market and sub-segment size must be sufficient to justify the expense and effort involved in certifying products. Compared with other developed economies, Australia and New Zealand have a very small consumer market (approx 3% of the USA market) and even smaller segment of people concerned with environmental issues and energy conservation.

As an example of the results of a voluntary certification program, the voluntary Energy Star certification program currently covers most home entertainment products, such as DVDs, VCRs, audio systems and home theatres. Only 154 models out of 2200 surveyed

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since 2001 have displayed an Energy Star Label in Australia (source EnergyConsult 2002-06). This represents 7% of the market which reduces its relevance. Neither of the major international programs can therefore be considered to present an effective approach to the use of voluntary efficiency standards for home entertainment products or evidence as to why voluntary efficiency standards would be effective in Australia. As a result, we conclude that the impact of this option in Australia and New Zealand would be negligible in comparison to the BAU case.

#### ***4.4 Dis-endorsement Label***

The principle of a dis-endorsement label is to highlight that a product is energy inefficient. Manufacturers and suppliers will not apply such a negative label on their products voluntarily, so this must be a mandatory scheme. Manufacturers and suppliers would be expected to strongly oppose the introduction of such a scheme.

A dis-endorsement label is different from the current energy star labelling scheme in Australia and New Zealand in the sense that it applies a negative characteristic to the labelled product, rather than providing information on the energy performance level of the product. As a dis-endorsement label provides such different information than the existing energy star labelling scheme, introducing the dis-endorsement label scheme is likely to confuse the consumer and reduce the effectiveness of both schemes. The resulting impact of the dis-endorsement label scheme is therefore likely to be minimal.

The introduction of a dis-endorsement label program would therefore appear to be unjustified and inappropriate in Australia and New Zealand, given the presence of the existing appliance labelling scheme and the likelihood of the scheme impact being minimal.

#### ***4.5 Levies and Emissions Trading***

One way of increasing the uptake by the market of more energy efficient home entertainment product 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 home entertainment product equipment via a levy or by raising the price of the energy the product consumes. Both options will be discussed.

##### **Equipment Levy**

The equipment levy involves imposing upon inefficient models a levy which would raise the prices of the inefficient home entertainment products. The funds raised could be used to fund programs which would reduce the greenhouse impact of using the home entertainment products. The revenue raised from the levy could be diverted to greenhouse-reduction strategies unrelated to the efficiency improvement of the target appliances or used to subsidise the costs of more efficient models of target appliances in order to reduce any cost differentials between these and inefficient models.

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 a 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, 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, such as home entertainment products. The imposition of a government levy on electricity prices or the introduction of emissions trading would raise the consumers' consideration of the energy efficiency of appliances and might encourage the uptake of more efficient home entertainment products.

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 home entertainment products.

### **Carbon 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 Federal 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 emissions trading scheme, 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 home entertainment cannot be determined until the Government has decided operational details of the ETS and until modelling of future electricity prices is available. The impact of an ETS on the CBA analysis is discussed in Section 5.6 and Appendix 6.

However, it is unclear if an ETS alone would impact on the energy efficiency of home entertainment products. 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 such as home entertainment products and consumers would still lack information on the energy usage of the home entertainment products even if they were more concerned.

In addition, the *Report of the Task Group on Emissions Trading* (Australian Government 2007) noted that MEPS will complement the emissions trading scheme, as follows:

*“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);

Hence it is concluded that an emissions trading scheme on its own is unlikely to affect home entertainment product energy performance or market take-up.

## **4.6 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 performance of one product relative to another. Energy labelling requires the establishment of relative energy levels and a rating system.

The Energy 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.

The comparative energy label which has been used in Australia and New Zealand 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 most cases, any benefit in terms of reduced energy consumption relies upon the selection of the appliance by the consumer.

If labelling were applied to home entertainment products, the benefit to the consumer of selecting a higher star rated product compared to the standard product may not be sufficient to influence the decision, as the difference in running costs are currently between \$2/yr to \$8/yr pa.

Energy performance labelling used in the E3 program originated by aiming at whitegoods. Consequently the label is large in design to provide effective visual impact on the buyer. The size and design of labels under the existing labelling scheme are generally not suitable for display on smaller electronic products. Considering that the existing labelling has achieved a successful branding status over the period of its existence, a new label design to suit electronic equipment would be required that is based on a similar design to exploit the effectiveness of the existing labelling scheme. Any new design and development initiative would be likely to cover a number of products other than just home entertainment products.

In contrast with the comparative energy label that provides actual energy consumption of the appliance and compares its performance against a scale, the ENERGY STAR scheme is an endorsement label for appliances that meet minimum high performance standards. The impact of this program is 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.

## **Conclusions**

Mandatory Energy labelling for home entertainment products is not considered practical, nor would the label provide information that would influence the purchase decision. Therefore this strategy is not assessed any further.

## ***4.7 Mandatory Minimum Energy Performance Standards***

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

A proposed MEPS that covers all home entertainment products is described in the following section. The maximum power levels for the MEPS are based on the existing requirements used by the voluntary agreement provided under the European Commission and EICTA, and the mandatory requirements for California and Korea. This New Zealand and Australian MEPS is tailored to mirror international requirements, while being moderated to address local industry technical issues. In this regard, the proposed MEPS provides a two stage implementation schedule, with the Stage 1 MEPS removing approximately 20 - 30% of the worst performing products currently on the market by late 2008 and Stage 2 MEPS implementing the IEA target of 1W by 2012. Consultation has been conducted with the consumer electronics industry over the period 2004 to 2007 on the proposed strategies.

The proposed MEPS includes requirements for maximum power levels for passive standby and OFF modes where the product has an OFF function. In addition, products are required to automatically power down to passive standby after 30 minutes of no AV input or inactivity in the Stage 2 MEPS ( i.e., after a DVD player has finished playing and

is no longer providing AV output). The proposed regulation also includes a high efficiency level that can provide recognition for those devices that meet the Stage 2 MEPS levels before they are introduced. This recognition may be provided in the provision of ENERGY STAR product endorsement, although no proposals have been put forward to-date. In addition, product that implement the power management features of a HDMI connection (which provides for automatic switching of the video player and the display device) may be considered for this endorsement.

Products are defined to come under the scope of the proposed MEPS if they meet the following definition.

Commercially available consumer equipment that produces, records or assists in producing an audio or video signal/output.

Products that are specifically covered or planned to be covered by other MEPS requirements (such as TVs, set top boxes, personal computers) would be excluded from this MEPS. Products that include an external power supply (EPS) would be required to meet both the EPS MEPS and this proposed MEPS. A summary of the proposed maximum levels that would apply by mode and product type are shown in Table 5.

**Table 5: Proposed MEPS: Maximum Standby Power Levels**

Home Entertainment Product Type	Stage 1 MEPS		Stage 2 MEPS	
	Passive standby	Off <sup>†</sup>	Passive standby	Off <sup>†</sup>
Without video recording capabilities	4 watts	0.3 watts	1 watt*	0.3 watts
With video recording capabilities	6 watts	0.3 watts	1 watt*	0.3 watts

<sup>†</sup> Applies only if the product includes an OFF function

\* Auto power down to passive standby after 30 minutes of no AV input or inactivity is also required

As explained in the following sections, home entertainment products are only differentiated by their video recording capability.

### *Stage 1 MEPS*

The MEPS for implementation for Stage 1 is proposed at 4 watts for all home entertainment products without video recording capabilities and at 6 watts for those with video recording capabilities. Additionally all products with an off mode would be required to have consumption less than 0.3W. Products would be considered high efficiency models if they meet the criteria set out for Stage 2 MEPS. Approximately 25% of all models surveyed in 2006 would not meet Stage 1 MEPS level as demonstrated in Table 10 (page 51).

It is suggested that the MEPS Stage 1 is implemented as early as possible, but not before 1 October 2008, which provides 2 years since the announcement of the proposal to enable industry to comply with these levels. Government/industry consultation has suggested that a 4 year period is appropriate for MEPS notification, based on product

development lifecycles (i.e., the time required to adjust product design to meet the new MEPS levels). However, the typical product lifecycle for home entertainment products is 18 months, due to the competitive nature of this market and the need to rapidly incorporate new technology and features. It has been reported by industry that a new model is typically released to the market every year for many of these equipment types. This shorter product development lifecycle enables the MEPS levels to be taken into account without interruption to the normal model development cycle.

### ***Stage 2 MEPS***

Stage 2 MEPS aims to meet the IEA target of less than 1 watt consumption in standby. All Australian Governments have adopted this target for all appliances under its Standby Power Strategy (MCE 2002). The Strategy proposes that this level be achieved by 2012 and it is considered that by 2012 the market would be ready to achieve a MEPS level of 1 watt or less in passive standby for home entertainment equipment. The New Zealand Government has committed to implementing a MEPS and labelling regime in alignment with Australia. This means that any regulatory interventions in New Zealand will be done in alignment with Australian States and Territories to the same stringency and at the same time. This reflects both the New Zealand Government's energy efficiency policies and obligations under the Trans Tasman Mutual Recognition Arrangement.

Therefore it is proposed that Stage 2 MEPS be implemented on or after 2012. This would also be consistent with the levels expected by international programs.

## ***4.8 Conclusions***

The voluntary options presented in the earlier sections are either not effective or practical or else they are not appropriate. These alternative options are assessed as less effective at reducing GHG emissions from BAU. In addition, mandatory labelling is not a practical or appropriate for home entertainment products.

The proposed MEPS regime for home entertainment products was to be a voluntary scheme. However, when industry was consulted there was concern raised that a voluntary scheme may not produce the outcomes that the scheme was designed to achieve (CESA 2004). Many suppliers also reported that as a matter of corporate policy they would comply with official standards whether it was voluntary or not. This had the potential to put them at a disadvantage compared to companies that did not have such policies. In general it was pointed out that the companies with such policies were the larger more established brand names such as Sony, Panasonic, LG and Samsung. In addition these suppliers pointed out that the structure of the market in Australia meant that there were a large number of suppliers in Australia with few having a large market share.

In conclusion, the most effective way to reduce GHG emissions for home entertainment products is MEPS. This is the option that is subsequently assessed in this study in terms of costs, benefits and impacts on consumers, taxpayers and industry.

## ***5 Cost-Benefit and Other Impacts***

This section presents the costs, benefits and other impacts of the MEPS for home entertainment products. Most of the assumptions that apply to Australia also apply to New Zealand as the products likely to be sold in NZ are similar to Australia. As such results that are commonly applicable to both Australia and New Zealand do not contain a direct reference to either country. In other cases, results and discussions are provided concurrently for both countries as the analysis reflects the results are based on GfK data specific to each country. The product stock modelling framework is explained in Appendix 2: Stock and Sales.

### ***5.1 Costs to the Taxpayer***

The proposed 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 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 and analysis, Regulatory Impact Statements, etc.

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

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

### ***5.2 Business Compliance Costs***

Responsibility for compliance with the MEPS lies with the importer or supplier of the product. This analysis assumes that any increases in product design and construction costs will be passed on to customers in the form of higher purchase prices. The Business Cost Calculator (OBPR 2006) has been used as a basis to the calculation of the costs for compliance with the MEPS. The costs of compliance were identified as follows:

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- Education – which involves maintaining awareness of legislation and regulations, and the costs of keeping abreast of changes to regulatory details.
- Permission – which involves applying for and maintaining permission for registration to conduct an activity, usually prior to commencing that activity.
- Record Keeping – which involves keeping statutory documents up-to-date.

The Purchase Cost category – which involves the costs of all materials, equipment, etc, purchased in order to comply with the regulation – was not included in the business compliance costs. This cost category was interpreted as the cost of design changes to the products to ensure that they meet the required power levels and these costs are explicitly included in the costs benefits analysis as increased purchase costs to the consumer.

Therefore the tasks, categories and costing assumptions are provided in Table 6.

**Table 6: Business Cost Calculation Inputs**

Category	Task	Cost Inputs	Source
Education	Train staff, keep up-to-date with regulations	16 hours/year per supplier	Estimated from other MEPS programs
Permission	Test HE product in laboratory	\$500/test per model supplied	Potential Test Laboratory
Permission	Complete MEPS registration	2 hours per model supplied	Estimated from other MEPS programs
Record Keeping	Maintain documents for 5 years	8 hours per 5 years per supplier	Estimated from other MEPS programs
Other inputs:		Staff costs \$40/hr	<i>Australian Jobs 2006</i>

The total costs of business compliance for the MEPS are in proportion to the number of businesses importing/suppling home entertainment products and the number of models supplied. Overall, some 1,300 unique models are currently available, from approximately 100 suppliers, or an average of approximately 13 models per supplier.

The Business Costs Calculator was used to determine the costs per business, and then these costs were allocated on a “per model” basis for the cost-benefit analysis. The RIS cost-benefit analysis models the costs on the basis of each model supplied to the market in a particular year, as this approach provides a greater certainty to the costing of MEPS. The total costs calculated are shown in Table 7.

**Table 7: Business Compliance Costs for Home Entertainment MEPS**

Category	Task	Costs / business	Costs / model
Education	Train staff, keep up-to-date with regulations	\$640	\$48
Permission	Test products in laboratory	\$6,636	\$500
Permission	Complete MEPS registration	\$1,062	\$80
Record Keeping	Maintain documents for 5 years	\$320	\$24
Total		\$8,658	\$652

These costs represent approximately \$865,000 to the suppliers in the first year of MEPS, based on 100 home entertainment product suppliers. This cost-benefit assumes that new models are introduced to the market each year, which has been observed in the Standby Store Surveys undertaken since 2003. Sensitivity analysis of these estimated costs shows that if these compliance cost increase by 100%, the effect on the cost-benefit is minimal.

### *5.3 Industry, Competition and Trade Issues*

#### *Industry Issues*

This section reviews the impacts of the proposal/s on suppliers. In the home entertainment product supply market, there are estimated to be over 100 suppliers; some are specific suppliers of particular product categories while others are multi-national consumer electronics companies. All home entertainment products are imported into Australia/New Zealand. These importers/distributors and consumer electronic companies vary in size, however all have some internal capacities to respond to the costs that the proposed regulations will place on them. Product energy testing costs are relatively small in the overall cost structure for product imports.

Most energy efficiency regulations envisage an increase in average production costs due to changes in the design of the product to integrate energy efficient components or software. This is likely to be the case with home entertainment products, although the envisaged price increases are rarely realised in practice. When these price increases occur, they are typically passed on to the retailer and consumer. Retail price increases due to the requirements of the home entertainment product MEPS are modelled in the CBA starting at \$2.00 in 2009 and reducing to zero by 2011 for MEPS Stage 1 and again another incremental cost increase of \$2.00 in 2012 due to MEPS Stage 2 reducing to \$0.20 by 2019. The range of estimated incremental cost increase to meet the MEPS requirements is shown in Table 8 ranges from -\$2.44 AUD (UN 2001) to \$6.45 (ACEEE 2004).

**Table 8: Incremental Price Increase Range and Sources**

Incremental Costs Increase	Source
\$1.63 (1 Euro)	Siderius 2006
\$2.44 (\$2 USD)	ACEEE 2004
-\$2.44 to 0.61 ( -\$2 to \$0.5 USD)	UN-ESCAP 2001, EPA
\$1.63 9 1 (Euro)	European Commission 2007

Table 9 presents the estimated incremental price increase due to the MEPS requirements by year for the Base scenario modelled in the CBA.

**Table 9: Incremental Price Increase Due to MEPS Requirements by Year**

Category	2009	2010	2011	2012	2013	2014	2015	2020
AV Components & Receivers	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
DVD Players	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
DVD/HD Recorders	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
Home Theatre	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
Integrated Stereos	\$2.00	\$1.00	\$0.50	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
Portable Stereos	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
Speakers & Subwoofers	\$2.00	\$1.00	\$0.50	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
VCR	\$0.00	\$0.00	\$0.00	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00
Other HE Eqmnt	\$2.00	\$1.00	\$0.50	\$2.00	\$1.67	\$1.33	\$1.00	\$0.00

The later sections examine the costs and benefits of the MEPS options from the perspective of consumers. 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 product suppliers as a group is neutral. The cost-benefit assessment provided in Section 5.4 assumes that the product suppliers recover the costs via an increase in the costs of the product to the consumer. As the benefits of the energy efficiency improvement accrue to the consumer, this approach allows for a consistent treatment of costs-benefits.

The supplier's ability to use internationally recognised testing standards reduces the need for testing of products for different regions. In collaboration with the US EPA (Energy Star), the European Union, Korea and China, the E3 program has adopted the IEC 62087 test method.

## *Trade*

Mandatory energy efficiency regulations apply to all products sold, whether locally manufactured or imported. 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.

There are no known local manufacturers of home entertainment products in Australia or New Zealand. All units are imported with suppliers either specifying designs in their own

company or purchasing units from the various contract OEM suppliers. The vast majority of product suppliers source their units from OEM suppliers in the Asia region, and re-badge the models to the supplier brand. Some larger consumer electronics companies design their own products and have them manufactured by their own companies, typically with manufacturing facilities in Asia.

According to the suppliers, the lead time from specification to availability in the marketplace ranges from 6 months to 2 years depending upon the specification and component availability. Overall, in the consumer electronics market, models are available for 12 months before they are replaced by new or upgraded models.

### ***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 all of the products addressed in the study 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 adopted by the Australian Standard replicates the IEC test. Korea, one of the world's major sources of consumer electronics has also adopted the same test procedure, along with the EU.

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 home entertainment product tested in other countries under comparable standards. There may also be scope for accepting a product that may comply with MEPS in its country of origin (e.g., in the EU, Korea or California) if it also complies with Australian 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.

## *TTMRA*

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

As the Australia-NZ 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 home entertainment products in New Zealand and therefore it is deemed that the TTMRA is not contravened. The TTMRA is an issue that may arise if New Zealand does not implement the MEPS requirements, in accordance with the Standard, at the same time as Australian states. However, the Australian and New Zealand regulators are working together within the E3 committee and hence this is not envisaged as an issue.

## *Competition*

Implementation of the proposed MEPS requirements is unlikely to affect the competitiveness of one supplier over another. The proposed MEPS addresses the energy efficiency performance of the home entertainment product, not the overall performance of the unit, so consumer choice will not be affected.

Approximately 25% of all models surveyed in 2006 would not meet Stage 1 MEPS level as demonstrated in Table 10.

It is suggested that the MEPS Stage 1 is implemented as early as possible, but not before October 2008, which provides 2 years since the announcement of the proposal to enable industry to comply with these levels. Government/industry consultation has suggested that a 4 year period is appropriate for MEPS notification, based on product development lifecycles (i.e., the time required to adjust product design to meet the new MEPS levels). However, the typical product lifecycle for home entertainment products is 18 months, due to the competitive nature of this market and the need to rapidly incorporate new technology and features. It has been reported by industry that a new model is typically released to the market every year for many of these equipment types. This shorter product development lifecycle enables the MEPS levels to be taken into account without interruption to the normal model development cycle.

**Table 10: MEPS Stage 1: Home Entertainment Products excluded when applied to Store Survey Data from 2001 to 2006**

Appliance	Year	2001	2002	2003	2004 <sup>1</sup>	2005 <sup>1</sup>	2006 <sup>1</sup>
AV Receiver	% of Models		30%	26%	12%	10%	14%
	No of Models		7	6	6	5	6
DVD Player	% of Models	42%	22%	18%	23%	27%	19%
	No of Models	10	8	6	18	18	10
Home Entertainment Other <sup>2</sup>	% of Models				33%	100%	75%
	No of Models				1	1	3
Home Theatre System	% of Models			22%	10%	15%	17%
	No of Models			2	3	8	4
Stereo Component	% of Models	88%	33%	20%	33%	25%	0%
	No of Models	29	4	1	3	2	0
Stereo - Integrated	% of Models	57%	53%	35%	39%	32%	32%
	No of Models	38	27	11	20	21	11
Stereo – Portable	% of Models	34%	0%	3%	7%	9%	24%
	No of Models	12	0	1	2	3	6
Subwoofer	% of Models				20%	40%	57%
	No of Models				1	4	4
DVD Recorder	% of Models			100%	20%	40%	40%
	No of Models			1	3	17	8
Hard Disk Recorder	% of Models				25%	53%	27%
	No of Models				1	10	7
VCR	% of Models	13%	0%	0%	0%	4%	0%
	No of Models	5	0	0	0	1	0
Total non-compliant	% of Models	47%	24%	17%	18%	24%	25%
	No of Models	94	46	28	58	90	59
Total All Home Entertainment	No of Models	198	195	165	321	377	239

Notes: (1) Data for 2004, 2005 and 2006 is from surveys undertaken in 2003/04, 2004/05 and 2005/06 respectively. (2) Home Entertainment Other is recent category and only includes very few products that can not be easily categorised (such as integrated stereos with a built in TV screen). Note that Blank cells indicate that no models were found with that mode for the year.

A MEPS level that removes the approximately 25% of the least efficient models surveyed is consistent with the method used to determine the MEPS levels for other products, such as three-phase air conditioners and motors, while still somewhat consistent a significant trading partners. The recommended levels are unique to New Zealand and Australia, as to directly mimic the only mandatory programs currently in existence would somewhat limit the E3 program and would not allow the flexibility for the constantly changing technologies. The CEC program only covers 4 product groups (DVD players DVD Recorders, Hard Disk Recorders and Integrated stereos) whilst the Japanese top runner only looks at VCRs. The levels set by the CEC are somewhat lower than those set out in Stage 1 MEPS, which if CEC levels are implemented would result in over 40% of current products being removed from the New Zealand and Australian market. The

MEPS levels nominated in stage one have been chosen to satisfy 3 criteria, removing approximately 25% of the least efficient models, keeping in-step with the international market especially Europe where product type is most similar, and a simple yet flexible system to cope with the constantly changing technological developments occurring in the home entertainment area.

**Figure 14: MEPS Stage 1 Percentage Excluded by Product and Year**

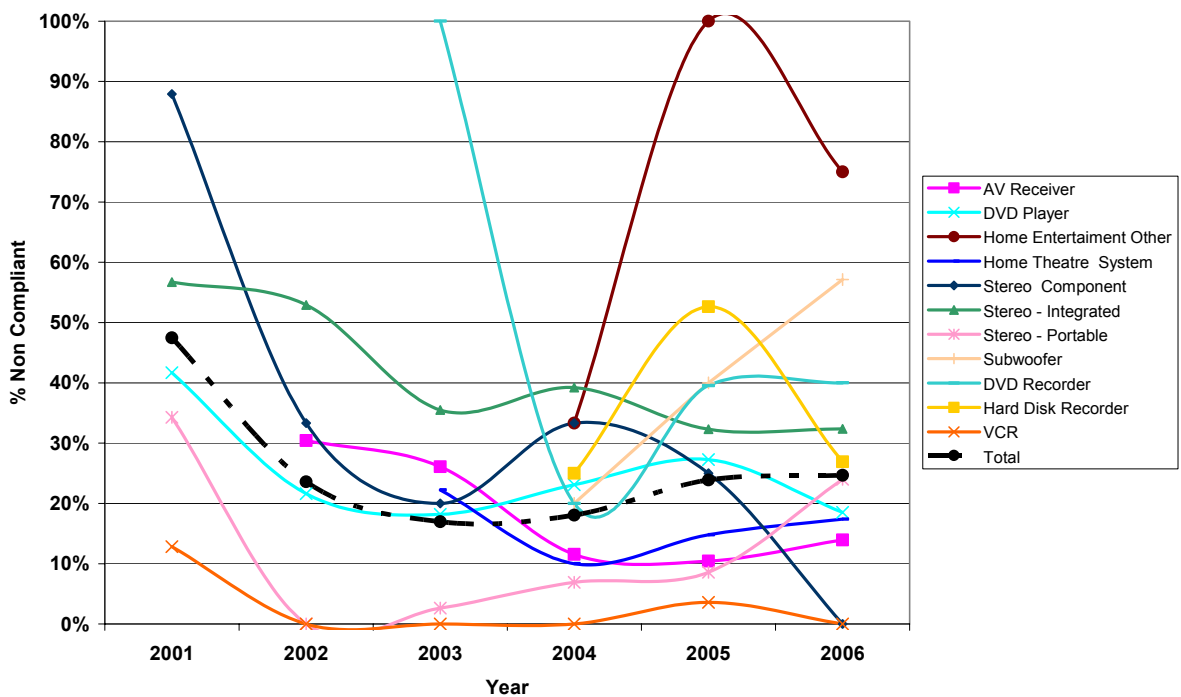


Figure 20 shows the trends in the percentage of products that would be non-compliant with the proposed MEPS Stage 1 levels when applied to the last 6 years of store surveys. Initially, the percentage of products excluded was relatively high; however over the last 5 years the trend has levelled off between 20 and 30%. It is apparent that the percentage non-compliant with the proposed MEPS Stage 1 levels is not decreasing over time – in fact there is a slight increase in the potential product that would not meet the proposed MEPS. This overall increase is due to the increase in number of models of DVD Recorders and Hard Drive Recorders and these products have greater percentages of non-compliance. If the overall trend is considered, than the number of non-compliant models would be expected to decrease between 2006 and the date of implementation of the proposed MEPS Stage 1.

The Stage 2 MEPS would significantly affect the availability of models on the market if no technological progress was made over the next 5 years. This is unlikely to occur as historically the number of models able to meet 1W passive standby has been increasing, as shown in Figure 15. The proposed passive standby level of 1 Watt would currently

exclude 66% of the market, as shown in Table 11, assuming that those products would also have implemented the auto power requirement where applicable.

**Table 11: MEPS Stage 2: Home Entertainment Products excluded when applied to Store Survey Data from 2001 to 2006**

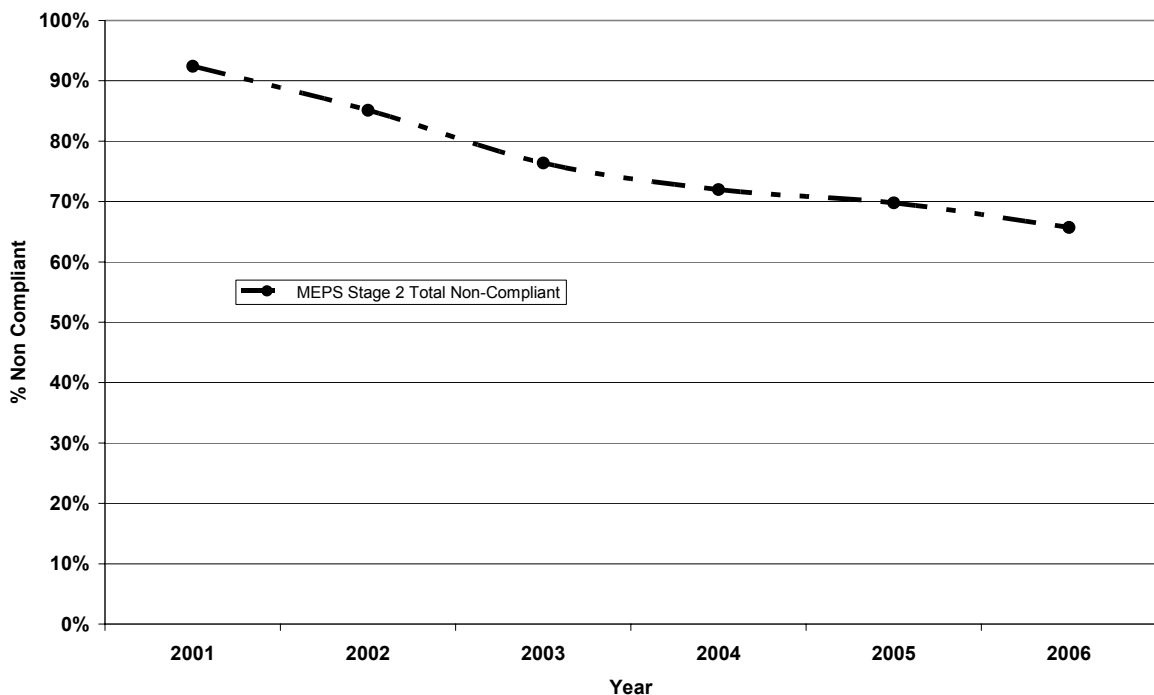
Appliance	Year	2001	2002	2003	2004 <sup>1</sup>	2005 <sup>1</sup>	2006 <sup>1</sup>
AV Receiver	% of Models		87%	57%	52%	52%	37%
	No of Models		20	13	27	25	16
DVD Player	% of Models	88%	78%	70%	72%	67%	56%
	No of Models	21	29	23	56	44	30
Home Entertainment Other <sup>2</sup>	% of Models				100%	100%	75%
	No of Models				3	1	3
Home Theatre System	% of Models			56%	47%	46%	39%
	No of Models			5	14	25	9
Stereo Component	% of Models	100%	100%	60%	78%	75%	100%
	No of Models	33	12	3	7	6	1
Stereo - Integrated	% of Models	84%	71%	65%	67%	58%	56%
	No of Models	56	36	20	34	38	19
Stereo – Portable	% of Models	97%	91%	95%	90%	86%	96%
	No of Models	34	29	36	26	30	24
Subwoofer	% of Models				40%	40%	100%
	No of Models				2	4	7
DVD Recorder	% of Models			100%	87%	100%	100%
	No of Models			1	13	43	20
Hard Disk Recorder	% of Models				100%	100%	100%
	No of Models				4	19	26
VCR	% of Models	100%	100%	100%	100%	100%	100%
	No of Models	39	40	25	45	28	2
Total non-compliant	% of Models	92%	85%	76%	72%	70%	66%
	No of Models	183	166	126	231	263	157
Total All Home Entertainment	No of Models	198	195	165	321	377	239

Notes: (1) Data for 2004, 2005 and 2006 is from surveys undertaken in 2003/04, 2004/05 and 2005/06 respectively. (2) Home Entertainment Other is recent category and only includes very few products that can not be easily categorised (such as integrated stereos with a built in TV screen). Note that Blank cells indicate that no models were found with that mode for the year.

Some form of exemption process may be necessary where the product group or technology is not capable of meeting the Stage 2 levels, however this would need to be considered under an industry and government agreement. Discussion on such exemption process would require timelines for eventual compliance and applicable alternative levels. Specialist audio equipment (such as extremely high quality and low sales volume audio amplifiers) may be candidates for these exemptions.

The trend in total percentage that does not comply with the proposed MEPS Stage 2 is downward, as shown in Figure 15. If this trend continues over the next 6 years, by 2012 approximately 30% of all products would not comply with the proposed MEPS Stage 2 levels. However, given that the EU agreement requires manufactures to meet the 1 Watt level by 2007, it is not unrealistic to assume the Australia/New Zealand market will be able to adjust by 2012.

**Figure 15: MEPS Stage 2 Percentage Excluded of all Product by Survey Year**



The proposed MEPS does not penalise products with additional features, as the MEPS only affect the standby power usage, which is not generally dependant on the features or other characteristics available in the product. Much of the market is typified by original equipment manufacturers, supplying models to consumer electronics companies. The market is becoming highly competitive with the number of brands increasing in Australasia and other regions worldwide. Given the substantial number of international manufacturers of home entertainment product, importers of these devices will be able to source MEPS-compliant product in place of non-compliant product in this competitive market without great difficulty by mid-2008. Consequently, there is unlikely to be any significant impact on the availability and range of models and hence consumer choice in New Zealand and Australia.

The proposed introduction of MEPS in Australia and New Zealand, combined with other international programmes, will provide a spur for increased innovation and performance. As all importers will have the same requirements for their products, they will all be on an equal footing and still be able to compete in their normal market processes.

In summary, it is not expected that the proposed regulation will restrict the ability for consumer electronic manufacturers and suppliers to compete based upon products with low capital cost, as silicon chip suppliers have available low power consuming components and some already have implemented the auto power down features (EC 2007).

### 5.4 Consumer Costs and Benefits

The assessment of costs and benefits from the perspective of the consumer is examined in this section. The benefits to the consumer include the estimated electricity cost savings from a more energy efficient product, while the costs include the estimated incremental price increase due to suppliers meeting the MEPS requirements. Consumer costs and benefits are modelled to begin in 2009 as the implementation date for the Stage 1 MEPS is set for late 2008 (1 October 2008).

#### Consumer Perspective

Calculations of the cost-benefit performed with the CBA model are shown in Figure 16 for Australia and in Figure 17 for New Zealand. The undiscounted benefits peak at \$108M for Australia in 2018 and \$18M for New Zealand in 2016, while the highest costs are estimated in 2012 at \$7.1M for Australia and \$1.4M for New Zealand.

Figure 16: Consumer Cost-Benefit of MEPS (Aus)

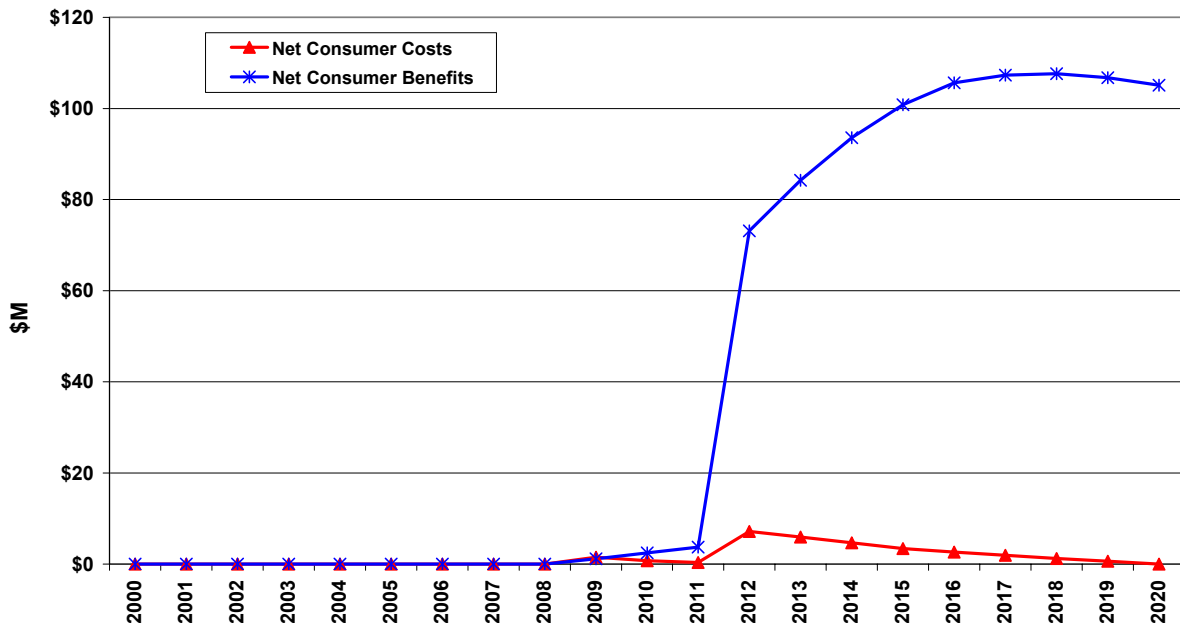
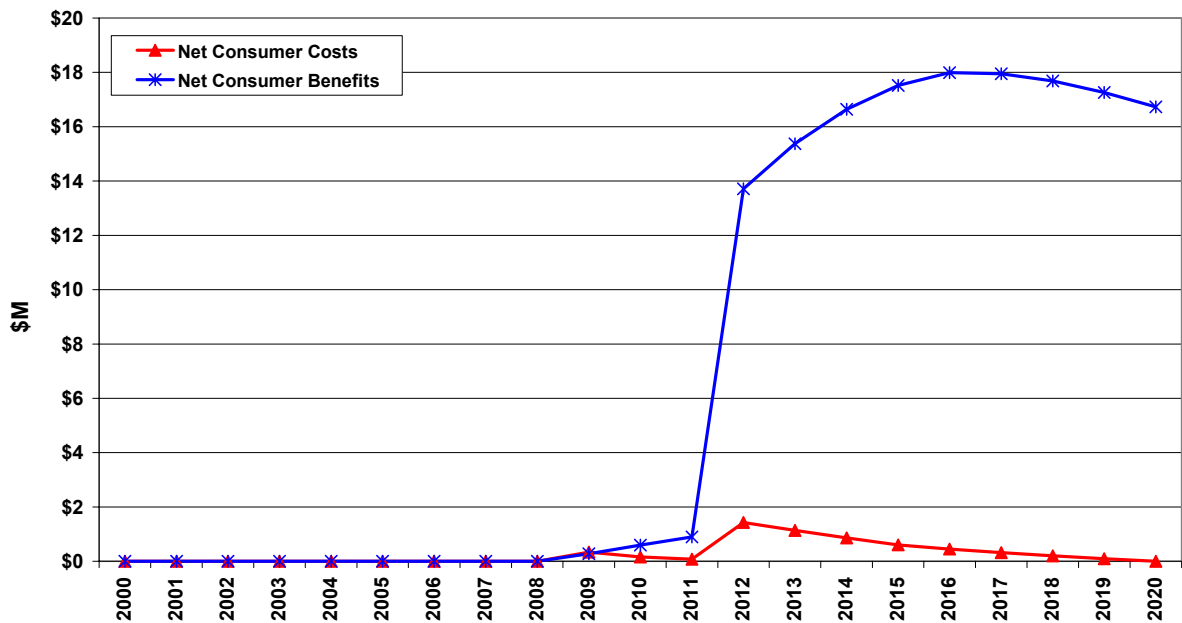


Figure 17: Consumer Cost-Benefit of MEPS (NZ)



The benefits start to decrease after 2017-18 as the predicted BAU efficiency improvements for products come closer to the MEPS requirements. The consumer benefits continue to grow even though the incremental cost of the more efficient products falls to zero by 2020, this is a result of cohorts of new, more efficient products (compared to the BAU) coming into use each year until the total number plateaus around 2017-18. After this period, the energy savings attributed to the MEPS reduce due to the lower sales of home entertainment products and reduced energy efficiency gains compared to the BAU.

As noted earlier in Section 5.3, the estimated retail cost increase due to the MEPS could be up to \$2 in 2009, and in many cases the hardware cost may be zero. Average retail prices from the GfK data show that products range from \$130 for a DVD player to \$600 for an AV receiver. This represents a price increase of between 1.5% and 0.3%. The data for New Zealand shows a similar result.

The individual consumer costs and benefits of the MEPS in 2008 are shown in Table 12. The present value of the benefits is discounted over an estimated average 8 service year life of the products (see Appendix 2).

**Table 12: Present Value Costs and Savings – HE Product MEPS, 7.5% Disc Rate**

Category	Incremental Retail Price Increase	Estimated Annual Energy Savings (kWh/yr)	Energy Costs Savings/year <sup>1</sup>	Present Value Cost Savings (8yrs) <sup>1</sup>
AV Components & Receivers	\$2.00	66	\$8.37	\$62.25
DVD Players	\$2.00	10	\$1.32	\$9.79
DVD/HD Recorders	\$2.00	47	\$5.95	\$44.27
Home Theatre	\$2.00	33	\$4.23	\$31.47
Integrated Stereos	\$2.00	50	\$6.32	\$47.06
Portable Stereos	\$2.00	16	\$1.98	\$14.75
Speakers & Subwoofers	\$2.00	56	\$7.11	\$52.94
VCR	\$2.00	15	\$1.87	\$13.95
Other HE Eqpmnt	\$2.00	99	\$12.63	\$94.02

1. The costs savings are based on an Australian average tariff of 12.7c/kWh. In New Zealand, the cost saving would be larger due to the higher electricity tariff of 17.4 c/kWh.

As Table 12 demonstrates, the value of the benefits are substantially larger (by a factor of at least 5) compared to the costs regardless of the product category. Many of the product categories demonstrate benefits that are 20 times greater than the costs.

### *Cost of Forgoing Product Features*

The design of home entertainment products are controlled by standards/specifications covering areas such as electrical safety, lasers, interference and receivers. The MEPS does not affect the in-use power consumption of various features of products and hence there is no forgoing of product features due to the MEPS. The improvement to passive standby power consumption required to meet the MEPS can easily be achieved by power management of the product and will not result in the loss of product features. In fact product already meets the proposed MEPS (both Stage 1 and Stage 2) (EnergyConsult 2002-06)

### *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 CBA analysis. These impacts are modelled on Australia data, which provides a more conservative assessment. The results would also be applicable to New Zealand however the benefits are larger due to the higher electricity tariff. Table 13 shows the impact for usage where the consumer reduces by 50% the time the product is used and a 20% reduction in active standby time in the *low* usage scenario. Similarly, the *high* usage scenario increases the time the product is used by 50% and increases the time the product is in active standby by 20%. Full details of these scenarios are shown in Appendix 5, Table 31. Data for the base MEPS analysis is as per Table 12, which is the NPV analysis over 8 years at 7.5% discount rate.

**Table 13: Present Value Costs and Savings: Varying Usage - MEPS, 7.5% Disc Rate**

Category	Usage Case	Estimated Annual Energy Savings (kWh/yr)	Energy Costs Savings/year <sup>1</sup>	Present Value Cost Savings (8yrs) <sup>1</sup>
AV Components & Receivers	Low	53	\$6.69	\$49.80
DVD Players	Low	9	\$1.10	\$8.16
DVD/HD Recorders	Low	45	\$5.66	\$42.12
Home Theatre	Low	32	\$4.03	\$29.98
Integrated Stereos	Low	49	\$6.23	\$46.39
Portable Stereos	Low	15	\$1.85	\$13.80
Speakers & Subwoofers	Low	60	\$7.57	\$56.32
VCR	Low	13	\$1.71	\$12.71
Other HE Eqmmt	Low	100	\$12.75	\$94.90
AV Components & Receivers	High	79	\$10.04	\$74.70
DVD Players	High	12	\$1.54	\$11.42
DVD/HD Recorders	High	49	\$6.24	\$46.42
Home Theatre	High	35	\$4.43	\$32.95
Integrated Stereos	High	51	\$6.41	\$47.74
Portable Stereos	High	17	\$2.11	\$15.69
Speakers & Subwoofers	High	52	\$6.66	\$49.55
VCR	High	16	\$2.04	\$15.19
Other HE Eqmmt	High	99	\$12.52	\$93.14

1. The costs savings are based on an Australian average tariff of 12.7c/kWh. In New Zealand, the cost saving would be larger due to the higher electricity tariff of 17.4 c/kWh.

In general, the low usage case decreases the benefits to the consumer compared to the base scenario, while the high usage case increases the consumer benefit. This is due to the larger power savings potential in active standby mode from the MEPS compared to the savings potential in passive standby mode. On average, the savings to the consumer are vary by  $\pm 6\%$  compared to the base usage scenario. For DVD Players( which has the lowest savings), the present value savings in the worst case (low usage) are still over four times greater than the incremental cost of the MEPS requirements. For the majority of the products the present value savings are generally around 20 times the incremental cost of the MEPS requirements.

## *5.5 Impact on Energy Use and Greenhouse Gas Emissions*

### *Sales Forecasts*

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. Therefore two scenarios have been modelled in the RIS; a Base Sales scenario with product sales slowing declining from 2007, and a Low Sales scenario with sales sharply declining from 2007. Forecast sales of home entertainment products to 2020 by category are shown in Figure 18 for Australia and in Figure 19 for New Zealand.

Annual sales by category of product are forecast from trends produced from the sales data collected by GfK Australia. The historical and forecasts sales figures developed for the CBA take into account the mix of effectively competing technologies (DVD Players and DVD/HD Recorders). Recent trends show that the sales of DVD players increased rapidly from 2000 to 2004 and have reached a plateau. The sales of DVD/HD recorders are forecast to increase as they become the dominant player and offer recording features, and will increasingly include digital receivers (STBs). Sales of these devices are not likely to mimic the early trends of DVD players as they will be replacing older DVD players and VCRs. To model the impacts of rapid growth in converged technologies (home theatre/DVD recorders, STBs etc), a low sales scenario is also provided.

**Figure 18: Forecast Sales of HE Product - Base Sales Scenario Australia**

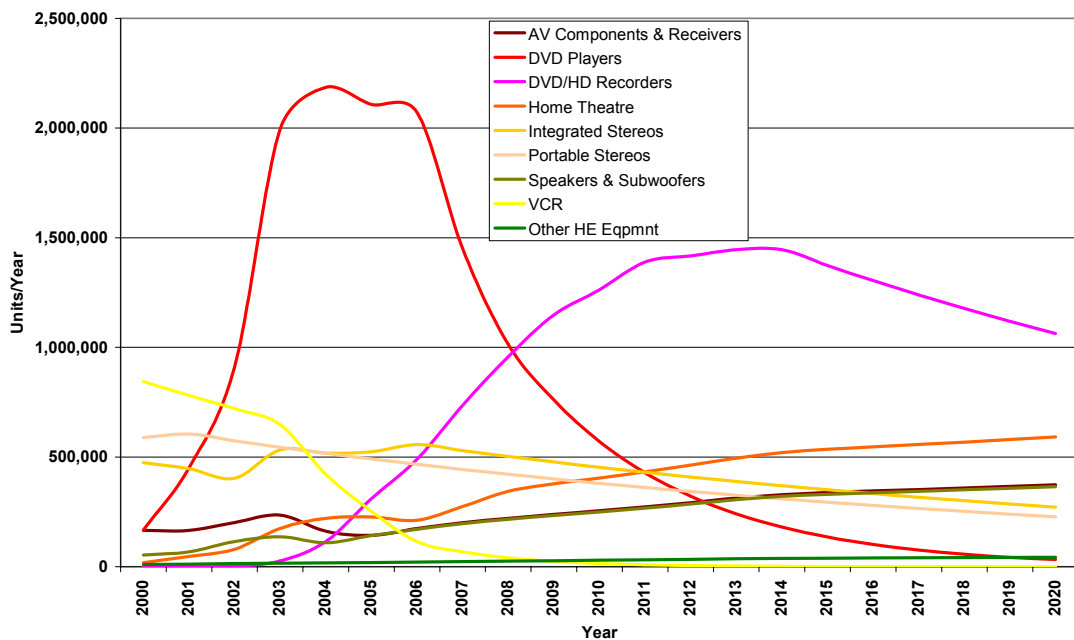
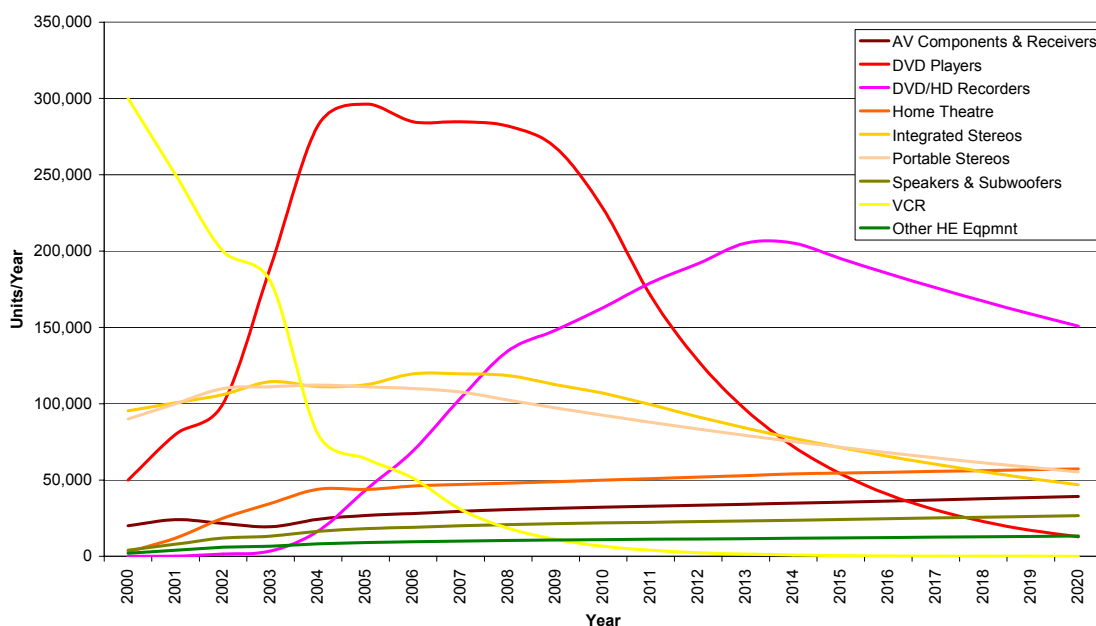


Figure 19: Forecast Sales of HE Product - Base Sales Scenario New Zealand



The current trends indicate that Base Sales scenario is more likely however many factors can influence these projections. Product development and convergence within the consumer electronics area is occurring rapidly and stand alone DVD Players and DVD/HD Recorders sales may decrease with the increasing sales of integrated home theatre products (which would include digital receivers, recorders and amplifiers/speakers).

To simulate the impact of these “competing” devices, a forecast for home entertainment products under a Low Sales scenarios for Australia and New Zealand were undertaken and are shown in Figure 20 and Figure 20 respectively. The sales of DVD/HD Recorders under this scenario are forecast to reach a plateau of 1M pa in 2011 compared to just under 1.5M by 2014 under the Base Sales scenario in Australia. In contrast the sales of DVD/HD Recorders under this scenario are forecast to reach a plateau of just under 150,000 pa in 2014 compared to just above 200,000 by the same year under the Base Sales scenario in New Zealand. It is considered unlikely that this scenario would develop given the historical sales of new product in Australia and New Zealand, so this low sales forecast scenario is utilised for sensitivity analysis of the CBA impact projections.

Figure 20: Forecast Sales of HE Product - Low Sales Scenario Australia

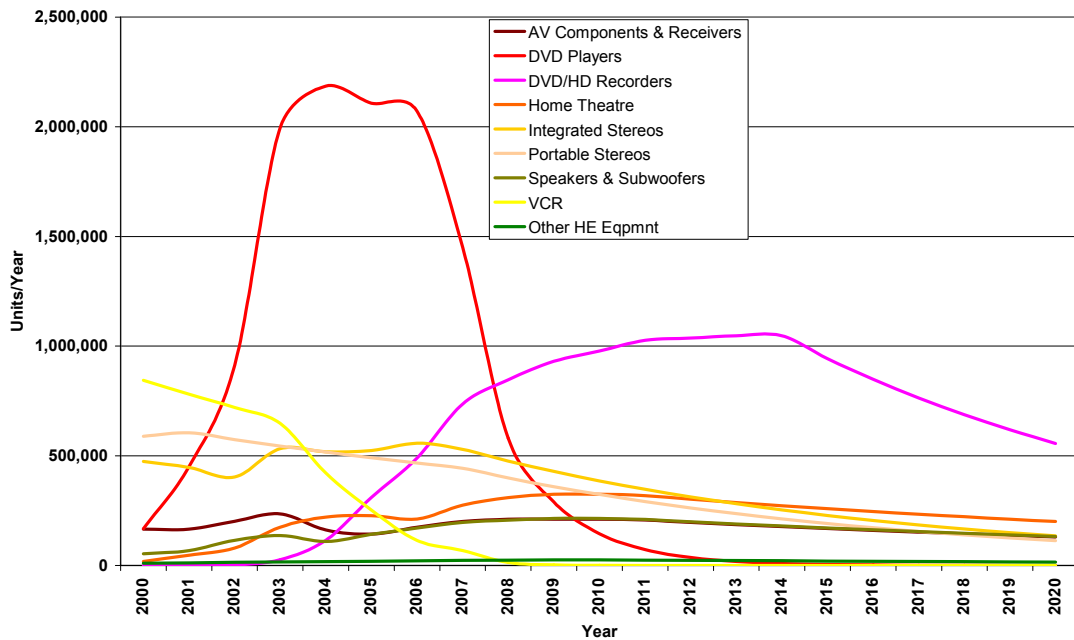
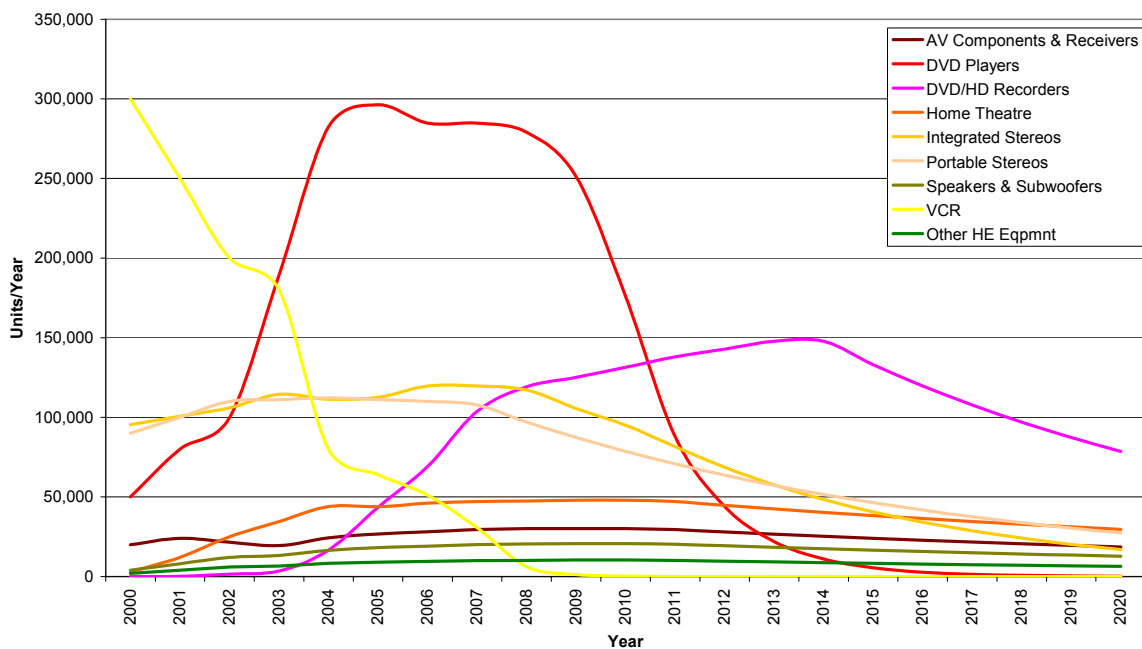


Figure 21: Forecast Sales of HE Product - Low Sales Scenario New Zealand



### Energy and Greenhouse Impacts

The MEPS impact is based on an implementation date of late 2008 for Stage 1 and early 2012 for Stage 2, hence the impacts are forecast to begin in calendar year 2009. For the

Base Sales scenario, the net energy impact of the proposed MEPS for each category of home entertainment product is shown in Figure 22, for Australia and in Figure 23 for New Zealand. The estimated impact of MEPS is shown as the policy (MEPS) line compared to business as usual (BAU). Annual net energy savings are estimated at 850 GWh per year for Australia and 103 GWh per year for New Zealand by 2017 for all products as a result of the MEPS with DVD/HD recorders representing approximately 38% (Australia) and 36% (New Zealand) of the total net energy savings.

Figure 22: Net Annual Energy - BAU and MEPS: Australia Base Sales Scenario

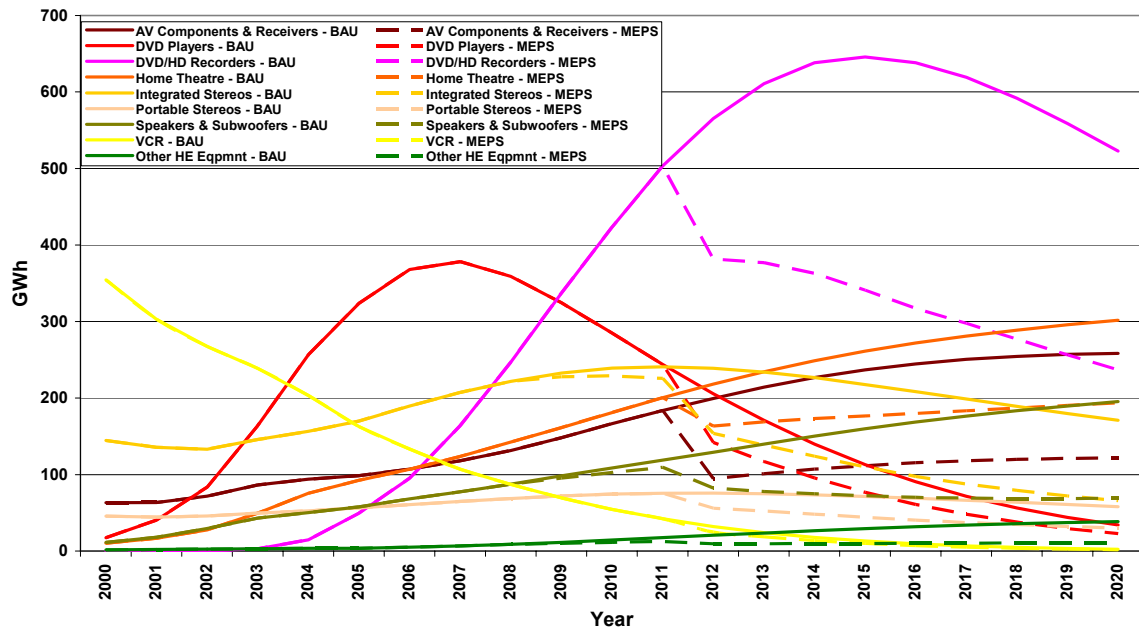
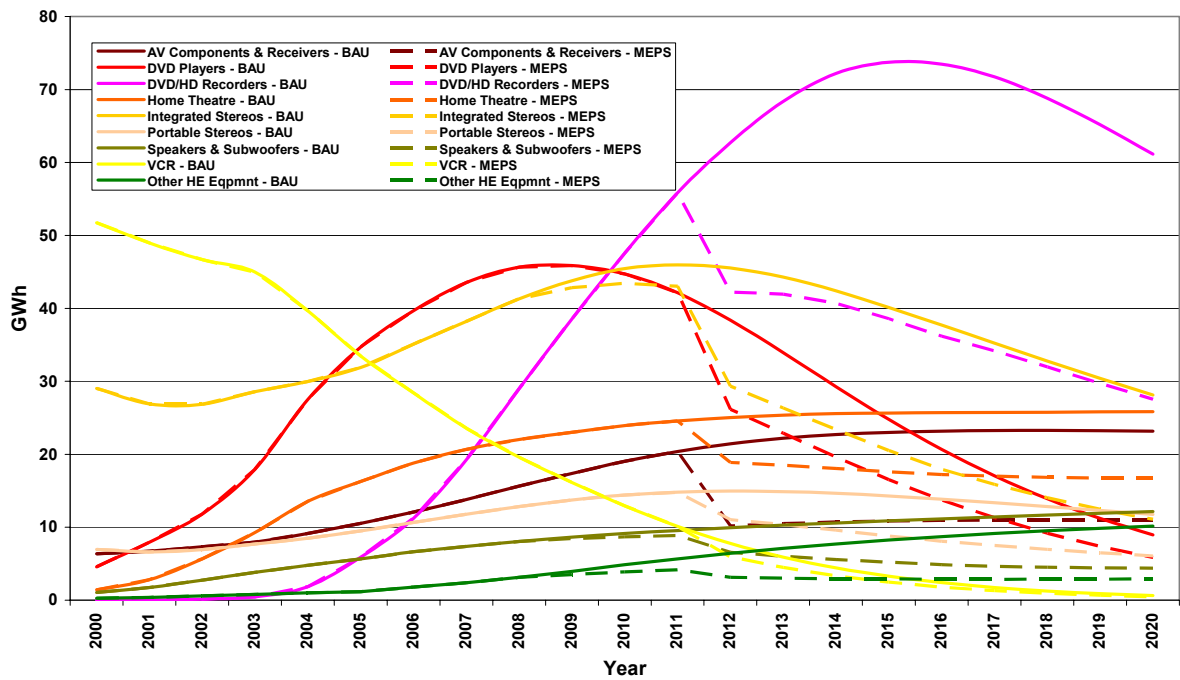


Figure 23: Net Annual Energy - BAU and MEPS: NZ Base Sales Scenario



The MEPS impact for the Low Sales scenario is shown in Figure 24, for Australia and in Figure 25 for New Zealand with total net energy savings of 560 GWh per year for Australia and 76 GWh per year for New Zealand by 2015.

Figure 24: Net Annual Energy - BAU and MEPS: Australia Low Sales Scenario

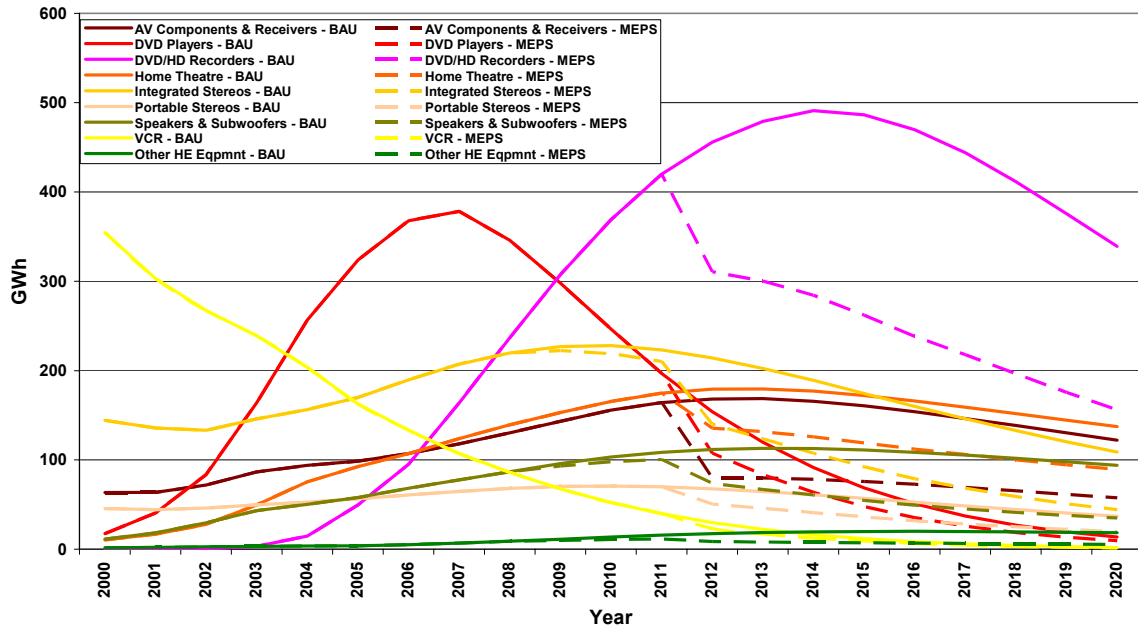
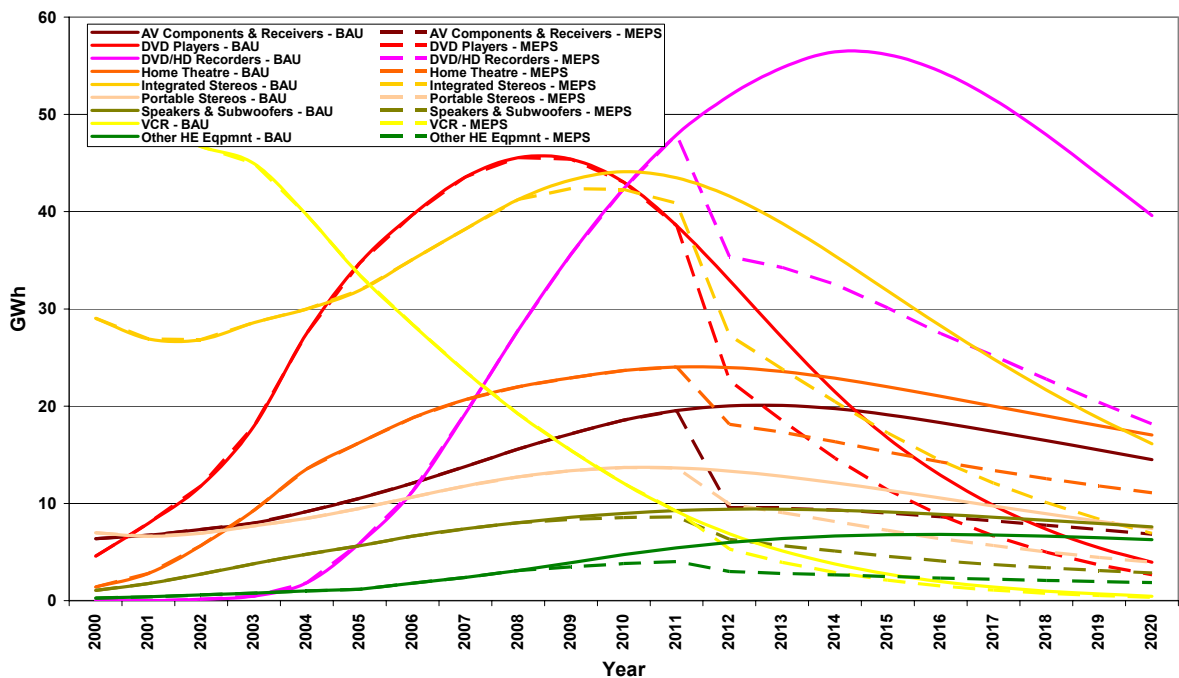


Figure 25: Net Annual Energy - BAU and MEPS: New Zealand Low Sales Scenario



For Australia the resulting estimated GHG emission reduction from the proposed MEPS is shown in Figure 26, with estimated GHG emission reductions for all home entertainment products of 770 kt CO<sub>2</sub>-e/yr under the Base Sales scenario in 2017. For

New Zealand the resulting estimated GHG emission reduction from the MEPS for home entertainment product is shown in Figure 27, with a 62 kt CO<sub>2</sub>-e/yr emission reduction for the Base Sales scenario. These annual emission savings represent a 0.38% reduction from Australia's electricity related GHG emissions in 2017 and a 0.23% reduction from New Zealand's electricity related GHG emissions in 2015

Figure 26: GHG Emissions - BAU and MEPS: Australia Base Sales Scenario

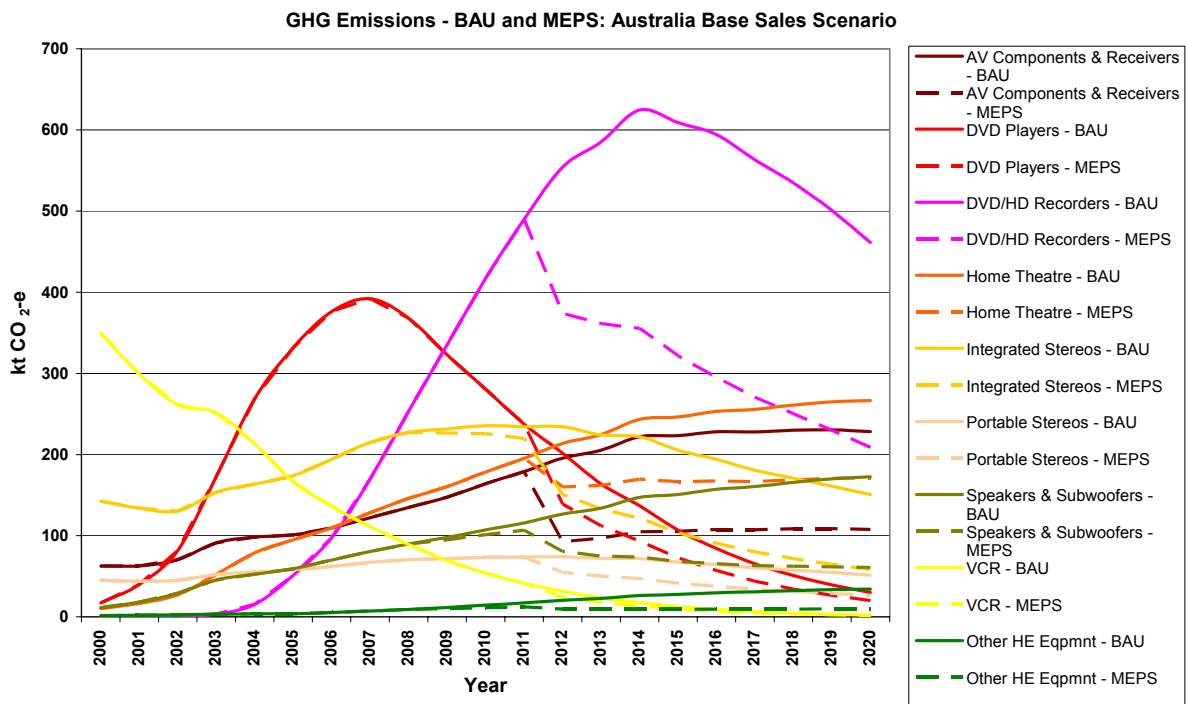


Figure 27: GHG Emissions - BAU and MEPS: NZ Base Sales Scenario

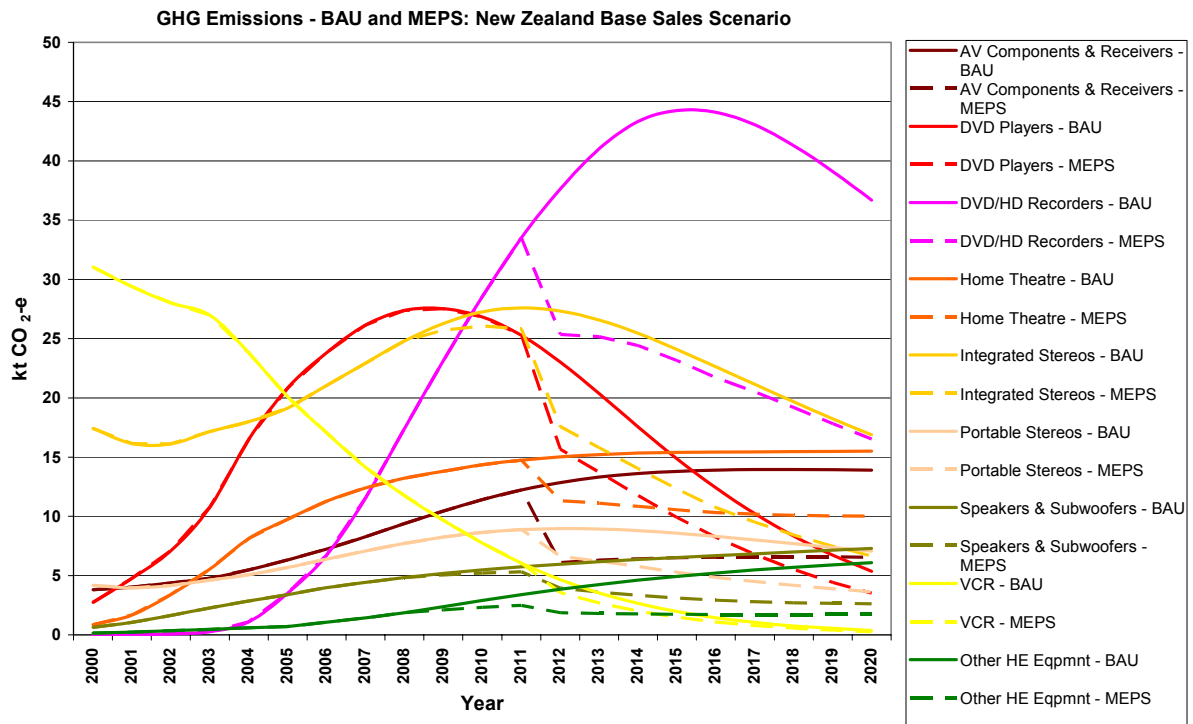


Figure 28 shows the resulting GHG emission reduction for the Low Sales scenario for Australia. It is estimated that greenhouse emissions would be approximately 250 kt CO<sub>2</sub>-e pa lower in 2017 compared to BAU under the Low Sales scenario. Figure 29 shows the resulting GHG emission reduction for the Low Sales scenario for New Zealand. It is estimated that greenhouse emissions would be approximately 17 kt CO<sub>2</sub>-e pa lower in 2017 compared to BAU under the Low Sales scenario.

Figure 28: GHG Emissions - BAU and MEPS: Australia Low Sales Scenario

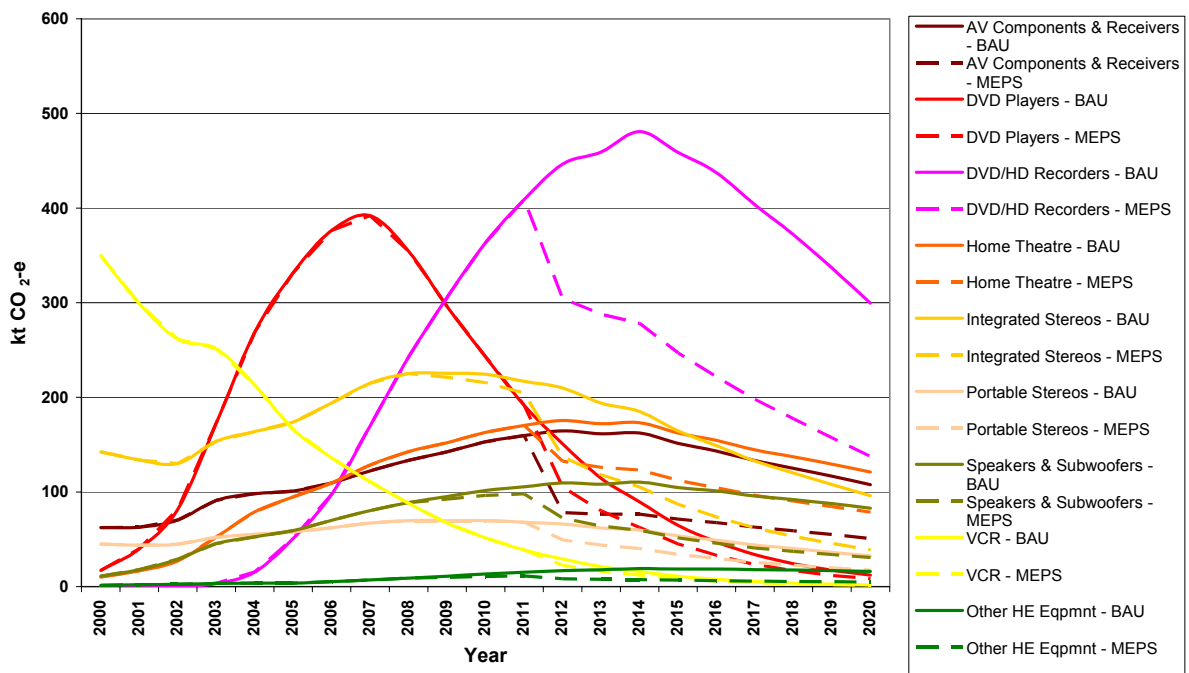
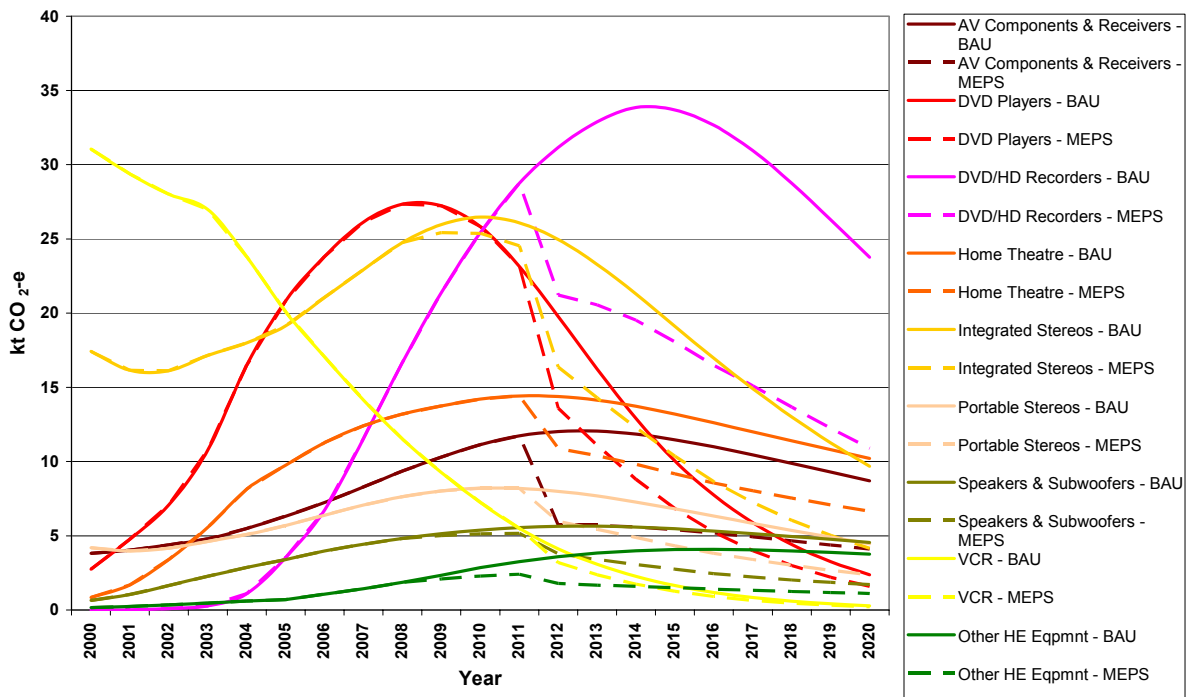


Figure 29: GHG Emissions - BAU and MEPS: NZ Low Sales Scenario



## **5.6 National and State Costs and Benefits**

### **National and State Analysis**

Table 14 shows the Net Present Value and Benefit-Cost Ratios (BCR) for Australia for a range of discount rates. The national perspective includes:

- **Costs:**
  - to the consumer due to the incremental price increases of product due to the MEPS
  - to the State and Federal government for implementing and administering the MEPS program
  - to the product supply businesses for complying with the requirements of the MEPS program, i.e., testing, administration, training, etc
- **Benefits** to the nation due to the avoided electricity generation, distribution and transmission costs.

It is worth noting that only the directly related avoided cost of generating and supplying electricity has been used to calculate the benefits. Several components of the actual cost of electricity, that are not avoidable simply by reducing energy consumption, have not been used in the benefits. Such costs may include cost of metering, general maintenance cost etc. The nature and magnitude of avoidable electricity costs has been estimated in a previous RIS for clothes washers & dishwashers (Syneca 2006). This study estimated the national 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, relative to the marginal tariff of electricity for a normal load (with normal peak to off peak consumption ratio) for residential customers of 12.7 cents/kWh. This avoidable cost is approximately 65% of the marginal tariff,

In this CBA, instead of using a single national avoided cost of electricity for Australia, it is considered more reasonable to estimate the avoidable cost of electricity on the basis of different values of marginal tariffs for each state and for New Zealand separately. In this way, the avoided costs will more accurately reflect the costs of supplying electricity by state. We have therefore calculated the avoidable cost of electricity as 65% of the marginal tariff in each state and in New Zealand. The estimated value of avoidable cost of electricity are shown in table Table 30 in Appendix 4.

All data tables are based on the incremental real price increase for home entertainment product as per Table 9 for MEPS compliant product, the State and Federal program costs in Section 5.1 and business compliance costs in Section 5.2.

The provisional benefits under an emissions trading scheme (ETS) are discussed in Appendix 6, but they are not included in the main analysis as the Australian Government has yet to establish the details of how an ETS will operate or to undertake modelling of

future electricity prices under emissions trading. This information will help determine the best approach to including the emissions abatement benefits under the ETS in the CBA.

**Table 14: Financial Analysis – Australia Base Sales Growth**

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	\$41,240,603	\$20,217,166	\$14,418,315	\$10,399,785
Total Benefits	\$601,644,114	\$261,819,177	\$176,260,321	\$120,165,508
Net Benefits	\$560,403,512	\$241,602,011	\$161,842,006	\$109,765,724
Benefit-Cost Ratio	14.6	13.0	12.2	11.6

Table 15 presents the NPV benefits and costs of the proposed MEPS for the Low Sales scenario.

**Table 15: Financial Analysis – Australia Low Sales Growth**

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	\$30,113,549	\$14,892,827	\$10,673,042	\$7,737,870
Total Benefits	\$400,343,515	\$176,920,332	\$119,989,498	\$82,391,942
Net Benefits	\$370,229,966	\$162,027,504	\$109,316,456	\$74,654,072
Benefit-Cost Ratio	13.3	11.9	11.2	10.6

To assess the potential sensitivity of the benefit-costs to the estimated incremental price increase for home entertainment product due to the MEPS, a number of options were modelled. The incremental price increase of home entertainment product was increased by 50% increments to 3 times the base scenario price assumed for the MEPS analysis. Figure 30 shows the change in the national BCR if the price of MEPS-compliant product is up to 200% higher than the price increase estimated in Table 9. As the figure demonstrates, the net present benefits are still significantly higher than the costs under these conditions.

**Figure 30: Benefit-Cost Ratio as a Function of Incremental Price Increase (Australia)**

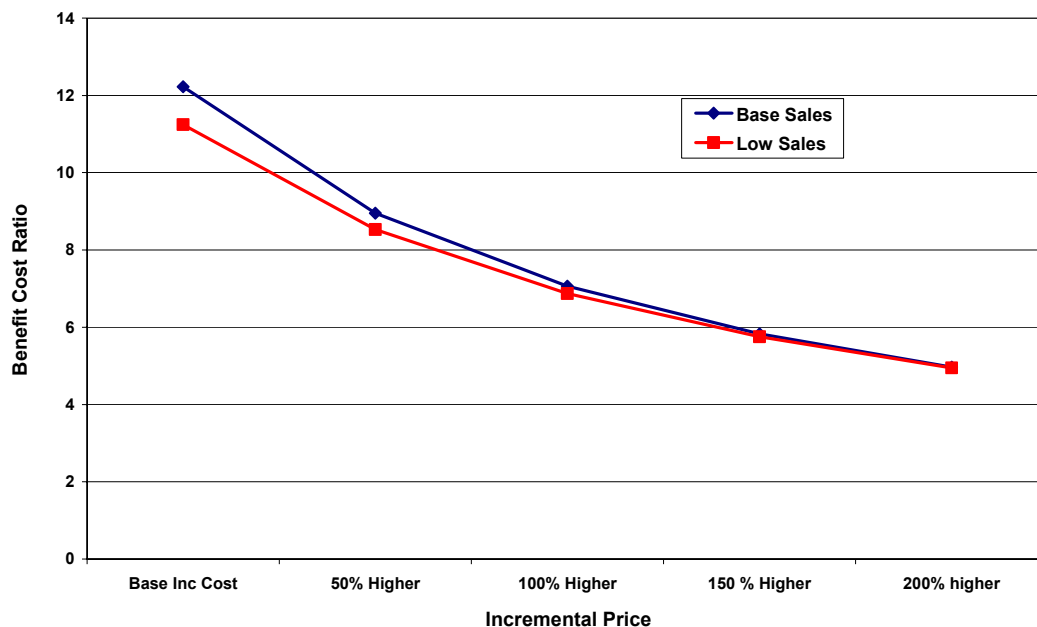


Table 16 shows the Net Present Value and Benefit-Cost Ratios for New Zealand for a range of discount rates under Base Sales scenario. All data tables are based on the incremental real price increase for products as per Table 9 for MEPS compliant products. In addition, part of the program costs is apportioned to NZ in relation to the proportion of NZ sales of home entertainment products to Australian sales. All values are expressed in NZ dollars, converted at 1.1NZD to 1 AUD.

**Table 16: Financial Analysis – NZ Base Sales Scenario**

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	\$8,256,638	\$4,069,146	\$2,910,021	\$2,104,850
Total Benefits	\$99,217,069	\$43,489,375	\$29,382,429	\$20,102,408
Net Benefits	\$90,960,431	\$39,420,229	\$26,472,408	\$17,997,558
Benefit-Cost Ratio	12.0	10.7	10.1	9.6

Table 17 presents the NPV benefits and costs of the proposed MEPS for the Low Sales scenario for New Zealand.

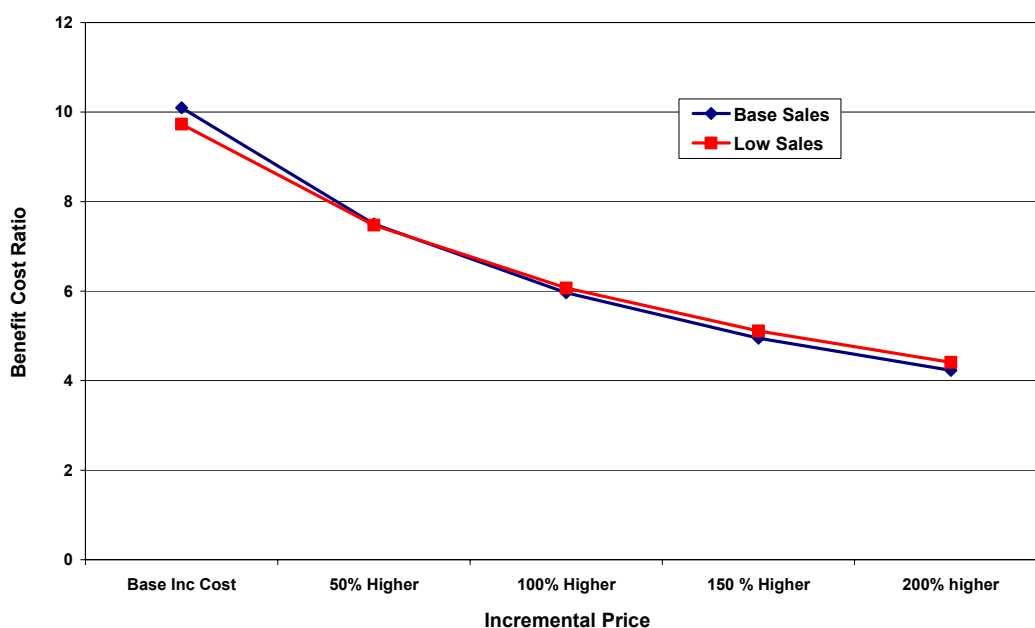
**Table 17: Financial Analysis – NZ Low Sales Scenario**

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	\$6,313,962	\$3,134,467	\$2,250,988	\$1,635,451
Total Benefits	\$72,433,767	\$32,206,502	\$21,908,922	\$15,088,956
Net Benefits	\$66,119,804	\$29,072,034	\$19,657,934	\$13,453,505
Benefit-Cost Ratio	11.5	10.3	9.7	9.2

The benefit-cost ratio under the Low Sales scenario is lower than the Base Sales scenario, but still substantially greater than 1.

Figure 31 shows the change in the national BCR for New Zealand if the price of MEPS-compliant product is up to 200% higher than the price increase estimated in Table 9. As the figure demonstrates, the net present benefits are still significantly higher than the costs under these conditions.

**Figure 31: Benefit-Cost Ratio as a Function of Incremental Price Increase (New Zealand)**



The benefit-cost ratios for all the Australian states are shown in Table 18 under the Base Sales scenario. In all states the BCR is well above 1. The highest BCR occurs in the Northern Territory, where electricity prices are higher and hence provide greater consumer benefits. State program costs are apportioned by household numbers in each state.

**Table 18: Benefit-Cost Ratio for States by Discount Rate: Base Sales Scenario**

State	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
NSW & ACT	12.7	11.3	10.6	10.0
NT	20.1	17.8	16.8	15.9
QLD	15.0	13.4	12.6	11.9
SA	14.5	12.8	12.1	11.5
TAS	11.6	10.3	9.7	9.2
VIC	15.2	13.5	12.7	12.0
WA	16.4	14.6	13.8	13.0

The benefit-cost ratios for all the Australian states are shown in Table 19 under the Low Sales scenario. Again, in all states the BCR is well above 1 and shows very little sensitivity to changes in sales growth.

**Table 19: Benefit-Cost Ratio for States by Discount Rate: Low Sales Scenario**

State	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
NSW & ACT	11.6	10.3	9.8	9.3
NT	18.3	16.3	15.5	14.6
QLD	13.7	12.2	11.6	11.0
SA	13.2	11.8	11.1	10.6
TAS	10.6	9.4	8.9	8.5
VIC	13.9	12.4	11.7	11.1
WA	15.0	13.4	12.7	12.0

Figure 32 shows the forecast net benefit by State over the period 2000 to 2020 at a discount rate of 7.5% for the Base Sales scenario. There are small negative benefits in 2008 and 2009 which reflect the government costs associated with the establishment of the MEPS program and systems before the implementation date of late 2008, however these are minor in the figure due to their size (less than \$500,000 for all states).

Figure 32: Annual Net Benefit \$M: Base Sales Growth Scenario

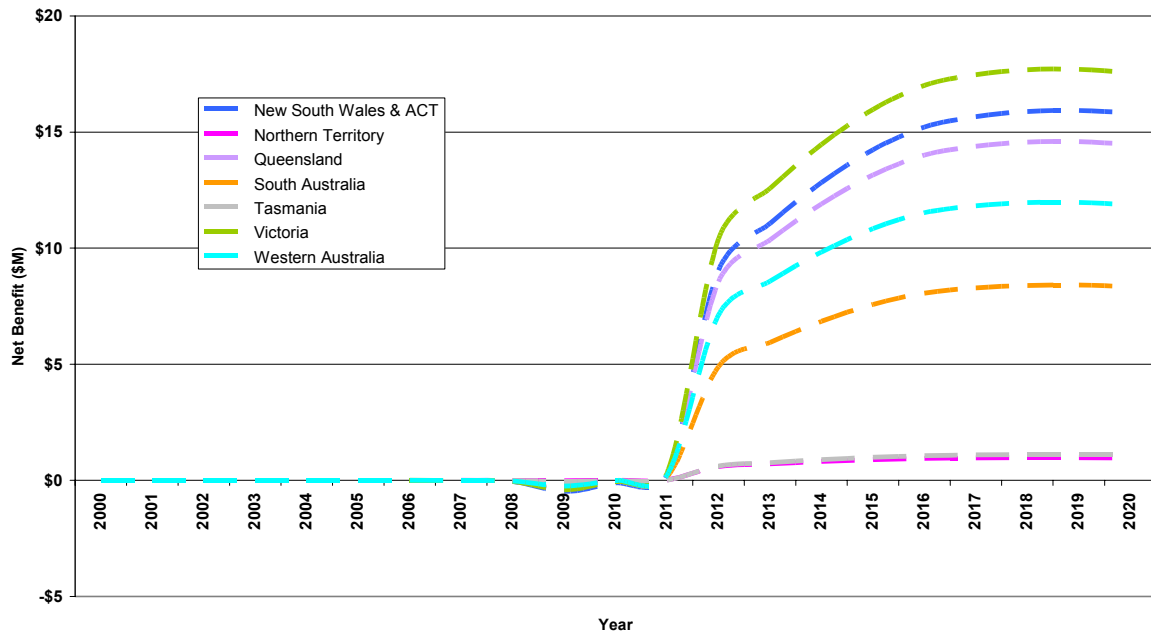
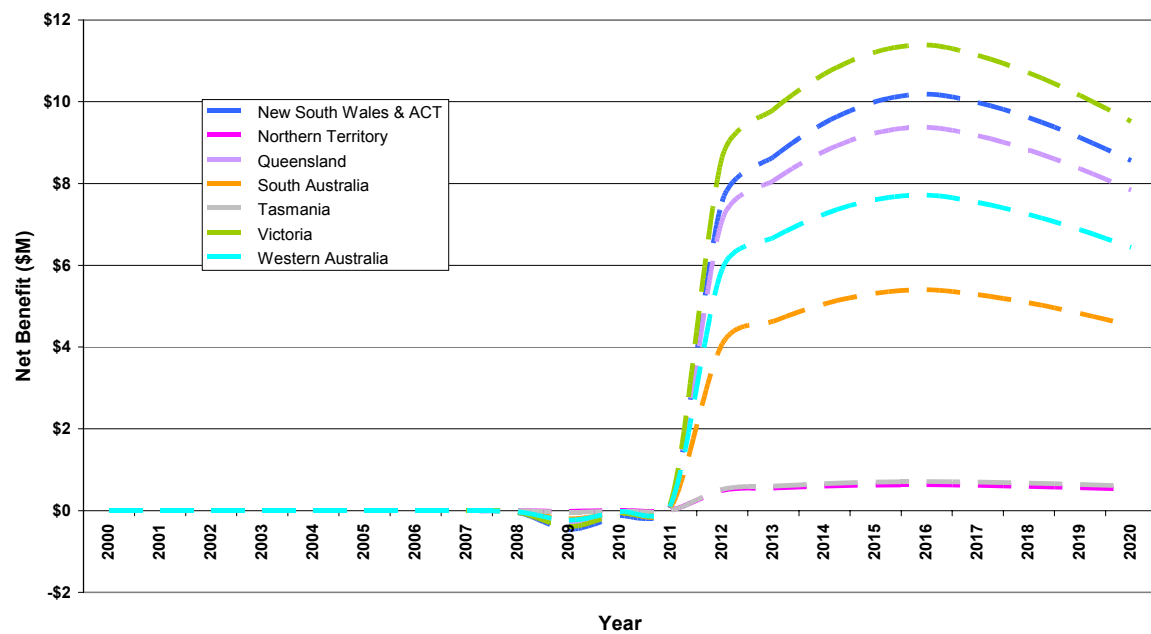


Figure 33 shows the forecast net benefit by State over the period 2000 to 2020 at a discount rate of 7.5% for the Low Sales scenario.

Figure 33: Annual Net Benefit \$M: Low Sales Growth Scenario



### Summary Data for Alternative BAU Sales Scenarios

The impact of changes to the forecast sales of home entertainment product is shown for the two scenarios in Table 20 for Australia and in Table 21 for New Zealand.

**Table 20 Summary Data for Alternative BAU Sales Australia – 7.5% Discount Rate**

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	7,040 GWh	4,685 GWh
GHG Emission Reduction (cumulative)	6.5 Mt CO <sub>2</sub> -e	4.4 Mt CO <sub>2</sub> -e
Total Benefit	\$176M	\$120M
Total Investment	\$14M	\$11M
Benefit-Cost Ratio	12.2	11.2

**Table 21 Summary Data for Alternative BAU Sales New Zealand – 10% Discount Rate**

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	886 GWh	640 GWh
GHG Emission Reduction (cumulative)	526 kt CO <sub>2</sub> -e	384 kt CO <sub>2</sub> -e
Total Benefit	\$20M	\$15M
Total Investment	\$2M	\$1.6M
Benefit-Cost Ratio	9.6	9.2

Note that NZ Govt requires analysis of alternative proposals with 10% discount rate

## 6 Consultations and Comments

The following consultations have been undertaken in relation to the policy development for home entertainment products:

- ***Launch of Standby Profile for DVD Players and other products: March 2004.*** Almost 100 participants attended the Energy Efficiency Forum in March 2004 representing industry, regulators, Commonwealth and State government agencies, testing authorities academia and consultants. At the conclusion of the workshop, the industry participants expressed a desire to see a MEPS for all standby power for all home entertainment products.

Following the launch of this standby power strategy for various home entertainment products, where voluntary measures were proposed for improving the energy efficiency, the industry association (CESA, 30/6/04) wrote to the AGO and requested the government move towards a MEPS, as follows:

*“CESA believes that the only way to provide a fair and equitable market is for government to move to a stage 2 mandatory measure. Proposed regulatory action by government and industry intervention will not provide sufficient incentive for acceptable levels of compliance. It would place expectations on the large market share suppliers without any guarantee that the growing number of small suppliers would comply. CESA only supports the product profiles and target dates if there are mandatory measures. A MEPS type mandatory regulation without labelling – one that is a self declared regime and is measured and defined by a published test standard - would be the preferred option.”*

- ***Launch of Proposed MEPS for Home Entertainment Product: November 2006.*** At the National Standby Conference in Canberra which was well attended by industry and policy officials, the initial policy response of a proposed MEPS for home entertainment products was released. This study provided details of the product description, power modes and characteristics of new products, ownership trends, relevant Australian Standards, Australian and international policies for this product, potential MEPS levels, energy consumption, greenhouse emissions and potential savings. Detailed comments were sought from industry. The timeline for development of this policy option was explained.

Two formal industry responses were provided by the close of the comments period (9 February 2007) to the proposal. Both submissions discussed the need to clarify the requirement for an OFF switch – which was not proposed in the MEPS. They also both requested consideration of the auto power down requirement when a device was undertaking some functions. These comments will be considered in the development of the Australian/ New Zealand Standard for the MEPS.

In June 2007, CESA requested that the implementation date for the Stage 1 MEPS be April 2009. The E3 committee consider that a delay is not warranted, as 75% of current models available meet the proposed Stage 1 MEPS, and any delay will reduce the impact of the proposal.

All these key policy/technical documents were also available on the public website, [www.energyrating.gov.au](http://www.energyrating.gov.au) and public comments invited.

## ***6.1 Summary of Comments***

To be added after release of the draft for consultation.

## ***6.2 Responses to Comments***

To be added after release of the draft for consultation

## ***7 Evaluation and Recommendations***

### ***7.1 Assessment***

#### ***Reduce Greenhouse Gas Emissions Below Business-as-Usual***

It is expected that, due to their voluntary nature, the non-mandatory policy alternatives will not reduce greenhouse emissions. This is supported by the industry who state that voluntary targets in this market would not provide sufficient incentive for acceptable levels of compliance, and overseas experience.

Based on the modelling of the MEPS, significant greenhouse gas emission reductions are possible.

Due to its non-voluntary nature, the MEPS option has the highest probability of reducing greenhouse gas emissions below business-as-usual with high benefit-cost ratios for end consumers.

#### ***Addressing Market Failures***

By requiring the removal of low efficiency product from the market, the MEPS will most effectively address market failures, so that the average lifetime costs of products are reduced. All other options rely on voluntary mechanisms and are not as effective in addressing this market failure.

MEPS will not effectively provide buyers with improved access to product performance information, nor will any of the other options, with the exception of mandatory labelling, which would not be effective in this market.

The MEPS option would clearly require importers and suppliers of home entertainment product to provide complying equipment. This is not thought to involve negative impacts on suppliers as the volume of sales would not be substantially affected and compliance costs are low.

#### ***Conclusions***

After consideration of the policy options it is concluded that:

- The 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 do not have industry support.
- Given that the proposal for MEPS has been in the public domain since October 2004 and time to market is 12 months, and the Australian Standard will be published in 2007, the program could be implemented in late 2008.

## *7.2 Recommendations (Draft)*

It is recommended that the Ministerial Council on Energy (MCE) agree:

1. To implement mandatory energy performance standards in two stages for home entertainment products in regulation.
2. That products covered by this CBA include all those defined as any piece of equipment that produces, records or assists in producing an audio or video signal/output, excluding those designed for professional use (i.e., studio equipment).
3. To use the test method AS/NZS 62087:2004 which specifies methods of measurement of the power consumption of home entertainment equipment for consumer use.
4. That home entertainment products must meet or surpass the energy performance requirements that are proposed in this document and will be set down in Australian and New Zealand Standard AS/NZS 62087.xx (MEPS requirements for home entertainment products).
5. That the amendments take effect not earlier than 1 October 2008.
6. To have all jurisdictions take the necessary administrative actions to ensure that the suite of regulations can take effect from not earlier than 1 October 2008.

## ***8 Implementation and Review***

Home entertainment product 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, Territories and New Zealand agree to mandatory requirements, their removal in any one jurisdiction would undermine the effect in all other jurisdictions, because of the relevant Mutual Recognition agreements. Under the co-operative arrangements for the management of the Equipment Energy Efficiency (E3) 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/New Zealand Standards called up in State, Territory and New Zealand labelling and MEPS regulations are also subject to regular review. The arrangements between the Commonwealth, State and Territory and New Zealand Governments and Australia/ New Zealand Standards agencies provide that the revision of any Standards called up in energy labelling and MEPS regulations are subject to the approval of the governments.

E3 has adopted the principles that there should be a MEPS 'stability period', and that a cost-benefit analysis would be undertaken before any revisions are proposed. The earliest possible timing of any change to the MEPS regulations discussed in this RIS would therefore depend on the date of implementation. If they are implemented in October 2008, the earliest possible revision would be October 2012. However, as the proposed MEPS includes Stage 2 in 2012 it would be unnecessary to carry out a review before this date.

## *Appendices*

Appendix 1: References	A-2
Appendix 2: Stock and Sales	A-4
Appendix 3: Overseas Policies, Programs and Measures	A-17
Appendix 4: Energy Prices and Factors	A-20
Appendix 5: Calculation Methodology	A-20
Appendix 6: ETS Provisional Benefits to be Included in Future	A-20
Appendix 7: Greenhouse Gas Emissions Factors	A-20
Appendix 8: Population and Household Numbers	A-20
Appendix 9: BAU and MEPS Power Consumption Values	A-20
Appendix 10: Annual Benefit and Cost Data	A-20

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## *Appendix 2: Stock and Sales*

### *Home Entertainment Products – Sales Trends*

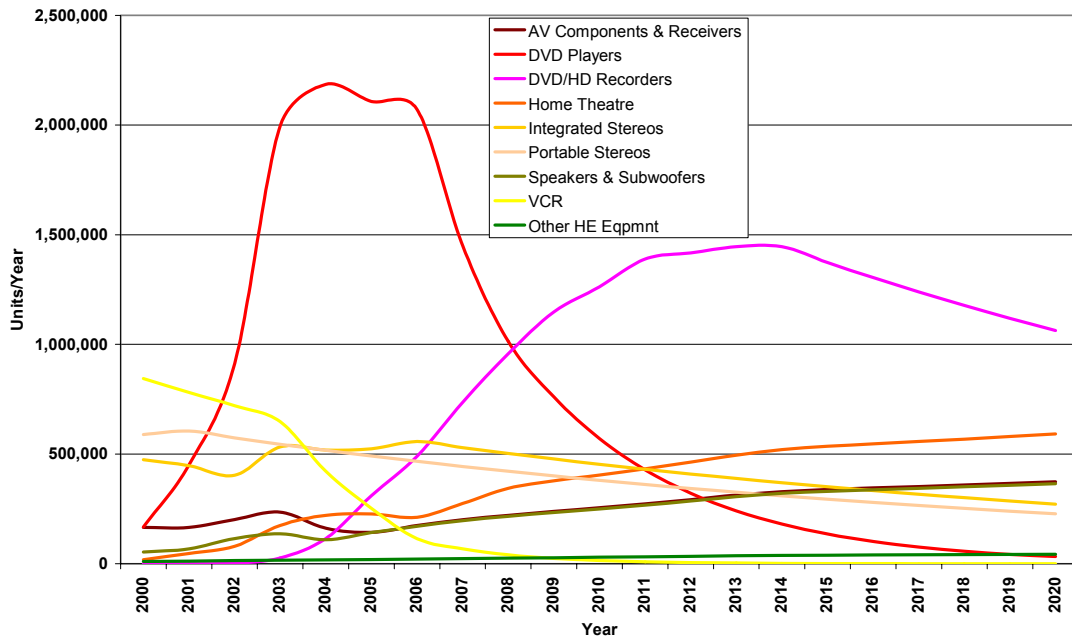
#### **Sales by Category**

The sales of home entertainment products increased rapidly during the period 2000 - 2005, particularly driven by sales of DVD players with sales of over 2,000,000 by 2004. As these DVD players are reaching saturation of the market, sales have been reducing from 2005 and are now declining.

Annual sales by category of product are forecast from trends produced from the sales data collected by GfK Australia (GfK 2007). The historical and forecasts sales figures developed for the CBA take into account the mix of effectively competing technologies (DVD Players and DVD/HD Recorders). Recent trends show that the sales of DVD players increased rapidly from 2000 to 2004 and have reached a plateau. The sales of DVD/HD recorders are forecast to increase as they become the dominant player and offer recording features, and will increasingly include digital receivers (STBs). Sales of these devices are not likely to mimic the early trends of DVD players as they will be replacing older DVD players and VCRs. To model the impacts of rapid growth in converged technologies (home theatre/DVD recorders, STBs etc), a low sales scenario is also provided.

Figure 34 shows the forecast sales of home entertainment products to 2020 in Australia by category for the base sales scenario.

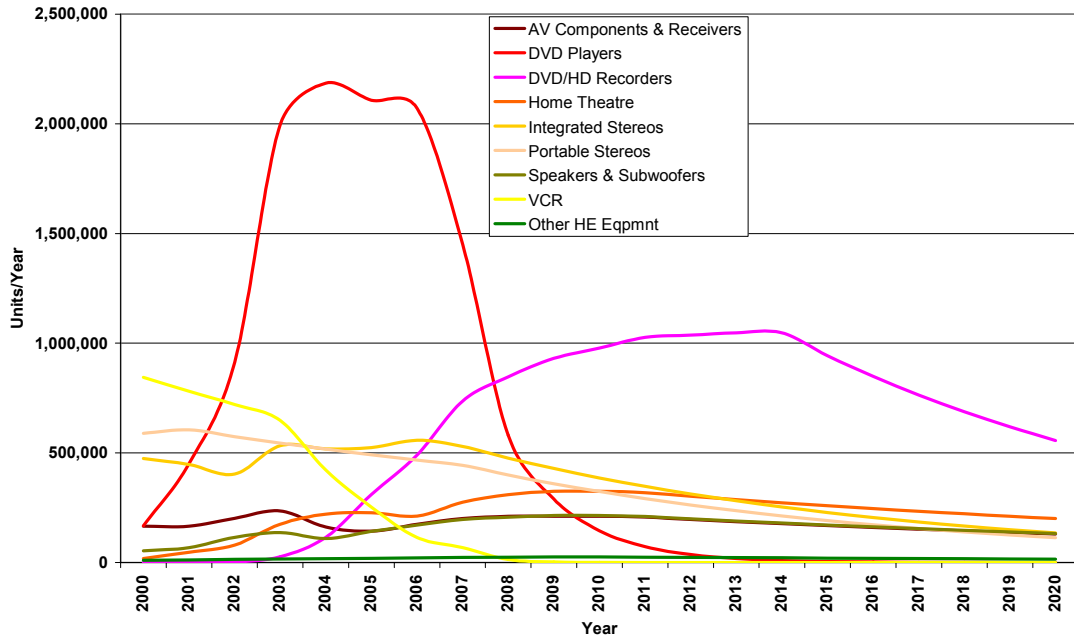
**Figure 34: Forecast Sales of home entertainment product - Base Sales Scenario Australia**



The current trends indicate that Base Sales scenario is more likely however many factors can influence these projections. Product development and convergence within the consumer electronics area is occurring rapidly and stand alone DVD Players and DVD/HD Recorders sales may decrease with the increasing sales of integrated home theatre products (which would include digital receivers, recorders and amplifiers/speakers). Similar trends are forecast to occur in the USA (PG&E 2006) where sales of DVD players are forecast to decline over the period 2005 - 2010, as competing technologies increase (such as DVD/HD recorders and personal video recorders – PVRs, as well as new high definition optical disc players).

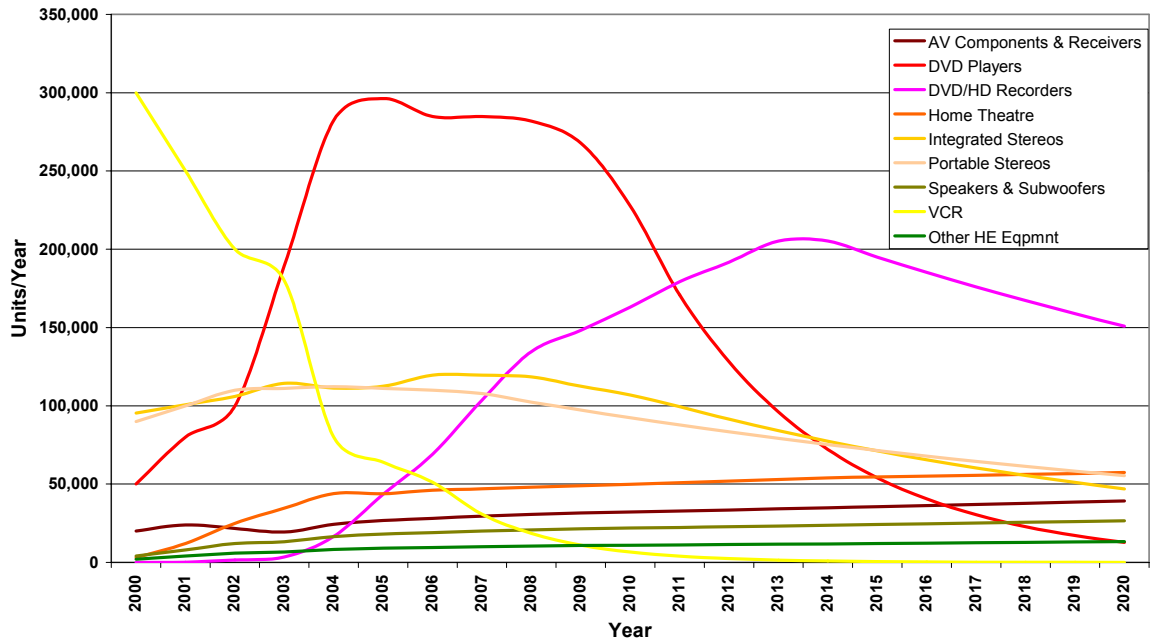
To simulate the impact of these “competing” devices, a forecast for home entertainment products under a Low Sales scenario for Australia was undertaken and is shown in Figure 35. The sales of DVD/HD Recorders under this scenario are forecast to rise to just over 1M pa in 2011 compared to just under 1.5M by 2015 under the Base Sales scenario. It is considered unlikely that this scenario would develop given the historical sales of new product in Australia, so this low sales forecast scenario is utilised for sensitivity analysis of the CBA impact projections.

**Figure 35: Forecast Sales of home entertainment product - Low Sales Scenario Australia**



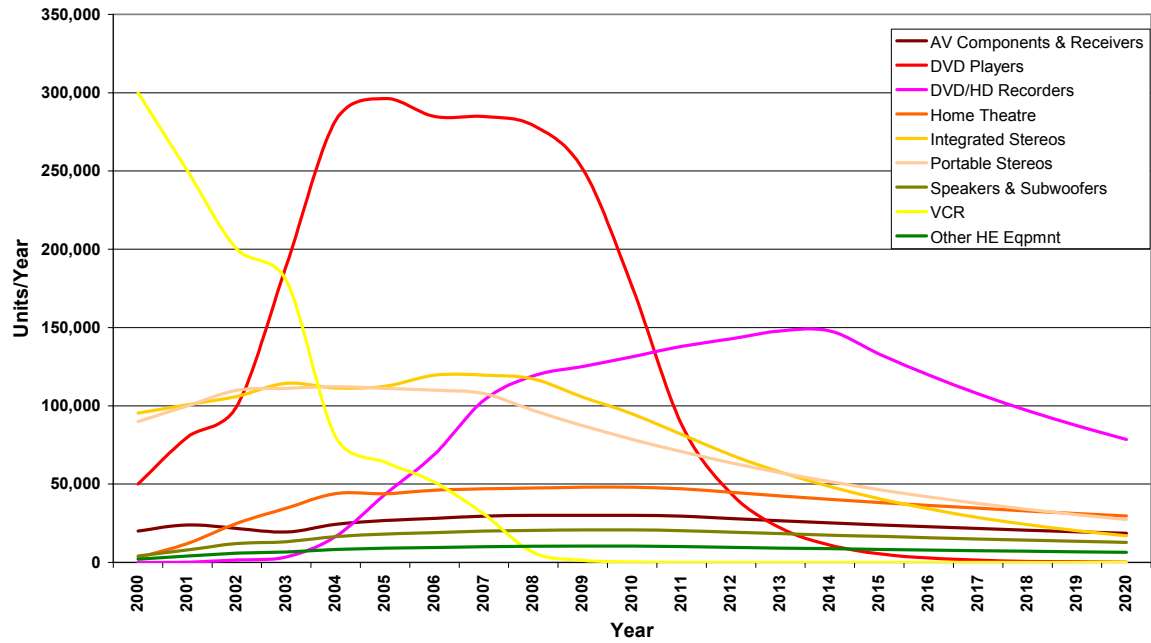
Similar forecasts and sales estimates were also made for the New Zealand market, based on the GfK data and trends on historical sales by category of product. Figure 36 shows the forecast sales of home entertainment products to 2020 by category in New Zealand for the base sales scenario.

**Figure 36: Forecast Sales of home entertainment product - Base Sales Scenario New Zealand**



Also, to simulate the impact of these “competing” devices, a forecast for home entertainment products under a Low Sales scenario for New Zealand was undertaken and is shown in Figure 37.

**Figure 37: Forecast Sales of home entertainment product - Low Sales Scenario New Zealand**



**Sales by States and New Zealand**

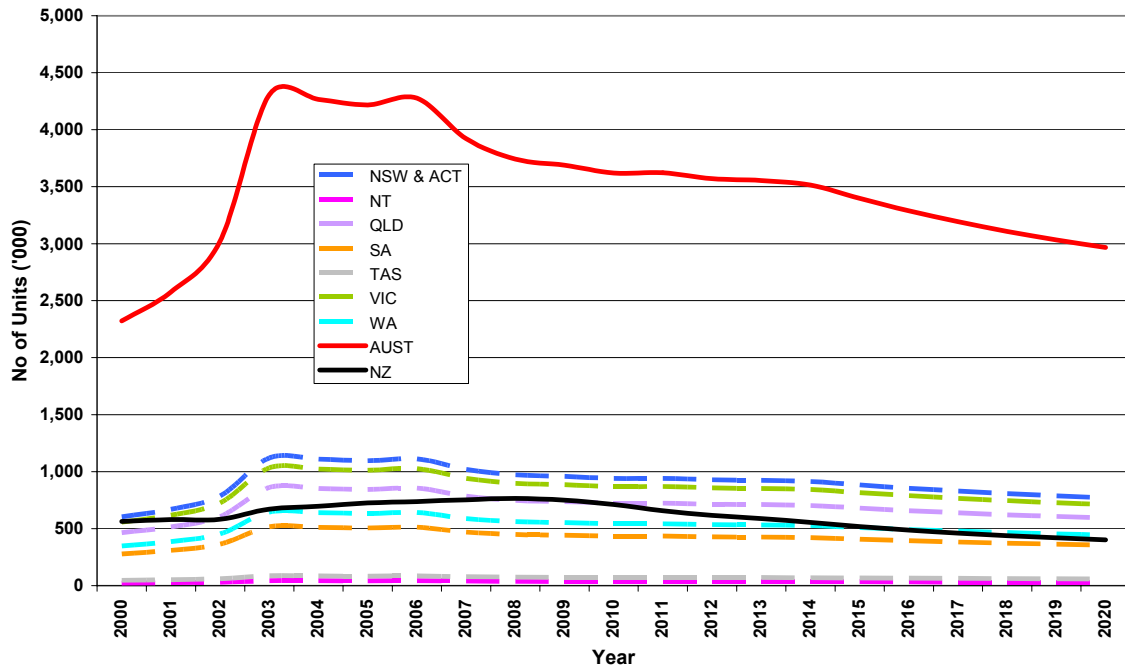
Based on the earlier forecasts of sales, the share of product sales by State for the period 2000 – 2020 are shown in Table 22 while Figure 38 graphically illustrates the sales trends. New Zealand sales are the total sales for New Zealand, where the Australian states based on the proportion of population by state.

Table 22: Total annual sales of home entertainment products 2000-2020, by States, Australia and New Zealand

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	604	23	464	279	46	557	348	<b>2,322</b>	<b>564</b>
2001	670	26	515	309	52	618	386	<b>2,577</b>	<b>579</b>
2002	786	30	605	363	60	726	453	<b>3,023</b>	<b>582</b>
2003	1,120	43	862	517	86	1,034	646	<b>4,308</b>	<b>672</b>
2004	1,109	43	853	512	85	1,024	640	<b>4,266</b>	<b>695</b>
2005	1,097	42	843	506	84	1,012	633	<b>4,217</b>	<b>725</b>
2006	1,112	43	855	513	86	1,026	641	<b>4,276</b>	<b>737</b>
2007	1,019	39	784	470	78	941	588	<b>3,921</b>	<b>753</b>
2008	973	37	748	449	75	898	561	<b>3,742</b>	<b>766</b>
2009	959	37	738	443	74	885	553	<b>3,688</b>	<b>749</b>
2010	941	36	724	434	72	869	543	<b>3,620</b>	<b>711</b>
2011	942	36	724	435	72	869	543	<b>3,622</b>	<b>658</b>
2012	928	36	714	428	71	857	536	<b>3,570</b>	<b>617</b>
2013	924	36	711	426	71	853	533	<b>3,554</b>	<b>588</b>
2014	914	35	703	422	70	843	527	<b>3,514</b>	<b>555</b>
2015	884	34	680	408	68	816	510	<b>3,398</b>	<b>519</b>
2016	855	33	658	395	66	789	493	<b>3,288</b>	<b>488</b>
2017	830	32	638	383	64	766	479	<b>3,192</b>	<b>462</b>
2018	808	31	621	373	62	746	466	<b>3,107</b>	<b>439</b>
2019	788	30	607	364	61	728	455	<b>3,033</b>	<b>420</b>
2020	771	30	593	356	59	712	445	<b>2,967</b>	<b>403</b>

Figures are in '000's of units

Figure 38: Annual sales of home entertainment products by State, Australia and NZ



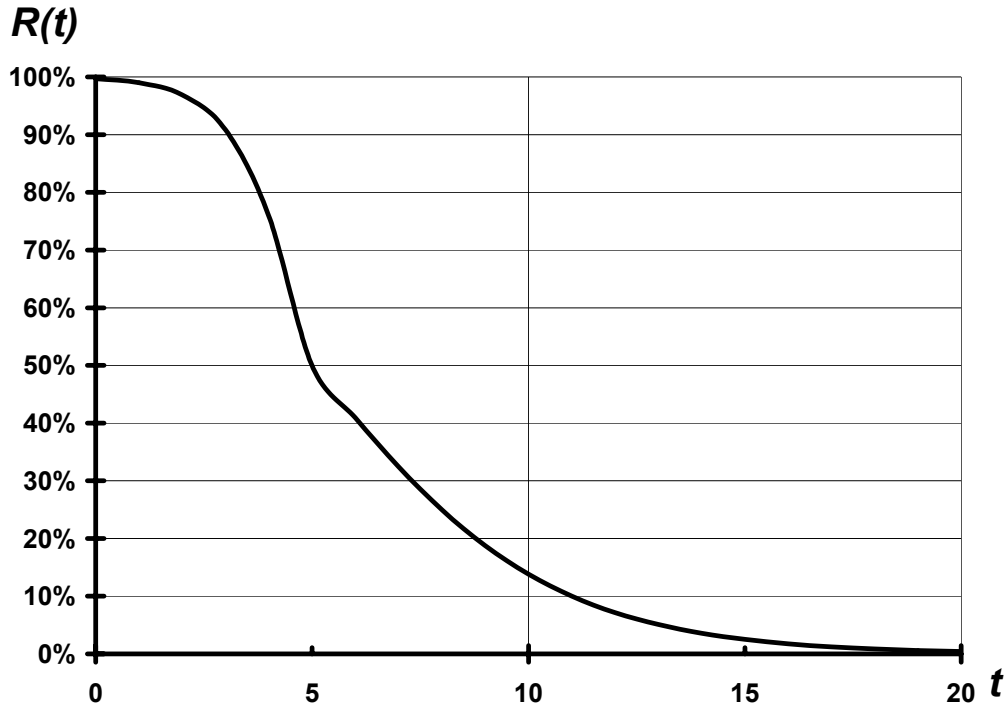
Figures are in '000's of units

## Home Entertainment Products – Stock Trends

### Stock by Category

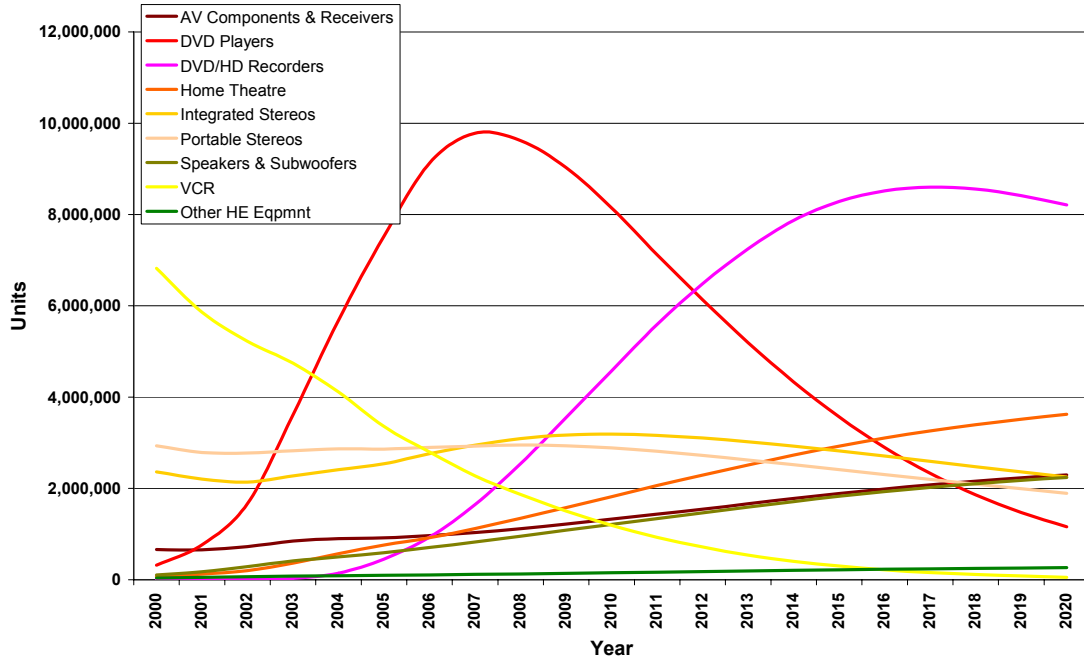
With rapid increase in sales, the stock of home entertainment products also continues to grow. The stock is a function of life/age of the device and annual sales. In case of majority of electronic devices, that do not have a mechanical component, the physical life is often greater than 10 years. For many home entertainment products with mechanical components (such as CD/DVD/HD players and recorders) the physical life is reduced to less than 10 years due to the failure of these components. In addition, as technological developments occur that offer enhanced features to the users, and coupled with rapidly declining prices as the technology matures, the users tend to replace these devices far earlier than their actual physical lives. A recent US study (PG&E 2006) has found the useful life of several categories of home entertainment products ranges from 5 to 9 years. This range is supported by a comprehensive analysis of the costs benefits of standby power reduction technologies undertaken by the European Commission (EC 2007), where the life of DVD players, radios, integrated stereos are shown as 8.7 years. Based on these sources we have devised a survival function to estimate stock on the basis of annual sales and average physical life of the device. The survival function shown in Figure 39 provides a graphical view of the percentage of home entertainment products ( $R_t$ ) in useful service over the life in years from purchase ( $t$ ).

Figure 39: Survival Function of home entertainment products for Australia and New Zealand

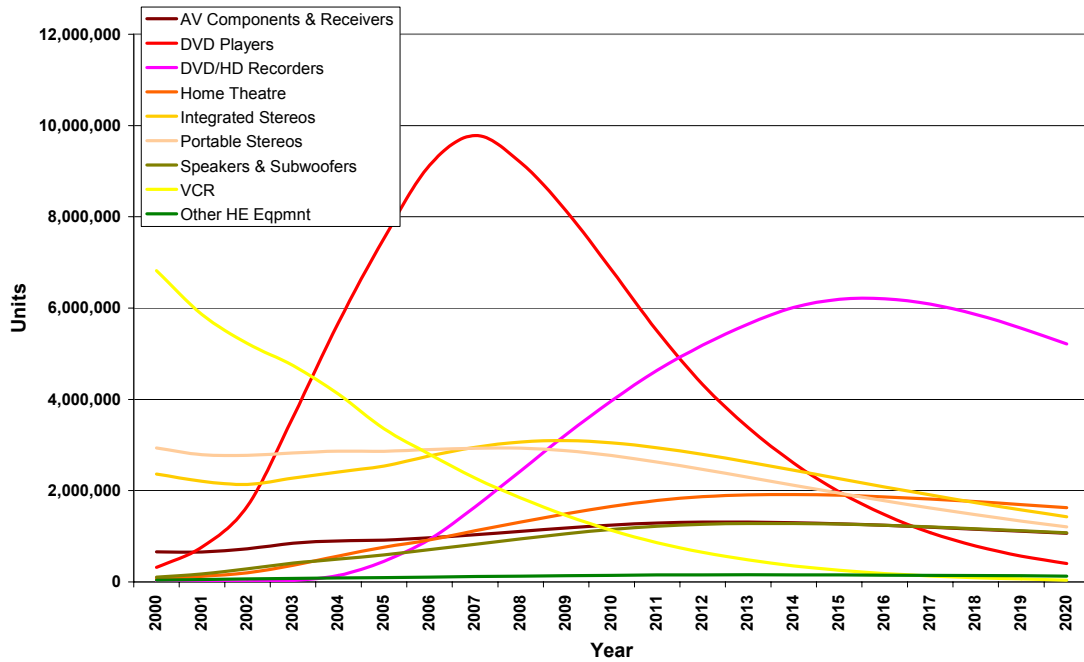


The estimated stock of home entertainment products by category for Australia over the period 2000 – 2020 is shown in Figure 40 for the base sales scenario and Figure 41 for the low sales scenario.

**Figure 40: Forecast Stock of home entertainment product - Base Sales Scenario Australia**

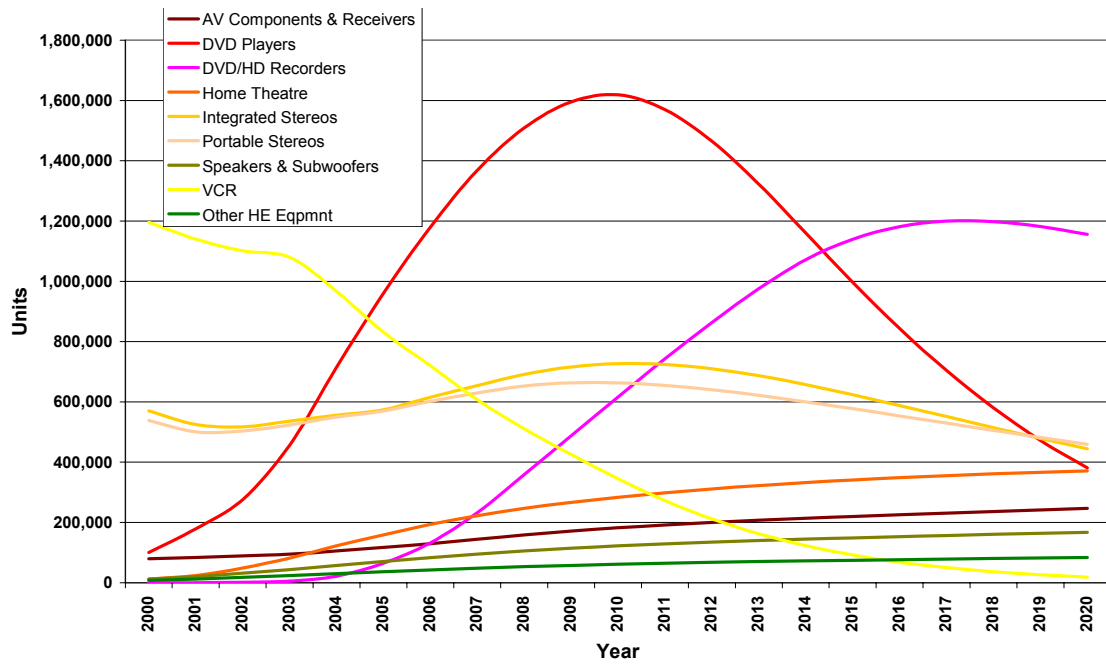


**Figure 41: Forecast Stock of home entertainment product - Low Sales Scenario Australia**

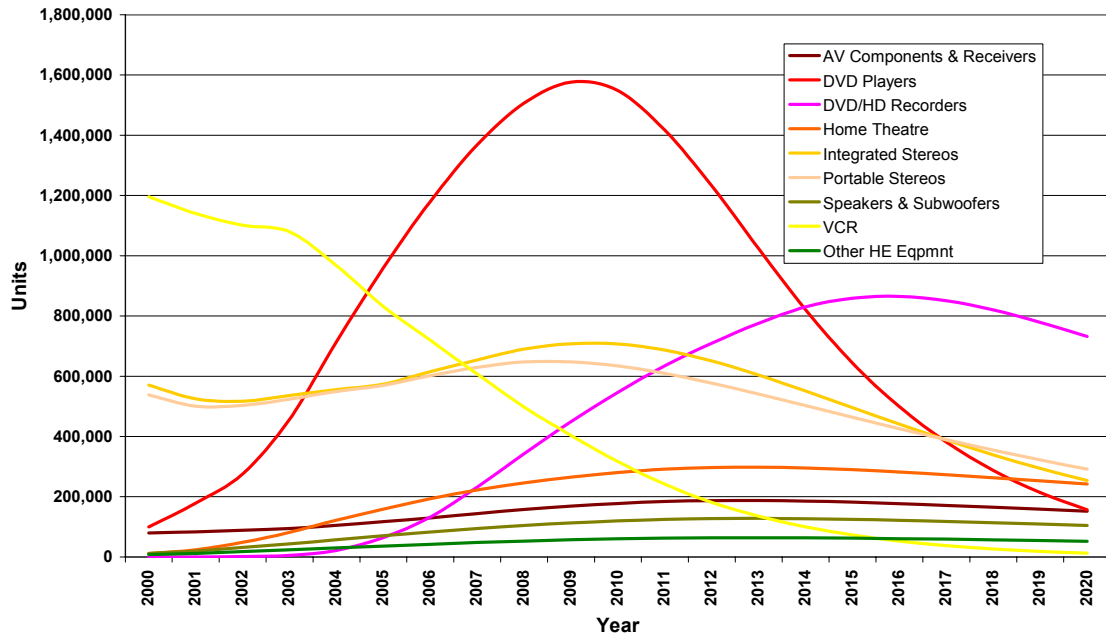


Similarly in NZ, the stock of home entertainment products by category for the period 2000 – 2020, for the base sales scenario is shown in Figure 42 and Figure 43 for the low sales scenario.

**Figure 42: Forecast Stock of home entertainment product - Base Sales Scenario New Zealand**



**Figure 43: Forecast Stock of home entertainment product - Low Sales Scenario New Zealand**



### Stock by States and New Zealand

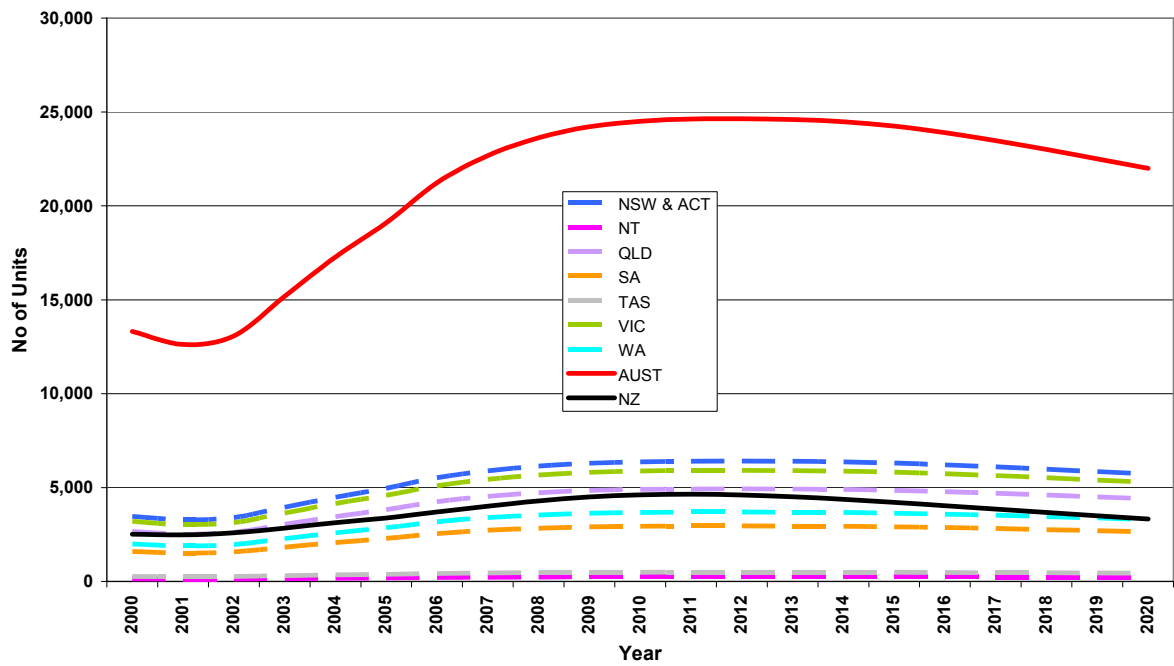
The estimates of home entertainment stock for the period between 2000 and 2020 by states, Australia as a whole and New Zealand are provided in Table 23 while Figure 44 shows the corresponding trend.

Table 23: Stock of home entertainment products 2000-2020, by States, Australia as a whole and New Zealand

YEAR	NSW ACT	& NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	3,462	133	2,663	1,598	266	3,196	1,997	<b>13,316</b>	<b>2,516</b>
2001	3,281	126	2,524	1,514	252	3,029	1,893	<b>12,620</b>	<b>2,484</b>
2002	3,399	131	2,615	1,569	261	3,138	1,961	<b>13,075</b>	<b>2,585</b>
2003	3,949	152	3,038	1,823	304	3,645	2,278	<b>15,188</b>	<b>2,844</b>
2004	4,492	173	3,455	2,073	346	4,146	2,592	<b>17,277</b>	<b>3,124</b>
2005	4,965	191	3,819	2,292	382	4,583	2,864	<b>19,096</b>	<b>3,381</b>
2006	5,518	212	4,245	2,547	424	5,094	3,184	<b>21,225</b>	<b>3,698</b>
2007	5,895	227	4,535	2,721	453	5,442	3,401	<b>22,673</b>	<b>4,000</b>
2008	6,141	236	4,723	2,834	472	5,668	3,543	<b>23,617</b>	<b>4,285</b>
2009	6,295	242	4,843	2,906	484	5,811	3,632	<b>24,213</b>	<b>4,497</b>
2010	6,370	245	4,900	2,940	490	5,880	3,675	<b>24,500</b>	<b>4,619</b>
2011	6,402	246	4,924	2,955	492	5,909	3,693	<b>24,621</b>	<b>4,648</b>
2012	6,406	246	4,928	2,957	493	5,913	3,696	<b>24,638</b>	<b>4,603</b>
2013	6,394	246	4,919	2,951	492	5,902	3,689	<b>24,593</b>	<b>4,508</b>
2014	6,364	245	4,896	2,937	490	5,875	3,672	<b>24,479</b>	<b>4,375</b>
2015	6,303	242	4,848	2,909	485	5,818	3,636	<b>24,242</b>	<b>4,214</b>
2016	6,213	239	4,779	2,868	478	5,735	3,585	<b>23,897</b>	<b>4,038</b>
2017	6,104	235	4,696	2,817	470	5,635	3,522	<b>23,478</b>	<b>3,856</b>
2018	5,981	230	4,601	2,760	460	5,521	3,451	<b>23,004</b>	<b>3,672</b>
2019	5,851	225	4,500	2,700	450	5,400	3,375	<b>22,502</b>	<b>3,495</b>
2020	5,718	220	4,399	2,639	440	5,278	3,299	<b>21,993</b>	<b>3,327</b>

Figures are in '000's of units

Figure 44: Trend - Stock of home entertainment products 2000 – 2020



Figures are in '000's of units

## ***Appendix 3: Overseas Policies, Programs and Measures***

This section reviews international practices related with specific energy efficiency requirements for home entertainment product.

### ***Voluntary Programs***

Various voluntary programs that address standby and in-use power consumption exist internationally and these are summarised below. The international ENERGY STAR Program is the only voluntary program that operates in New Zealand and Australia addressing standby power consumption.

#### ***USA and International***

In the US, the ENERGY STAR Program run by the EPA aims to encourage industry best practice by forming partnerships with manufacturers and setting performance targets for appliances. The ENERGY STAR is a voluntary program and covers most home entertainment products. The *Consumer Audio and DVD products* category establishes criteria for AV Receivers, Home Theatre Systems, Stereo equipment, powered sub woofers and speakers, and DVD players/recorders. This has been implemented in two phases the first ending in 2002 and the second phase coming into effect on January 1, 2003. To qualify for an ENERGY STAR these products must consume 1 Watt or less in Standby mode. VCR's and VCR/DVD combination units are covered by the *TV's, VCR's and combination units* criteria. Phase I, which began in 2002 required both products to consume 4 watts or less In phase II, which began in July 2004, this level was lowered for VCRs to 1 Watt or less and in July 2005 phase 3 introduced the 1 watt or less criteria for VCR/DVD combination units. ENERGY STAR does not cover HDR's. These standards also apply to Canada, Australia and New Zealand.

#### ***Europe***

In Europe, there are a number of initiatives that target power consumption in home entertainment products. The Group for Energy Efficient Appliances (GEEA), which is made up of representatives from European national energy agencies and government departments, encourages industry best practice through a voluntary energy labelling scheme. The GEEA label is available for VCR and DVD players and recorders. It also covers AV receivers, Integrated and Portable stereos and stereo components. The current criteria for these products, which are valid until 31 December 2007, are:

1. DVD and Video players and all audio equipment must have a passive standby consumption less than 1W.
2. For the purpose of the GEEA label passive standby will be taken as the higher value when DVD players and audio components consumption values differ at the end of playing and when switched to standby.

3. Stereo Components and DVD players are required to power down to a lower consumption mode within 30 minutes after the end of playing.
4. VCRs and DVD recorders must have a passive standby consumption less than 2.5W.
5. VCRs and DVD players must also meet on mode criteria with consumption limited to 15W for VCR and DVD recorders and 11W for DVD and Video players.

More information regarding the GEEA program is available at [www.efficient-appliances.org/Home.htm](http://www.efficient-appliances.org/Home.htm)

In 1997, the European Association of Consumer Electronics Manufacturers (EACEM) established a voluntary agreement with the European Commission to reduce standby losses of VCRs. This agreement was updated in 2003 and EACEM has now merged its activities with the European Information & Communications Technology Industry Association and is now known as the European Information, Communications and Consumer Electronics Technology Industry Associations (EICTA). The updated agreement now also covers DVD players and a commitment was made to establish a code for 'Personal Video Recorder Equipment' which will cover DVDRs, VCRs and HDRs. Additionally in 1999 a voluntary agreement was made relating to audio equipment. This covers AV receivers, integrated and portable stereos, and stereo components.

The 1997 agreement stated that from 2000 all VCRs would have a standby power consumption of 10 watts or less and that the average standby power consumption for all units sold by a single manufacturer would be 6 watts or less. The allowable average will be reduced to 3 watts by 2009 at which time a ban on all models consuming greater than 10w in standby will come into effect. The agreement made in 2003 stated that all DVD players when in passive standby should consume 1 watt or less by 2005. The audio agreement established 3 targets: By 2001 passive standby should be 5 watts or lower; by 2004 passive standby should be 3 watts or lower; by 2007 passive standby should be 1 watt or lower. As well as setting target values all three agreements stated that manufacturers needed to alert consumers to standby power consumption of products by for example printing information in operating instructions or product leaflets.

The European Commission also fund a pan European database of energy efficient appliances called HomeSpeed. The database includes white goods, consumer electronics and office equipment. It provides information about the brand name (manufacturer, model name), availability in 11 European countries and the latest energy related information. Specific information such as size, speed, add-ons or labelling systems (e.g. Energy Star or GEEA Label) is given, depending on the appliance type. The database currently covers 29 active appliance groups containing details of 18,222 appliances. Standby consumption is given for VCRs, DVDs, DVDRs and audio equipment. The database can be accessed by anyone, for more information see [www.homespeed.org](http://www.homespeed.org).

The Nordic Swan program is a voluntary eco label system used across five northern European countries. It launched eligibility criteria for integrated stereo systems, VCRs and DVD players and recorders in 2003. To be eligible integrated stereo requirements include a passive standby target of less than 1W and an on mode target of less than 40W. VCRs and DVD players and recorders need to have a passive standby consumption 2 watts or less and on mode consumption 15 watts or less. All equipment must have a clearly visible off switch and alert consumers that the unit can be turned off. The program has earmarked auto power down as a feature they may require of products in the future. For more details see [www.svanen.nu](http://www.svanen.nu).

### ***Korea – Energy Boy***

The Energy-saving Office Equipment & Home Electronics Program has been implemented since April 1, 1999 to enhance the sales of the energy saving products that decrease electric energy consumption during standby. The agreement is based on Article 13 of the Rational Energy Utilization Act of Korea and Ministry of Commerce, Industry and Energy's Notification (Regulation on the Enhanced Spreading of the Energy-saving Office Equipments & Home Electronics). The purpose of the program is to save standby power consumption systematically by encouraging manufacturers to voluntarily produce and sell the energy saving products that meet the energy saving standard suggested by Ministry of Commerce, Industry and Energy (MOCIE) and Korea energy Management Corporation (KEMCO). The program is known locally as the "Energy Boy" and applies to energy-efficient products that meet the specifications. The label is currently available to VCRs, DVD players and recorders, home audio products, and home theatre system. These Home entertainment products are already required to consume 1W or less in standby in order to receive a label.

In 2005, Korea updated this strategy, announcing their plan to implement the IEA standby power target of 1W in Korea by 2010. The strategy is based on three phases of action which begins with lowering the voluntary targets until 2010. In 2010 it will become mandatory to report standby energy consumption. Those products that don't meet the 1W standard will be labelled with a warning to consumers that the product is a high consumer of energy. It will also be mandatory for products to have an off switch which allows the consumer to turn the appliance into a state of zero consumption. The strategy also clearly targets active standby power as a major issue to be addressed.

The Korean Government also adopted a policy in 2005 requiring government departments and agencies to give priority to purchasing products with standby power below 1W.

More information on this program and the strategy can be found at [www.kemco.or.kr/](http://www.kemco.or.kr/).

### ***International Initiatives***

The International Energy Agency (IEA) has been promoting the "One Watt Initiative" energy saving program to cut world-wide electricity losses from appliances in stand-by.

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Launched in 1999, this campaign aims to guide government policy-makers and appliance manufacturers towards equipment that consumes no more than one watt when in standby mode. The Australian Government has endorsed the one watt standby target for appliances sold in Australia.

## ***Mandatory Programs***

Two mandatory programs exist for home entertainment products. California has recently introduced mandatory MEPS covering DVD players and recorders, Hard disk recorders, Integrated Stereos and Stereo Components. Japan has mandatory targets for VCRs. Additionally Korea has announced its intention to implement a mandatory program from 2010 (see Korea – Energy Boy page A-19) and Europe is currently investigating the possibility of implementing minimum energy standards.

### ***USA***

In addition to the ENERGY STAR program the California Energy Commission released mandatory regulations in April 2005. These regulations apply to products sold in California. The regulations deem that DVD players and Recorders including Hard Disk Recorders manufactured from 1 January 2006 must consume 3 Watts or less in passive standby mode. Additionally, the *Compact Audio Products* regulations require integrated stereo that are manufactured from 1 January 2007 to consume 2 watts or less in passive standby. If the product has a permanent illuminated clock displayed than this level is increased to 4 watts or less. These regulations do not cover AV receivers, Home Theatre Systems, Portable stereos; Stand alone subwoofers, stereo components or VCR's. See [www.energy.ca.gov/appliances/index.html](http://www.energy.ca.gov/appliances/index.html)

In addition, the Federal Energy Management Program (FEMP) requires all federal government agencies to purchase equipment with consumption at or below the recommended standby consumption. This applies to audio products, DVD players which are required to use no more than 1 watt and to VCRs which must have a consumption of 2 watts or less. Details of this program are available at [www.eere.energy.gov/femp/](http://www.eere.energy.gov/femp/).

### ***Japan – Top Runner***

Japan's Top Runner program has mandatory criteria and energy efficiency standards for VCRs and DVD recorders. These standards are estimated to have achieved a 73.6% improvement in standby power of VCR's between 1997 and 2003 and are expected to result in a 22.4% improvement for DVD recorders. The standards are set as an energy consumption efficiency level. The current levels are set out in the tables below.

Table 24: Energy consumption efficiency level for VCRs

Category	Standard energy consumption efficiency
1.VCRs with signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions	2.5
2.VCRs with signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	2.0
3.VCRs without signal processing power for 400 or more lines of horizontal resolution that have satellite broadcasting receiving functions	2.2
4.VCRs without signal processing power for 400 or more lines of horizontal resolution that do not have satellite broadcasting receiving functions	1.7

\*1. As for double cassette VCRs, the target standard values are obtained from the above values multiplied by 1.6 for each category.

Source: EECJ 2005

Table 25: Energy consumption efficiency level for DVD Recorders

Category				Standard energy consumption efficiency or calculation formula
Attached recording device	Tuner and signal conversion function	Additional terminal	Category name	
Having HDD only	Basic specifications	Without digital network terminal	A	$E=0.02C+45$
		With digital network terminal	B	$E=0.02C+49$
	Having multiple tuners	Without digital network terminal	C	$E=0.02C+55$
		With digital network terminal	D	$E=0.02C+60$
	Having multiple MPEG encoders	Without digital network terminal	E	$E=0.02C+63$
		With digital network terminal	F	$E=0.02C+68$
Having VCR only	Basic specifications	Without digital network terminal	G	$E=39$
		With digital network terminal	H	$E=44$
	Having multiple tuners	Without digital network terminal	I	$E=39$
		With digital network terminal	J	$E=54$
Having both HDD and VCR	Basic specifications	Without digital network terminal	K	$E=0.02C+58$
		With digital network terminal	L	$E=0.02C+63$
	Having multiple tuners	Without digital network terminal	M	$E=0.02C+68$
		With digital network terminal	N	$E=0.02C+73$
	Having multiple MPEG encoders	Without digital network terminal	O	$E=0.02C+76$
		With digital network terminal	P	$E=0.02C+81$

#### Remarks

1. "Digital network terminal" means iLink, USB, LAN, and HDMI.
2. "E" and "C" represent the following numeric values.  
E: Standard energy consumption efficiency (kWh per year)  
C: HDD storage capacity (gigabytes)

Source: EECJ 2005

More information can be found at [www.eecj.or.jp/top\\_runner/index.html](http://www.eecj.or.jp/top_runner/index.html).

### Europe – Eco Design Program

The EU parliament has agreed to consider mandatory "Eco-design" requirements for all energy using products (EUP's). Currently the program is in the research stage, with one section (lot 6) focused on Standby power losses. The lot 6 study is investigating ways to reduce or avoid standby and off mode power consumption across 15 EUP's including Radio, DVD and Integrated stereo, however it is expected that findings will be eventually applied to all home entertainment products. The study is currently investigated the best

available technology in each category and conducting meetings with stakeholders prior to moving into the final analysis stage.

### *Summary of Testing Standards and Energy Efficiency Programs*

While there are several programs covering various combinations of home entertainment products, the main focus of all of them is passive standby energy consumption. The majority programs are voluntary labelling schemes, which in general are aiming for appliances to consume no more than 1W. However, video recording products are generally allowed a higher target somewhere between 2 and 4 watts. Other requirements included in these programs, include automatic power down, visible off switch and on mode consumption limits. The mandatory programs are typically MEPS style programs and only target passive standby. The CEC program requires products to consume less than 2 watts. The exception being those units with a clock display can consume up to 4 watts and Video recording products can consume up to 3 watts. Table 26, Table 27 and Table 28 summarise the coverage provided by international Standards and energy efficiency programs.

**Table 26: Summary of Testing Standards**

<b>Equipment Type</b>	<b>Region /Country</b>	<b>Program/ Standard Name</b>	<b>Modes</b>	<b>Target</b>
<b>Standards</b>				
All household mains powered appliances	Australia	AS/NZS 62301:2005	Standby	Standard defining methods of measurement
Audio, video and related equipment	Australia	AS 62087	All	Standard defining methods of measurement
Audio, video and related equipment	International	IEC 62087	All	Standard defining methods of measurement
All household mains powered appliances	International	IEC 62301	Standby	Standard defining methods of measurement

Table 27: Brief Overview of Energy Efficiency Programs

Program	Voluntary Programs							Mandatory Programs	
	Energy Star	GEEA	EICTA	HomeSpeed	Nordic Swan	Energy Boy	IEA 1W	CEC	Top Runner
Type	Label	Label	Agreement	Database	Label	Label	Target	MEPS	Target
AV Receivers	✓	✓	✓	✓		✓	✓		
Home Theatre Systems	✓					✓	✓		
Integrated Stereo	✓	✓	✓	✓	✓	✓	✓	✓	
Portable Stereo	✓	✓	✓	✓		✓	✓		
Stereo Components	✓	✓	✓	✓		✓	✓		
Sub Woofers	✓						✓		
Speakers	✓						✓		
DVD Players	✓	✓	✓	✓	✓	✓	✓	✓	✓
DVD Recorders	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hard Disk Recorders			✓				✓	✓	✓
VCRs	✓	✓	✓	✓	✓	✓	✓		✓

**Table 28: Detailed Summary of Energy Efficiency Programs**

<b>Program/ Standard Name</b>	<b>Region /Country</b>	<b>Equipment Type</b>	<b>Modes</b>	<b>Target</b>
<b>Voluntary Programs</b>				
ENERGY STAR	USA, Canada, Australia, New Zealand	AV Receivers Home Theatre Systems Integrated Stereos Portable Stereo Stereo Components Sub Woofers & Speakers DVD Players DVD Recorders VCRs VCR/DVD Combo	Standby only	Standby $\leq 1W$
GEEA Energy tick	Europe	AV Receivers Integrated Stereos Portable Stereo Stereo Components DVD Players DVD Recorders VCRs	Standby/On	Standby $\leq 1W$ (2.5W for VCRs or DVDRs) 30 min power down (Not VCRs or DVDRs) On mode $\leq 15W$ for VCRs $\leq 11W$ DVDPs
EICTA agreement	Europe	AV Receivers Integrated Stereos Portable Stereo Stereo Components DVD Players DVD Recorders Hard Disk Recorders VCRs	Standby only	Audio standby $\leq 3W$ ( $\leq 1W$ from 2007) DVDP standby $\leq 1W$ VCRs standby $\leq 10W$ plus achieve sales weighted average of 6W in passive standby. (Average reduced to 3W in 2009) Commitment to reduce consumption of video recording devices.
Nordic Swan	Scandinavia	Integrated Stereos DVD Players DVD Recorders VCRs	Standby/On	Audio standby $\leq 1W$ on mode $\leq 40W$ VCRs, DVDPs, & DVDRs $\leq 2W$ on mode $\leq 15W$ Visible Off Switch (Considering adding Auto power down)
Energy Boy , e-Standby	Korea	AV Receivers Integrated Stereos Portable Stereo Stereo Components Home Theatre Systems	Standby only	Standby $\leq 1W$

<b>Program/ Standard Name</b>	<b>Region /Country</b>	<b>Equipment Type</b>	<b>Modes</b>	<b>Target</b>
		DVD Players DVD Recorder VCRs		
IEA "One Watt Initiative"	International	All	Standby only	Standby $\leq 1W$
<b>Mandatory Programs</b>				
CEC	California	Integrated Stereos  DVD Players DVD Recorders Hard Disk Recorders	Standby only	From 2007 Audio Standby $\leq 2W$ ( $\leq 4W$ if has permanent clock display) From 2006 HDRs, DVDPs, & DVDRs $\leq 3W$
Top Runner	Japan	VCRs DVD Recorder Hard Disk Recorders	Standby only	Sales weighted MEPS levels based on formula.
FEMP	USA Government Agencies	AV Receivers Integrated Stereos Portable Stereo Stereo Components DVD Players VCRs	Standby only	Must these purchase products with standby $\leq 1W$ and VCRs $\leq 1W$
Korea	Korean Government Agencies	AV Receivers Integrated Stereos Portable Stereo Stereo Components DVD Players VCRs	Standby only	Must these purchase products with standby $\leq 1W$ and VCRs $\leq 1W$

## *Appendix 4: Energy Prices and Factors*

**Table 29: Marginal Electricity Tariffs 2005-06**

State	c/kWh Household (day rate)	c/kWh Household (off peak)
NSW	11.0	4.8
Victoria	15.6	
Queensland	11.6	
SA	14.8/18.0	
WA	14.7	
Tasmania	12.5	
NT	15.4	
ACT	9.8	
<b>Australia (weighted)</b>	<b>12.7</b>	
<b>New Zealand</b>	<b>17.42</b>	

Source: EPS RIS 2006, NZ EECA 2007

**Table 30: Avoided Marginal Costs of Electricity**

State	c/kWh Avoided Costs of Electricity
NSW	7.2
Victoria	10.0
Queensland	7.5
SA	9.6
WA	8.1
Tasmania	10.1
NT	9.6
ACT	6.4
<b>Australia (weighted)</b>	<b>8.3</b>
<b>New Zealand</b>	<b>11.3</b>

Based on 65% of Marginal Tariff (Syneca 2006)

## ***Appendix 5: Calculation Methodology***

The following Appendix 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.

### **Power and Usage**

Like any electrical appliance, the contribution of home entertainment products to energy use and emissions is a function of number of units in operation, technical attributes of the units, and usage behaviour of the users.

Stock and sales estimates were made for all Australia and New Zealand as detailed in Appendix 2: Stock and Sales. These sales, in combination with the survival function, were multiplied by BAU and MEPS power consumption figures for each mode. The BAU and MEPS power consumption values for each type of product are shown in Appendix 9: BAU and MEPS Power Consumption Values. To determine the total energy consumption, these values were multiplied by their respective usage characteristics. The usage applied to the different categories of products shown in Table 31 for 3 scenarios.

**Table 31: Hours of Operation by Product by Mode (hrs/day) Low, Base & High Usage Scenario**

Category	Hours – Base	Hours – Low	Hours – High
AV Components & Receivers - (ON)	2.0	3.0	1.0
AV Components & Receivers - (Active Stdby)	5.5	6.6	4.4
AV Components & Receivers - (Passive Stdby)	15.4	13.4	17.4
AV Components & Receivers - (OFF)	1.1	1.0	1.2
DVD Players - (ON)	2.0	3.0	1.0
DVD Players - (Active Stdby)	5.5	6.6	4.4
DVD Players - (Passive Stdby)	15.4	13.4	17.4
DVD Players - (OFF)	1.1	1.0	1.2
DVD/HD Recorders - (ON)	2.0	3.0	1.0
DVD/HD Recorders - (Active Stdby)	5.5	6.6	4.4
DVD/HD Recorders - (Passive Stdby)	15.4	13.4	17.4
DVD/HD Recorders - (OFF)	1.1	1.0	1.2
Home Theatre - (ON)	5.0	7.5	2.5
Home Theatre - (Active Stdby)	3.8	4.6	3.0
Home Theatre - (Passive Stdby)	14.3	11.2	17.3
Home Theatre - (OFF)	0.9	0.7	1.2
Integrated Stereos - (ON)	2.0	3.0	1.0
Integrated Stereos - (Active Stdby)	5.5	6.6	4.4
Integrated Stereos - (Passive Stdby)	15.4	13.4	17.4
Integrated Stereos - (OFF)	1.1	1.0	1.2
Portable Stereos - (ON)	2.0	3.0	1.0
Portable Stereos - (Active Stdby)	4.4	5.3	3.5
Portable Stereos - (Passive Stdby)	9.9	8.8	11.0
Portable Stereos - (OFF)	7.7	6.9	8.5
Speakers & Subwoofers - (ON)	2.0	3.0	1.0
Speakers & Subwoofers - (Active Stdby)	15.4	18.5	12.3
Speakers & Subwoofers - (Passive Stdby)	5.5	2.1	8.9
Speakers & Subwoofers - (OFF)	1.1	0.4	1.8
VCR - (ON)	2.0	3.0	1.0
VCR - (Active Stdby)	7.7	9.2	6.2
VCR - (Passive Stdby)	14.3	11.8	16.8
VCR - (OFF)	-	-	-
Other HE Eqmnt - (ON)	2.0	3.0	1.0
Other HE Eqmnt - (Active Stdby)	4.4	5.3	3.5
Other HE Eqmnt - (Passive Stdby)	9.9	8.8	11.0
Other HE Eqmnt - (OFF)	7.7	6.9	8.5

Hours of operation for the Base Scenario are estimated from the Intrusive Survey of Standby Power undertaken in 2005 (EES 2006) and recent studies conducted in Europe (EC 2007)

## Energy and Greenhouse

The sum of direct and indirect energy consumption was used to provide the net energy consumption used for all subsequent calculations. Direct energy consumption was calculated as described above. The indirect energy, that results due to the operation of home entertainment product (e.g. increase in air conditioning energy), is a function of heating and air conditioner penetration, performance of heating and cooling systems, and, number of heating, cooling and temperature neutral days. The indirect energy use calculation parameters are shown in Table 32.

**Table 32: Indirect Energy Use Calculation Parameters by State & NZ**

Parameters	NSW	NT	QLD	SA	TAS	VIC	WA	NZ
Share Population %	34.77%	1.00%	19.64%	7.55%	2.38%	24.71%	9.94%	100%
AC Saturation %	70%	80%	80%	40%	30%	45%	70%	20%
Heating Saturation %	95%	2%	30%	95%	100%	100%	20%	100%
Average COP (Heating)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Average COP (Cooling)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
% Heating Days	30%	0%	10%	60%	70%	60%	50%	70%
% Cooling Days	50%	70%	70%	20%	10%	20%	25%	10%
% Neutral Days	20%	30%	20%	20%	20%	20%	25%	20%

The GHG emissions used the State energy calculations combined with the Greenhouse Gas Emissions Factors in Appendix 7.

## Cost-Benefits

The NPV benefits are calculated for each State using the domestic tariffs as shown in Appendix 4: Energy Prices and Factors multiplied by the energy savings calculated earlier. The incremental costs are based upon supplier information and shown in Table 9. These costs are multiplied by the sales of product to obtain the customer costs. The sum of these customer costs, the supplier costs and government costs provide the total costs for the MEPS option.

## Sensitivity Scenarios

To test the sensitivity of the analysis outputs, scenarios were developed as follows:

- Two sales scenarios were modelled. Base and Low Growth.
- Three usage scenarios were modelled – high, base and low Usage
- Several incremental cost scenarios were modelled as shown in Figure 30 and Figure 31

## ***Appendix 6: ETS Provisional Benefits to be Included in Future***

The potential impact of an emissions trading scheme (ETS) on the benefit-cost ratio is assessed in this appendix. On 3 June 2007, the Prime Minister announced that Australia will implement a domestic emissions trading system beginning no later than 2012, and that the Government will set a national emissions target in 2008. The ETS has the potential to increase the national benefits as a cost is imposed on greenhouse gas (GHG) emissions. Hence the CBA should take into account the increased benefits due to the avoided cost of carbon permits for electricity generators, which will result from the proposed MEPS reducing the consumption and generation of electricity at the margin.

These valuations are included as a trial in this CBA and will be included within the main analysis once the Australian Government has set out parameters for how the emissions trading scheme will operate and this CBA methodology has been trialled and reviewed.

A number of possible methodologies could be used to value the GHG emissions abatement, such as using a separate carbon price or using retail electricity tariffs that include the effects of the ETS. The most appropriate approach can be determined once the Government has made decisions on how the ETS will operate (which will clarify how a new MEPS and the ETS interact) and once modelling of future electricity prices under emissions trading is available.

In the interim, the MCE E3 Committee plans to use the valuation methodology discussed below, and to revisit the choice of methodology once more information is available. The approach essentially involves sensitivity testing of a range of plausible carbon prices.

The methodology values abatement at the shadow price of the carbon permit price on the basis that by introducing emissions trading the Government has placed a carbon constraint on the economy and created a market value for emission reductions (i.e., “commoditised” emissions). Abatement is also shown in tonnes of greenhouse gases for information. With an ETS operating in the economy, any new MEPS should have its abatement valued in terms of the counter-factual cost of achieving the same abatement through other measures in the ETS.

As this CBA is a partial equilibrium analysis, it values the costs and benefits of the proposed measure at the prevailing prices in the economy, assuming the impact of the measure has negligible impact on those prices. As already noted in Section 5.6, the MEPS will reduce the consumption of electricity at the margin and this reduction is valued at the avoided cost of electricity generation and transmission for the economy – hence it provides the basis of the national benefits.

Similarly, a partial equilibrium analysis takes the ETS cap as given, assuming any new individual MEPS will have negligible impact on the carbon market and cap. Therefore the GHG emissions reduction is valued at the expected prevailing carbon permit price. This implicitly recognises that the emissions avoided through the MEPS will obviate the need for an equivalent amount of abatement elsewhere in the economy. Using the same approach as for the avoided cost of electricity generation and transmission, the avoided cost of carbon permits is added to the national benefits.

The carbon prices for sensitivity analysis are shown at \$0, \$10 and \$20/t CO<sub>2</sub>-e from 2012 and Table 33 reports the effect of this on the CBA.

**Table 33: Carbon Permit Sensitivity Analysis – Australia Base Sales Growth**

<b>\$0/t CO<sub>2</sub>-e Carbon Permit Price</b>	<b>NPV Nil (0%)</b>	<b>NPV Low (5%)</b>	<b>NPV Med (7.5%)</b>	<b>NPV High (10%)</b>
Total Costs	\$41,240,603	\$20,217,166	\$14,418,315	\$10,399,785
Total Benefits	\$601,644,114	\$261,819,177	\$176,260,321	\$120,165,508
Net Benefits	\$560,403,512	\$241,602,011	\$161,842,006	\$109,765,724
Benefit-Cost Ratio	14.6	13.0	12.2	11.6
Cumulative Mt CO <sub>2</sub> -e Abatement (2012 -2020)	6.5			
<b>Potential Carbon Permit Avoided Costs</b>				
Additional Avoided Carbon Costs @ \$10/t CO <sub>2</sub> -e from 2012	\$64,817,550	\$28,250,083	\$19,027,867	\$12,976,316
Additional Avoided Carbon Costs @ \$20/t CO <sub>2</sub> -e from 2012	\$129,635,100	\$56,500,165	\$38,055,735	\$25,952,631
<b>Changes to Benefit-Cost Ratio</b>				
BCR with @ \$10/t CO <sub>2</sub> -e from 2012	16.2	14.3	13.5	12.8
BCR with @ \$20/t CO <sub>2</sub> -e from 2012	17.7	15.7	14.9	14.1

As the table shows, a potential carbon permit price of \$10/t CO<sub>2</sub>-e would increase the BCR from 12.2 to 13.5; likewise the permit price of \$20/t CO<sub>2</sub>-e would increase the BCR to 14.9, at a discount rate of 7.5%.

## Appendix 7: Greenhouse Gas Emissions Factors

**Table 34: Projected Marginal Emissions Factors: Electricity by State 2000-2020**

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	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600

Source: [www.greenhouse.gov.au/ggap/round3/emission-factors.html](http://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<sub>2</sub>-e per kWh delivered, taking into account transmission and distribution losses (combustion emissions only).

## Appendix 8: 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 9: BAU and MEPS Power Consumption Values

POWER (W)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AV Comp & Rcvrs - (ON) - BAU	30.8	32.4	34.1	35.7	37.1	39.5	40.3	42.2	43.9	45.5	47.1	45.7	44.3	42.8	41.4	40.0	39.0	38.0	37.0	36.0	35.0
AV Comp & Rcvrs - (Active Stdby) - BAU	30.8	32.4	34.1	35.7	37.1	39.5	40.3	42.2	43.9	45.5	47.1	45.7	44.3	42.8	41.4	40.0	39.0	38.0	37.0	36.0	35.0
AV Comp & Rcvrs - (Pass Stdby) - BAU	1.3	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
AV Comp& Rcvrs - (OFF) - BAU	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
AV Comp & Rcvrs - (ON) - MEPS	30.8	32.4	34.1	35.7	37.1	39.5	40.3	42.2	43.9	45.5	47.1	45.7	44.3	42.8	41.4	40.0	39.0	38.0	37.0	36.0	35.0
AV Comp & Rcvrs - (Active Stdby) - MEPS	30.8	32.4	34.1	35.7	37.1	39.5	40.3	42.2	43.9	45.5	47.1	45.7	44.3	42.8	41.4	40.0	39.0	38.0	37.0	36.0	35.0
AV Comp & Rcvrs - (Pass Stdby) - MEPS	1.3	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
AV Comp & Rcvrs - (OFF) - MEPS	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DVD Players - (ON) - BAU	13.7	12.8	11.8	10.6	10.4	8.9	8.0	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	7.0	7.0	7.0	7.0
DVD Players - (Active Stdby) - BAU	13.7	12.8	11.8	10.6	10.4	8.9	8.0	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	7.0	7.0	7.0	7.0
DVD Players - (Pass Stdby) - BAU	2.7	2.6	2.4	1.9	2.6	2.1	1.6	1.7	1.5	1.4	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.0
DVD Players - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DVD Players - (ON) - MEPS	13.7	12.8	11.8	10.6	10.4	8.9	8.0	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	7.0	7.0	7.0	7.0
DVD Players - (Active Stdby) - MEPS	13.7	12.8	11.8	10.6	10.4	8.9	8.0	7.6	7.5	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	7.0	7.0	7.0	7.0
DVD Players - (Pass Stdby)-MEPS	2.7	2.6	2.4	1.9	2.6	2.1	1.6	1.7	1.5	1.4	1.2	1.2	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.0
DVD Players - (OFF) – MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DVD/HD Recorders - (ON) - BAU	26.5	25.8	25.1	23.4	24.5	24.3	21.2	21.6	20.9	20.2	19.5	18.6	17.7	16.8	15.9	15.0	14.4	13.8	13.2	12.6	12.0
DVD/HD Recorders - (Active Stdby) - BAU	26.5	25.8	25.1	23.4	24.5	24.3	21.2	21.6	20.9	20.2	19.5	18.6	17.7	16.8	15.9	15.0	14.4	13.8	13.2	12.6	12.0
DVD/HD Recorders - (Pass Stdby) - BAU	7.3	7.1	6.9	7.2	5.3	7.5	5.8	6.0	5.8	5.6	5.4	5.1	4.9	4.6	4.3	4.0	3.8	3.6	3.4	3.2	3.0
DVD/HD Recorders - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DVD/HD Recorders - (ON) - MEPS	26.5	25.8	25.1	23.4	24.5	24.3	21.2	21.6	20.9	20.2	19.5	18.6	17.7	16.8	15.9	15.0	14.4	13.8	13.2	12.6	12.0
DVD/HD Recorders - (Active Stdby) - MEPS	26.5	25.8	25.1	23.4	24.5	24.3	21.2	21.6	20.9	20.2	19.5	18.6	17.7	16.8	15.9	15.0	14.4	13.8	13.2	12.6	12.0
DVD/HD Recorders - (Pass Stdby) - MEPS	7.3	7.1	6.9	7.2	5.3	7.5	5.8	6.0	5.8	5.6	5.4	5.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
DVD/HD Recorders - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

POWER (W)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Home Theatre - (ON) - BAU	35.0	35.0	35.0	32.8	31.3	24.4	23.8	23.5	23.0	22.5	22.0	21.6	21.2	20.8	20.4	20.0	20.0	20.0	20.0	20.0	20.0
Home Theatre - (Active Stdbby) - BAU	35.0	35.0	35.0	32.8	31.3	24.4	23.8	23.5	23.0	22.5	22.0	21.6	21.2	20.8	20.4	20.0	20.0	20.0	20.0	20.0	20.0
Home Theatre - (Pass Stdbby) - BAU	4.5	4.3	4.1	3.8	4.2	3.1	3.6	3.6	3.6	3.6	3.6	3.5	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
Home Theatre - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Home Theatre - (ON) - MEPS	35.0	35.0	35.0	32.8	31.3	24.4	23.8	23.5	23.0	22.5	22.0	21.6	21.2	20.8	20.4	20.0	20.0	20.0	20.0	20.0	20.0
Home Theatre - (Active Stdbby) - MEPS	35.0	35.0	35.0	32.8	31.3	24.4	23.8	23.5	23.0	22.5	22.0	21.6	21.2	20.8	20.4	20.0	20.0	20.0	20.0	20.0	20.0
Home Theatre - (Pass Stdbby) - MEPS	4.5	4.3	4.1	3.8	4.2	3.1	3.6	3.6	3.6	3.6	3.6	3.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Home Theatre - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Integrated Stereos - (ON) - BAU	15.6	15.7	15.7	16.0	15.4	16.1	16.0	16.0	16.1	16.1	16.2	15.7	15.3	14.9	14.4	14.0	14.0	14.0	14.0	14.0	14.0
Integrated Stereos - (Active Stdbby) - BAU	15.6	15.7	15.7	16.0	15.4	16.1	16.0	16.0	16.1	16.1	16.2	15.7	15.3	14.9	14.4	14.0	14.0	14.0	14.0	14.0	14.0
Integrated Stereos - (Pass Stdbby) - BAU	2.8	3.1	3.5	4.0	3.7	4.5	4.8	5.1	5.4	5.7	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Integrated Stereos - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Integrated Stereos - (ON) - MEPS	15.6	15.7	15.7	16.0	15.4	16.1	16.0	16.0	16.1	16.1	16.2	15.7	15.3	14.9	14.4	14.0	14.0	14.0	14.0	14.0	14.0
Integrated Stereos - (Active Stdbby) - MEPS	15.6	15.7	15.7	16.0	15.4	16.1	16.0	16.0	16.1	16.1	16.2	15.7	15.3	14.9	14.4	14.0	14.0	14.0	14.0	14.0	14.0
Integrated Stereos - (Pass Stdbby) - MEPS	2.8	3.1	3.5	4.0	3.7	4.5	4.8	5.1	4.0	4.0	4.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Integrated Stereos - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Portable Stereos - (ON) - BAU	4.0	4.5	4.9	5.4	5.4	6.7	6.4	7.1	7.5	7.9	8.4	8.3	8.2	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0
Portable Stereos - (Active Stdbby) - BAU	4.0	4.5	4.9	5.4	5.4	6.7	6.4	7.1	7.5	7.9	8.4	8.3	8.2	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0
Portable Stereos - (Pass Stdbby) - BAU	1.4	1.6	1.7	2.0	1.9	2.1	2.4	2.4	2.6	2.7	2.9	2.9	2.9	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Portable Stereos - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Portable Stereos - (ON) - MEPS	4.0	4.5	4.9	5.4	5.4	6.7	6.4	7.1	7.5	7.9	8.4	8.3	8.2	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0
Portable Stereos - (Active Stdbby) - MEPS	4.0	4.5	4.9	5.4	5.4	6.7	6.4	7.1	7.5	7.9	8.4	8.3	8.2	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0
Portable Stereos - (Pass Stdbby) - MEPS	1.4	1.6	1.7	2.0	1.9	2.1	2.4	2.4	2.6	2.7	2.9	2.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Portable Stereos - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

POWER (W)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
Speakers & Subwoofers - (ON) - BAU	15.2	14.4	13.5	13.6	10.9	10.4	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
Speakers & Subwoofers - (Active Stdby) - BAU	15.2	14.4	13.5	13.6	10.9	10.4	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Speakers & Subwoofers - (Pass Stdby) - BAU	3.0	4.3	5.7	7.4	7.4	10.0	10.9	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Speakers & Subwoofers - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Speakers & Subwoofers - (ON) - MEPS	15.2	14.4	13.5	13.6	10.9	10.4	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Speakers & Subwoofers - (Active Stdby) - MEPS	15.2	14.4	13.5	13.6	10.9	10.4	11.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Speakers & Subwoofers - (Pass Stdby) - MEPS	3.0	4.3	5.7	7.4	7.4	10.0	10.9	10.0	4.0	4.0	4.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Speakers & Subwoofers - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
VCR - (ON) - BAU	8.5	8.3	8.1	8.0	7.6	7.7	7.3	7.2	7.0	6.8	6.6	6.3	5.9	5.6	5.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
VCR - (Active Stdby) - BAU	8.5	8.3	8.1	8.0	7.6	7.7	7.3	7.2	7.0	6.8	6.6	6.3	5.9	5.6	5.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
VCR - (Pass Stdby) - BAU	3.8	3.6	3.4	3.1	3.1	2.9	2.6	2.4	2.2	2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
VCR - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
VCR - (ON) - MEPS	8.5	8.3	8.1	8.0	7.6	7.7	7.3	7.2	7.0	6.8	6.6	6.3	5.9	5.6	5.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
VCR - (Active Stdby) - MEPS	8.5	8.3	8.1	8.0	7.6	7.7	7.3	7.2	7.0	6.8	6.6	6.3	5.9	5.6	5.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
VCR - (Pass Stdby) - MEPS	3.8	3.6	3.4	3.1	3.1	2.9	2.6	2.4	2.2	2.0	1.9	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VCR - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other HE Eqpmnt - (ON) - BAU	10.0	10.0	10.0	10.3	10.3	7.5	19.4	18.0	20.5	22.9	25.4	26.3	27.2	28.2	29.1	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Other HE Eqpmnt - (Active Stdby) - BAU	10.0	10.0	10.0	10.3	10.3	7.5	19.4	18.0	20.5	22.9	25.4	26.3	27.2	28.2	29.1	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Other HE Eqpmnt - (Pass Stdby) - BAU	4.0	4.0	4.0	3.9	3.9	4.6	11.9	12.3	14.7	17.2	19.6	19.7	19.8	19.9	19.9	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Other HE Eqpmnt - (OFF) - BAU	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other HE Eqpmnt - (ON) - MEPS	10.0	10.0	10.0	10.3	10.3	7.5	19.4	18.0	20.5	22.9	25.4	26.3	27.2	28.2	29.1	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Other HE Eqpmnt - (Active Stdby) - MEPS	10.0	10.0	10.0	10.3	10.3	7.5	19.4	18.0	20.5	22.9	25.4	26.3	27.2	28.2	29.1	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Other HE Eqpmnt - (Pass Stdby) - MEPS	4.0	4.0	4.0	3.9	3.9	4.6	11.9	12.3	4.0	4.0	4.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Other HE Eqpmnt - (OFF) - MEPS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

## Appendix 10: Annual Benefit and Cost Data

Table 35: Annual Consumer Energy, Benefits and Costs by State for Australia & NZ: Base Sales Scenario

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Australia</b>																						
BAU Energy use	GWh/yr	649	625	662	784	907	1015	1135	1247	1354	1456	1547	1627	1685	1727	1749	1749	1733	1705	1669	1627	1583
With-program energy use	GWh/yr	649	625	662	784	907	1015	1135	1247	1354	1447	1528	1597	1108	1061	1010	952	899	857	819	784	753
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	9	19	29	577	665	739	796	834	848	850	843	830
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.4	3.7	73.1	84.2	93.6	100.8	105.6	107.3	107.6	106.8	105.1
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	9	19	29	566	638	723	751	777	771	768	756	733
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.7	0.4	7.1	5.9	4.7	3.4	2.6	1.9	1.2	0.6	0.0
<b>NSW&amp;ACT</b>																						
BAU Energy use	GWh/yr	175	169	179	212	245	274	306	337	366	393	418	439	455	466	472	472	468	461	451	440	428
With-program energy use	GWh/yr	175	169	179	212	245	274	306	337	366	391	413	431	299	287	273	257	243	232	221	212	203
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	2	5	8	156	180	200	215	225	229	230	228	224
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.7	14.3	16.4	18.2	19.7	20.6	20.9	21.0	20.8	20.5
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	2	5	8	151	170	192	198	205	202	204	201	194
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.1	1.9	1.5	1.2	0.9	0.7	0.5	0.3	0.2	0.0
<b>NT</b>																						
BAU Energy use	GWh/yr	8	7	8	9	11	12	13	15	16	17	18	19	20	20	21	21	20	20	20	19	19
With-program energy use	GWh/yr	8	7	8	9	11	12	13	15	16	17	18	19	13	12	12	11	11	10	10	9	9
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	0	0	0	7	8	9	9	10	10	10	10	10
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	1.2	1.3	1.4	1.5	1.5	1.5	1.5	1.5
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	0	0	0	5	6	6	7	7	7	7	7	7
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>QLD</b>																						
BAU Energy use	GWh/yr	152	146	155	183	212	237	265	291	316	340	362	380	394	403	409	409	405	398	390	380	370
With-program energy use	GWh/yr	152	146	155	183	212	237	265	291	316	338	357	373	259	248	236	223	210	200	191	183	176
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	2	5	7	135	155	173	186	195	198	199	197	194
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.8	15.7	18.0	20.0	21.6	22.6	23.0	23.0	22.9	22.5
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	2	4	6	126	140	160	170	176	177	174	170	169
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	1.4	1.2	0.9	0.7	0.5	0.4	0.2	0.1	0.0

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>SA</b>																						
BAU Energy use	GWh/yr	69	66	70	83	96	107	120	132	143	154	164	172	178	182	185	185	183	180	176	172	167
With-program energy use	GWh/yr	69	66	70	83	96	107	120	132	143	153	161	169	117	112	107	101	95	91	87	83	80
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	1	2	3	61	70	78	84	88	90	90	89	88
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	9.1	10.5	11.7	12.6	13.2	13.4	13.4	13.3	13.1
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	1	2	3	68	76	85	85	88	88	88	89	84
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.9	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.0
<b>TAS</b>																						
BAU Energy use	GWh/yr	11	10	11	13	15	17	19	21	23	24	26	27	28	29	29	29	29	29	28	27	26
With-program energy use	GWh/yr	11	10	11	13	15	17	19	21	23	24	26	27	19	18	17	16	15	14	14	13	13
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	0	0	0	10	11	12	13	14	14	14	14	14
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	1.4	1.5	1.7	1.7	1.8	1.8	1.8	1.7
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	0	0	0	10	11	12	14	14	14	14	14	14
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
<b>VIC</b>																						
BAU Energy use	GWh/yr	137	132	140	165	191	214	239	263	286	307	326	343	355	364	369	369	365	360	352	343	334
With-program energy use	GWh/yr	137	132	140	165	191	214	239	263	286	305	322	337	234	224	213	201	190	181	173	165	159
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	2	4	6	122	140	156	168	176	179	179	178	175
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	1.0	19.0	21.9	24.3	26.2	27.4	27.9	28.0	27.7	27.3
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	2	4	7	135	152	173	176	180	177	178	172	164
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.1	1.7	1.4	1.1	0.8	0.6	0.5	0.3	0.1	0.0
<b>WA</b>																						
BAU Energy use	GWh/yr	98	94	100	118	137	153	171	188	205	220	234	246	255	261	264	264	262	258	252	246	239
With-program energy use	GWh/yr	98	94	100	118	137	153	171	188	205	219	231	241	167	160	153	144	136	130	124	118	114
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	1	3	4	87	100	112	120	126	128	128	127	125
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.7	12.8	14.8	16.4	17.7	18.5	18.8	18.9	18.7	18.4
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	1	3	4	72	83	94	102	108	105	103	103	102
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	1.1	0.9	0.7	0.5	0.4	0.3	0.2	0.1	0.0
<b>NZ</b>																						
BAU Energy use	GWh/yr	101	102	109	121	136	149	164	181	197	211	222	229	232	232	230	224	217	209	200	191	182
With-program energy use	GWh/yr	101	102	109	121	136	149	164	181	197	209	219	224	153	144	134	123	114	106	98	92	86
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	0	2	3	5	79	88	96	101	103	103	102	99	96
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.9	13.7	15.4	16.6	17.5	18.0	17.9	17.7	17.3	16.7
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	0	1	2	3	47	53	57	60	62	62	61	59	58
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	1.4	1.1	0.9	0.6	0.5	0.3	0.2	0.1	0.0

Table 36: Annual Consumer Energy, Benefits and Costs by State for Australia &amp; NZ: Low Sales Scenario

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Australia</b>																						
BAU Energy use	GWh/yr	907	1015	1135	1247	1321	1373	1404	1413	1397	1368	1323	1262	1190	1112	1031	950	872	907	1015	1135	1247
With-program energy use	GWh/yr	907	1015	1135	1247	1321	1365	1387	1388	930	856	782	704	632	571	515	464	418	907	1015	1135	1247
Energy savings	GWh/yr	0	0	0	0	0	8	17	25	468	511	542	558	558	541	516	486	454	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	1.0	2.1	3.2	59.3	64.7	68.6	70.6	70.7	68.5	65.4	61.6	57.5	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	8	17	24	459	490	530	526	520	492	467	436	401	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	1.3	0.6	0.3	4.7	3.8	2.9	2.0	1.5	1.0	0.6	0.3	0.0	0.0	0.0	0.0	0.0
<b>NSW&amp;ACT</b>																						
BAU Energy use	GWh/yr	245	274	306	337	357	371	379	382	378	369	357	341	321	300	279	257	235	245	274	306	337
With-program energy use	GWh/yr	245	274	306	337	357	369	375	375	251	231	211	190	171	154	139	125	113	245	274	306	337
Energy savings	GWh/yr	0	0	0	0	0	2	5	7	126	138	146	151	151	146	139	131	123	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6	11.6	12.6	13.4	13.8	13.8	13.4	12.7	12.0	11.2	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	2	4	6	122	130	141	138	137	129	124	116	106	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	1.2	1.0	0.8	0.5	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
<b>NT</b>																						
BAU Energy use	GWh/yr	11	12	13	15	16	16	16	17	16	16	16	15	14	13	12	11	10	11	12	13	15
With-program energy use	GWh/yr	11	12	13	15	16	16	16	16	11	10	9	8	7	7	6	5	5	11	12	13	15
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	5	6	6	7	7	6	6	6	5	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.9	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	4	4	5	5	5	5	5	4	4	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>QLD</b>																						
BAU Energy use	GWh/yr	212	237	265	291	309	321	328	330	327	320	309	295	278	260	241	222	204	212	237	265	291
With-program energy use	GWh/yr	212	237	265	291	309	319	324	324	217	200	183	165	148	133	120	108	98	212	237	265	291
Energy savings	GWh/yr	0	0	0	0	0	2	4	6	109	119	127	130	130	126	121	114	106	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.7	12.7	13.9	14.7	15.1	15.1	14.7	14.0	13.2	12.3	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	2	4	5	102	108	118	119	118	113	105	98	92	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.9	0.8	0.6	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>SA</b>																						
BAU Energy use	GWh/yr	96	107	120	132	140	145	148	149	148	145	140	133	126	118	109	100	92	96	107	120	132
With-program energy use	GWh/yr	96	107	120	132	140	144	147	147	98	91	83	74	67	60	54	49	44	96	107	120	132
Energy savings	GWh/yr	0	0	0	0	0	1	2	3	49	54	57	59	59	57	55	51	48	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.4	7.4	8.1	8.6	8.8	8.8	8.6	8.2	7.7	7.2	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	1	2	3	55	58	63	60	59	56	53	51	46	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.6	0.5	0.3	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<b>TAS</b>																						
BAU Energy use	GWh/yr	15	17	19	21	22	23	23	24	23	23	22	21	20	19	17	16	15	15	17	19	21
With-program energy use	GWh/yr	15	17	19	21	22	23	23	23	16	14	13	12	11	10	9	8	7	15	17	19	21
Energy savings	GWh/yr	0	0	0	0	0	0	0	0	8	9	9	9	9	9	9	8	8	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	1.1	1.1	1.2	1.2	1.1	1.1	1.0	0.9	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	0	0	0	8	9	9	10	9	9	8	8	7	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>VIC</b>																						
BAU Energy use	GWh/yr	191	214	239	263	279	290	296	298	295	288	279	266	251	235	217	200	184	191	214	239	263
With-program energy use	GWh/yr	191	214	239	263	279	288	293	293	196	181	165	148	133	120	109	98	88	191	214	239	263
Energy savings	GWh/yr	0	0	0	0	0	2	4	5	99	108	114	118	114	109	103	96	0	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.8	15.4	16.8	17.8	18.3	18.4	17.8	17.0	16.0	14.9	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	2	4	6	109	117	127	123	120	113	108	99	90	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	1.1	0.9	0.7	0.5	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0
<b>WA</b>																						
BAU Energy use	GWh/yr	137	153	171	188	200	207	212	213	211	207	200	191	180	168	156	144	132	137	153	171	188
With-program energy use	GWh/yr	137	153	171	188	200	206	210	210	140	129	118	106	95	86	78	70	63	137	153	171	188
Energy savings	GWh/yr	0	0	0	0	0	1	3	4	71	77	82	84	84	82	78	74	69	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6	10.4	11.4	12.0	12.4	12.4	12.0	11.5	10.8	10.1	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	1	2	3	58	64	69	71	72	67	63	59	56	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<b>NZ</b>																						
BAU Energy use	GWh/yr	136	149	164	181	195	206	211	211	206	198	188	176	163	150	137	125	113	136	149	164	181
With-program energy use	GWh/yr	136	149	164	181	195	204	208	206	137	125	112	99	88	78	69	62	55	136	149	164	181
Energy savings	GWh/yr	0	0	0	0	0	2	3	5	69	73	76	76	75	72	68	63	58	0	0	0	0
Value of energy saved	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.8	11.9	12.7	13.2	13.3	13.1	12.5	11.8	11.0	10.2	0.0	0.0	0.0	0.0
Emissions saved (marginal)	ktCO2-e	0	0	0	0	0	1	2	3	41	44	45	46	45	43	41	38	35	0	0	0	0
Additional appliance cost	\$M	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0