Report No 2007/03

Equipment Energy Efficiency Committee Cost-Benefit Analysis:

Minimum Energy Performance Standards and Alternative Strategies for Set-top Boxes

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

April 2007

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
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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
CBA	Cost-Benefit Analysis
CDV	Committee Draft for Vote
CEC	California Energy Commission
CECP	China Certification Centre for Energy Conservation Projects
CESA	Consumer Electronics Suppliers Association (Australia)
CO_2-e	Carbon dioxide equivalent units
COAG	Council of Australian Governments
DEH	Department of Environment and Heritage
DoE	Department of Energy (USA)
EC	European Commission
EECA	Energy Efficiency and Conservation Authority – New Zealand
E_3	Equipment Energy Efficiency Program (formerly NAEEEP)
EPA	Environment Protection Agency (USA)
EPS	External Power Supply
EU	European Union
E_3 Committee	Equipment Energy Efficiency Committee (formerly NAEEEC)
FTA	Free-to-Air
GATT	General Agreement on Tariffs and Trade
GWA	George Wilkenfeld & Associates
GWh	Giga Watt hour – 1 million Watt hours
HD	High Definition
IEC	International Energy Commission
Kt	Kilo Tonnes – 1 thousand Tonnes
kWh	Kilo Watt hour – 1 thousand watt hours
LCD	Liquid crystal display
MCE	Ministerial Council on Energy
MEPS	Minimum Energy Performance Standards
MRET	Mandatory Renewable Energy Target
Mt	Mega Tonnes – 1 million Tonnes
NAEEEC	National Appliance & Equipment Energy Efficiency Committee (now E_3 Committee)
NAEEEP	National Appliance & Equipment Energy Efficiency Program (now E_3)
NPV	Net Present Value
NZ	New Zealand
RIS	Regulatory Impact Statement
SD	Standard Definition
STB	Set Top Box
STV	Subscription (Pay) Television
TTMRA	Trans Tasman Mutual Recognition Arrangement

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 Set-Top Boxes (STBs) 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 (E_3 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 digital STBs 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 Thursday, 31 May 2007 on any of the issues raised in the document. 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 STB 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.

Please address your written submissions to:

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Executive Summary

This is a Cost-Benefit Analysis (CBA) of a proposal to introduce Minimum Energy Performance Standards (MEPS) for digital Set-Top Boxes (STBs) that are imported and sold in Australia and New Zealand. It has been prepared and issued by the Equipment Energy Efficiency Committee (E_3 Committee) under the Ministerial Council on Energy of the Australian federal, state and territory governments and the New Zealand Government.

A digital STB may also be referred to as a digital television adaptor, decoder or receiver and is used to convert digital FTA signals and subscription TV (STV) services to a signal compatible with the existing audiovisual display technology. This regulatory proposal is for STBs without a recording function (i.e. without a hard drive).

STBs were among a group of products identified for immediate action in the standby power program. As very few STBs 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 in not used 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 STBs, however comments received on this plan suggested that mandatory regulations that examined all modes of use, including on mode, might better meet the Australian and New Zealand governments' efficiency goals.

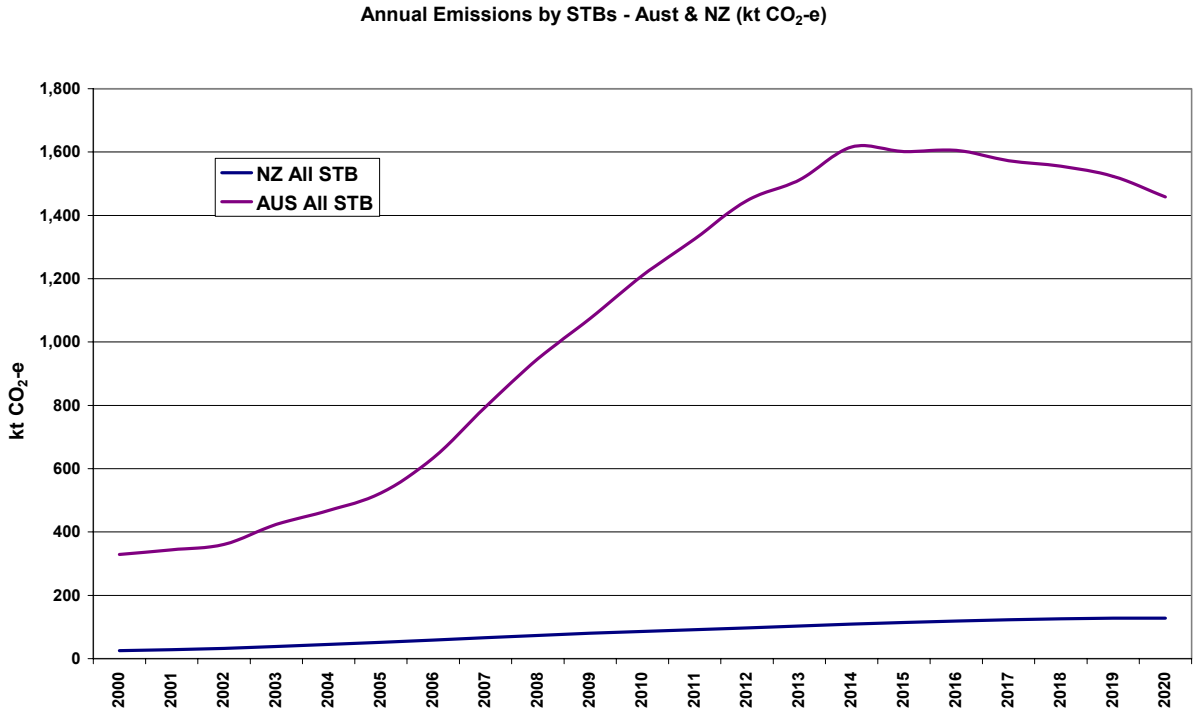
The Problem

In Australia, it is planned to phase out analog TV from around 2010 and an estimated 15 million TVs will require a STB to receive digital TV. There are an estimated 3.9 million STBs, including Subscription TV STBs, operating in Australian households in 2006.

In New Zealand Free-to-Air digital TV transmission is being launched in May 2007, with analogue TV transmission to be switched off in 2015. In 2006 there were an estimated 575,000 subscription STBs used in New Zealand and it is expected that by 2010 Free-to-Air STBs will total 400,000. There are 2.8 million TVs in New Zealand which will all require STBs in 2015.

The annual direct and indirect electricity consumption of all STBs for the year 2006 has been estimated to be 620 GWh/yr in Australia. The net energy resulting from the use of STBs is projected to grow to over 1,700 GWh by the year 2016. Currently the overall electricity used by STBs accounts for nearly 1.5% of total household electricity usage. The share of STB energy in overall household energy is expected to rise to 2.6% by 2010. Similarly the share of STBs in overall electricity-related GHG emissions is expected to grow from 0.35% in 2006 to 0.85% in 2015. The figure following provides the estimated annual BAU GHG emissions by STBs in Australia & New Zealand to 2020.

Annual BAU GHG emissions by STBs – Australia & New Zealand



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 supplier to give any serious consideration to energy efficiency.

STBs are expected to become "high volume low profit" products. 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 passive standby power use has been increasing over the last 3 years. In the UK market this trend has also been observed (Harrison 2004)

The Objective

The objective of the proposed strategies for STBs 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 MEPS that cover STBs suitable for free-to-air (FTA) broadcast TV and subscription (or pay) TV from 1 April 2008. The regulation that would stipulate the maximum power levels for these products in order to be sold on the Australian and New Zealand market. MEPS aim to remove the worst performing products from the marketplace, rather than promoting the best. The maximum power levels for the MEPS are based on the existing requirements used by the voluntary agreement provided under the European Code of Conduct (CoC) and the mandatory requirements for digital television adapters in California.

The proposed MEPS includes requirements for passive standby, active standby and in-use modes, separate requirements for standard definition and high definition STBs as well as free-to-air and subscription TV services. The maximum power levels for MEPS are based on the power consumption of a basic platform configuration. The MEPS for a particular configuration of STB is made up of this maximum power level and an allowance for additional features.

Assessment

In the analysis two annual sales growth scenarios have been analysed

- a base sales scenario that is used for the CBA and provides a total of 15 million STBs by 2016; and
- a low sales scenario that considers increasing shares of competing digital receiver technologies, such as integrated digital TVs and digital personal video recorders, with approximately 7 million STBs in use by 2016.

Australia

The following table summarises the analyses for Australia for the period 2008 to 2020. The data presented is based upon valuations at marginal electricity tariffs and 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)	4,339 GWh	2,613 GWh
GHG Emission Reduction (cumulative)	4.1 Mt CO_2-e	2.5 Mt CO_2-e
Total Benefit	$174M	$108M
Total Investment	$6.7M	$5.1M
Benefit-Cost Ratio	25.9	21.0

Even at a higher discount rate of 10%, for the base and low sales scenario, benefit-cost ratios are positive at 23.5 and 19.3 respectively. If the incremental costs of improved STBs to meet the MEPS are increased to 3 times the values assumed in the CBA analysis, the benefit are still approximately 10 times the costs.

New Zealand

The following table summarises the analyses for New Zealand for the period 2008 to 2020. The data presented is based upon valuation at the marginal electricity tariff and 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)	463 GWh	407 GWh
GHG Emission Reduction (cumulative)	278 kt CO_2-e	244 kt CO_2-e
Total Benefit	$17.2M	$15.3M
Total Investment	$0.50M	$0.55M
Benefit-Cost Ratio	35	29

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 financial instruments;
- 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 are not worthy of consideration until such time as government policy changes to favour levy schemes.

Certification is unlikely to succeed as the energy efficiency certification of a STB 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 STBs, the benefit to the consumer of selecting a higher star rated product compared to the standard STB 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 for STBs in regulation.
2. That STBs covered by this CBA include those without a recording function (i.e. without a hard drive).
3. To the test method AS/NZS 62087:2004 which specifies methods of measurement for the power consumption of, amongst other home entertainment equipment, STBs for consumer use.
4. That STBs must meet or surpass the energy performance requirements set down in the draft Australian and New Zealand Standard AS/NZS 62087.2 (MEPS requirements for digital television STBs). A copy of the committee (TE-001 and TE-001-08) draft standard is attached as Appendix 10 at p A-36.
5. That the amendments take effect not earlier than 1 April 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 April 2008.

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1 Scope

1.1 General

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 state 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 council of Australian, State, Territory and New Zealand energy ministers. Regulatory interventions such as mandatory energy labelling and mandatory minimum energy efficiency performance standards (MEPS) have been regarded as necessary to achieve the objectives of both increasing energy efficiency and reducing greenhouse gas emissions of appliances. Such interventions also are needed to address the market failure regarding the provision of life-time cost information for appliances.

The Equipment Energy Efficiency Program (referred to as just "E_3"), formerly known as National Appliance and Equipment Energy Efficiency Program (NAEEEP), 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. The implementation of E_3 is overseen by the Equipment Energy Efficiency Committee (referred to as the "E_3 Committee"), which comprises officials from Commonwealth, State and Territory Government agencies as well as representatives of the New Zealand Government. The E_3 Committee is ultimately responsible to the Ministerial Council on Energy (MCE) comprising ministers responsible for energy from all jurisdictions.

E_3 is a collection of coordinated end-use energy efficiency programs that deliver economic and environmental benefits to the community, typically via market intervention programs that include MEPS and mandatory energy efficiency labelling (star ratings). Analysis of E_3's achievements during 2004 has shown significant reductions in greenhouse gas emissions at a net present value of minus $23 per tonne of CO_2e.

This Cost-Benefit Analysis (CBA) is being released by the E_3 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 E_3, 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 savings made over the lifetime of the product.

This CBA has also been prepared within the scope of E_3.

1.2 Digital Set-Top Boxes

Digital Set-Top Boxes (STB) became available for free-to-air (FTA) TV in Australia in 2001 to coincide with launching of digital television. A digital STB may also be referred to as a digital television adaptor, decoder or receiver and is used to convert digital FTA signals and subscription TV (STV) services to a signal compatible with the existing audiovisual display technology, including analog RF, composite video, s-vhs , component video or DVI/HDMI. Digital STBs have been used by the STV service provider AUSTAR since 1995. According to the government digital TV implementation timetable, between 2010 and 2012, most analog FTA TV transmissions will be progressively turned off and Australian households will require a digital STB or TV with an integrated digital receiver to view free-to-air TV broadcasts. With approximately 15 million TVs in Australian households (ABS 2005) several million STBs will be required over the next decade.

Energy consumption from STBs in 2012 is estimated to be almost 1,500 GWh/yr 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.

STBs were among a group of products identified for immediate action in the standby power program. As very few STBs 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 in not used 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 STBs, however comments received on this plan suggested that mandatory regulations that examined all modes of use, including on mode, 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. STBs used for the conversion of Digital TV broadcasts 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 in-use power consumption was identified as a priority due to the large number of STBs that will be potentially left in this mode.

ENERGY STAR

Australia and New Zealand are international ENERGY STAR partners for some office and home entertainment equipment, specifically:

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

ENERGY STAR is a voluntary program whereby conforming products are required to meet ENERGY STAR criteria. 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, NAEEEC 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, Standards Australia published AS/NZS 62301 Household Electrical Appliances—Measurement of Standby Power (a clone of IEC CDV draft). It is

also planned to add separate parts to the standard with test procedures specific to individual products.

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, STBs themselves have become a high priority due 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 officers 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.

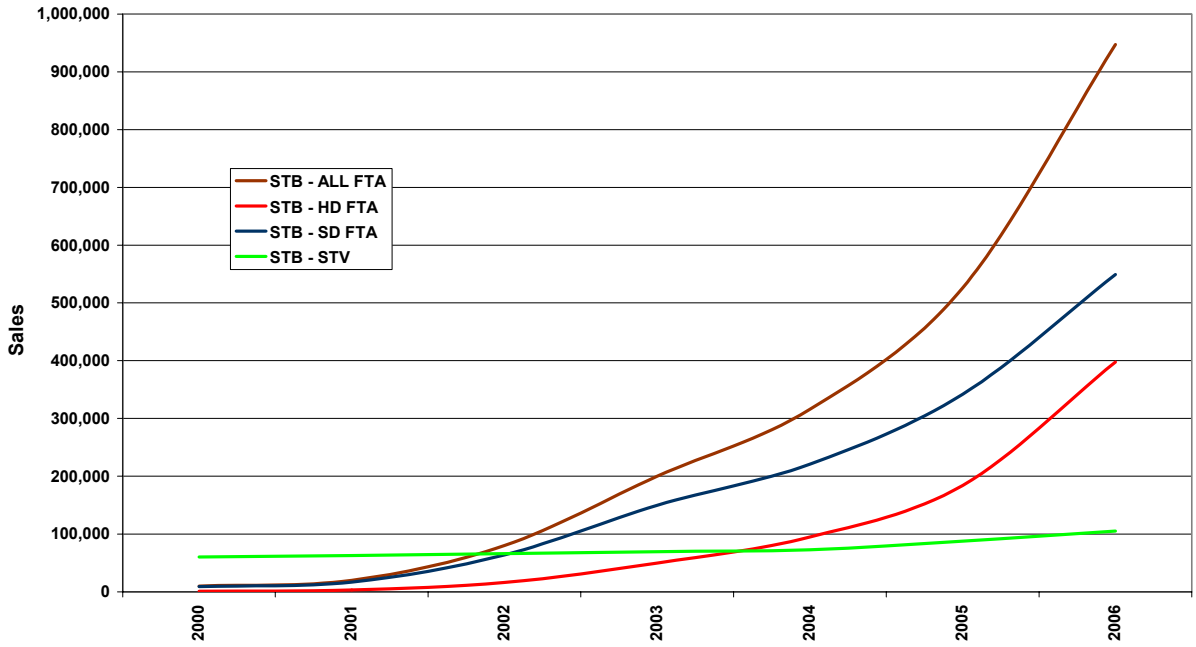
1.4 STB Market

STBs are sold to provide two functions, these being to convert Free to Air Digital TV signals into a format suitable for analog television sets or to provide a decoder service for Pay TV subscribers to allow them to access the pay TV services. The market for both types of STB is growing.

The sales of terrestrial Free to Air STBs are increasing rapidly, with sales estimated at over 500,000 in 2005, and predicted to grow to 900,000 by the end of 2006 (DBA 2007). The total penetration of Free to Air Digital TV in households is 20% of Australian homes. Analog TV services are to be phased out from 2010, signifying STBs will certainly increase their market share. It is expected that millions of STBs will be required over the next decade with the majority sold in the next 5 years. Unless the consumer makes the decision to purchase a TV capable of receiving digital TV transmissions, a STB will be the only option available for those who have an existing analog TV after analog services are phased out.

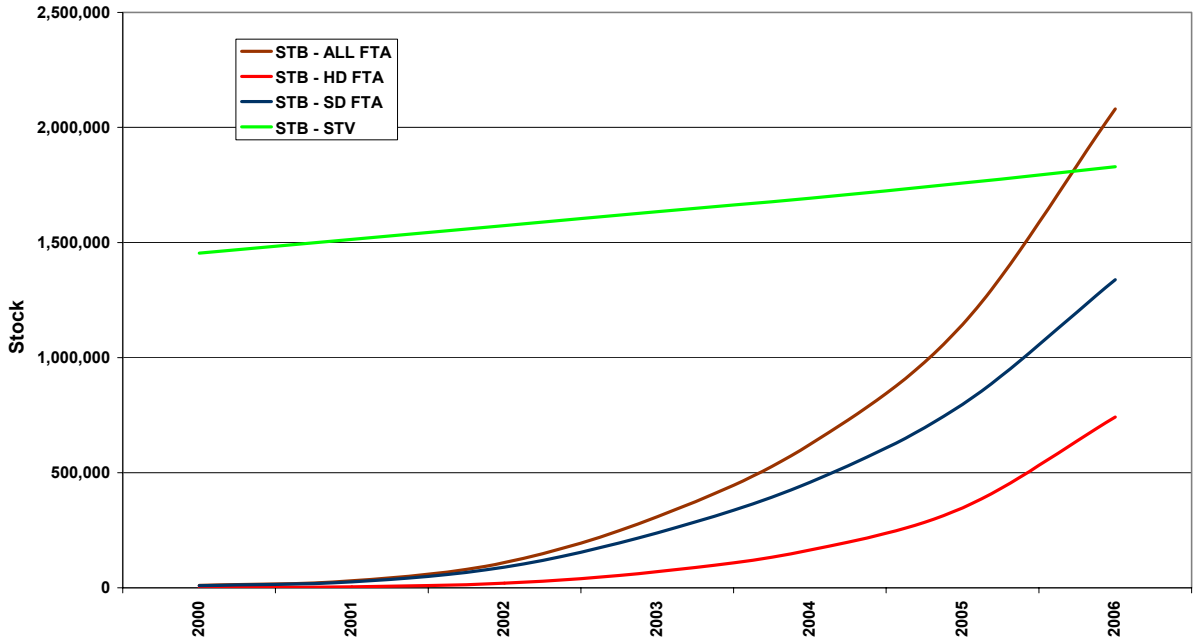
The total number of Pay TV subscribers is 1,841,000 as of June 2006 (AFC 2006). Over 1.27 million are with Foxtel/Optus and approximately 470,000 with Austar. While Austar have in place a digital platform, Foxtel have substantially converted their system to digital, with a change over to their digital STB for existing subscribers and all new subscribers. Both Foxtel and Austar supply STBs with the subscription TV service and the type of STB being provided varies depending on the date the subscriber joined or upgraded their service. Total annual sales of STBs are shown in Figure 1, with Free-to-Air (FTA) STB shown separately for Standard Definition (SD) and High Definition (HD) STBs.

Figure 1: Annual Sales of STB – Australia



The total installed stock of STBs in Australia is shown in Figure 2, with FTA STB shown separately for SD and HD STBs.

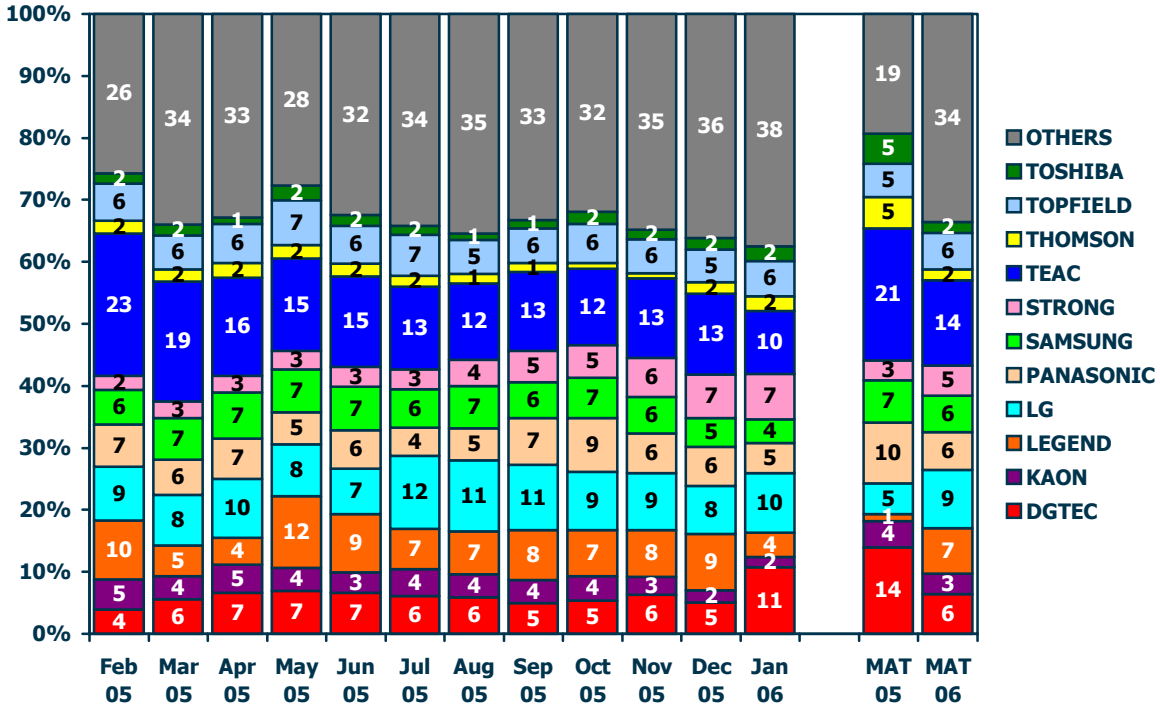
Figure 2: Total Installed Stock of STB – Australia



1.5 Australian Market Players

In general the major companies supplying STBs in Australia for the FTA TV market are the established brand names such as Sony, Panasonic, LG, TAEC and Samsung. However the structure of the market in Australia is changing rapidly with a larger number of smaller suppliers having a large market share as shown in Figure 3.

Figure 3: STB Brand shares in Australia



Source: GfK Infomark. Digital Set Top Box Report , January 2006

From Figure 3 it is evident that 66% of the market is supplied by 11 suppliers. The other 34% is actually supplied by at least 21 identifiable other suppliers. Many of these other suppliers, and indeed a number of the 11 larger suppliers, are in fact traders who source existing product from various OEM (original equipment manufacturer) manufacturers.

The latest Foxtel STB is provided by Pace Micro Technology plc, who are signatories to the EC Code of Conduct for Digital TV Services. There are a number of major suppliers of STBs for AUSTAR. However both STV service providers undertake competitive tenders for the supply of STBs and hence suppliers may change in the future.

The New Zealand Market

New Zealand STBs are mostly provided by Sky and Telstraclear for subscription TV with Sky dominating the market. There are 575,000 set top boxes in New Zealand households

of which about 570,000 are from Sky. The latest Sky STBs are Pace models which claim to meet the proposed MEPS. Free to Air digital TV transmission in May 2007 will expand the market significantly with 400,000 FTA STBs expected to be in use by 2010.

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 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 federal, 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's and New Zealand's climate change strategies.

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 STBs will be almost 1,500 GWh/yr with current business as usual conditions. This level of energy consumption is about twice the projected 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.

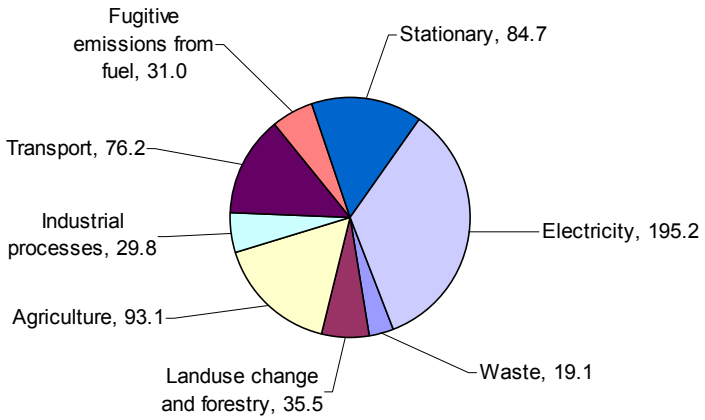
In late 2002 the Ministerial Council on Energy in Australia launched a 10-year strategy to deal with excessive standby electricity consumption (MCE 2002). As part of this strategy, STBs were initially identified for voluntary targets for standby power consumption; however industry groups requested that the government consider mandatory requirements. Furthermore, the regulation of in-use power consumption was identified as a priority due to the large number of STBs that will be potentially left in this mode.

In Australia, it is planned to phase out analog TV from around 2010 and an estimated 15 million TVs will require a STB to receive digital TV. A study of the potential policy options for STBs (EnergyConsult 2004) recommended regulating the maximum in-use and standby power consumption of digital Set Top Boxes (STB) from 2006.

2.1 Energy and Greenhouse Gas Emissions

Figure 4 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_2-e (NGGI 2004). The electricity sector represents the greatest contribution to Australia's greenhouse gas emissions, as illustrated in Figure 4.

Figure 4: Australian Greenhouse Gas Emissions by Sector 2004 (Source: NGGI 2004)



Electricity generation accounted for 195.2 Mt C02-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.

2.2 Contribution of STBs to Energy Use and Emissions

Like any electrical appliance, the contribution of STBs 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 3.9 million STBs, including Subscription TV STBs, operating in Australian households. This number is expected to reach a plateau of around 15 million by the year 2016 or earlier depending on how rapidly the analog system is switched off. , After 2016 it is expected the stock of STBs will decline due to technological developments that will enable digital tuners to be integrated within television sets. Although other factors may influence the sales and penetration of STBs to continue to increase, such as additional digital TV services that require consumers to obtain a new STB. These factors are discussed in more detail in Section 5.5 under Sales Forecasts, where a Low Sales scenario is modelled.

The net annual energy consumption of all STBs for the year 2006 has been estimated to be 620 GWh/yr. The net energy resulting from the use of STBs is projected to grow to over 1,700 GWh by the year 2016. The net energy consumption is the arithmetic sum of the direct and indirect energy. *Direct* energy use is the energy used by the STB, while *indirect* energy is the energy used or displaced by the heating/cooling systems as a result of the heat generated from the STB in the buildings that STBs 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 STB is shown in Figure 5 for Australia and Figure 6 for New Zealand. Figure 7 provides the estimated GHG emissions by type of STB in Australia.

Table 1: Net annual BAU energy consumption of all STBs by States, Australia as a whole and New Zealand (GWh)

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	90	4	78	35	6	70	50	**333**	**42**
2001	94	4	81	37	6	73	53	**348**	**47**
2002	100	4	86	39	6	78	56	**369**	**55**
2003	109	5	94	43	7	85	61	**403**	**64**
2004	121	5	104	47	7	94	67	**446**	**75**
2005	138	6	119	54	9	108	77	**511**	**86**
2006	167	7	145	65	10	131	94	**620**	**99**
2007	207	9	179	81	13	162	116	**767**	**111**
2008	250	11	216	98	15	195	140	**924**	**122**
2009	292	13	253	114	18	228	163	**1,081**	**133**
2010	332	14	287	130	21	259	186	**1,228**	**143**
2011	368	16	318	144	23	287	206	**1,362**	**153**
2012	399	17	345	156	25	311	223	**1,477**	**162**
2013	426	19	369	167	26	333	238	**1,577**	**172**
2014	446	19	386	174	28	348	249	**1,651**	**181**
2015	459	20	397	179	28	358	257	**1,698**	**190**
2016	465	20	403	182	29	363	260	**1,723**	**198**
2017	467	20	404	183	29	365	261	**1,730**	**204**
2018	465	20	402	182	29	363	260	**1,721**	**209**
2019	459	20	397	180	28	358	257	**1,699**	**213**
2020	446	19	386	175	28	348	249	**1,651**	**212**

Figure 5: Net annual BAU energy consumption by STB Categories - Australia

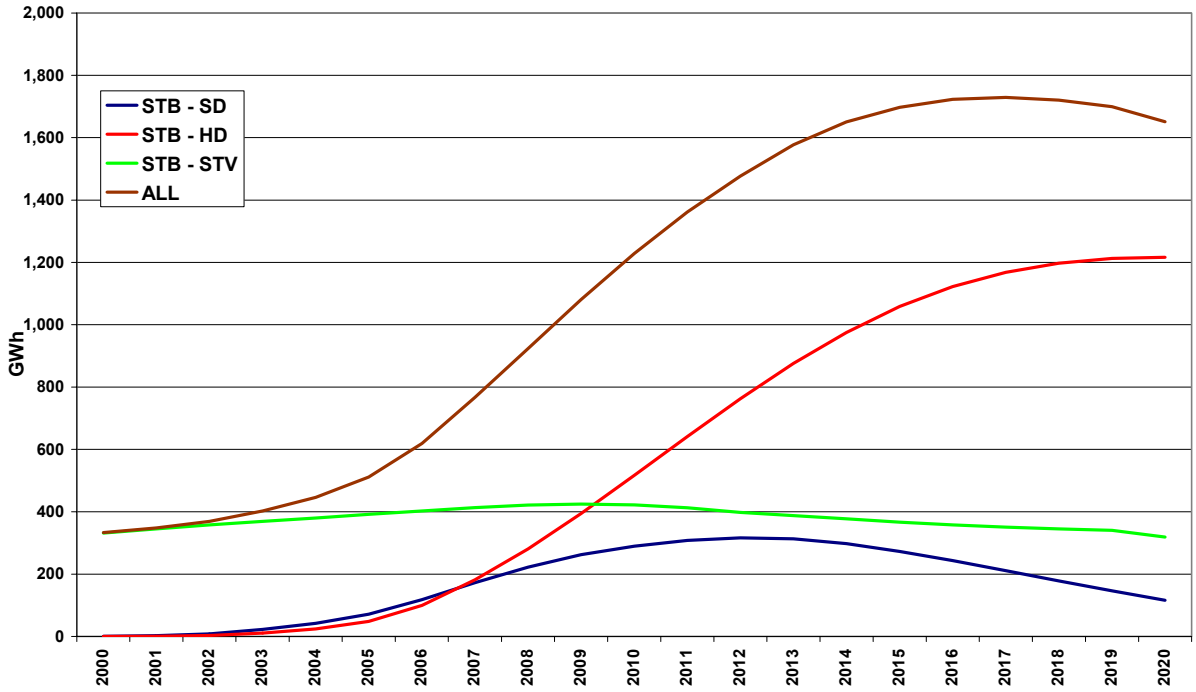
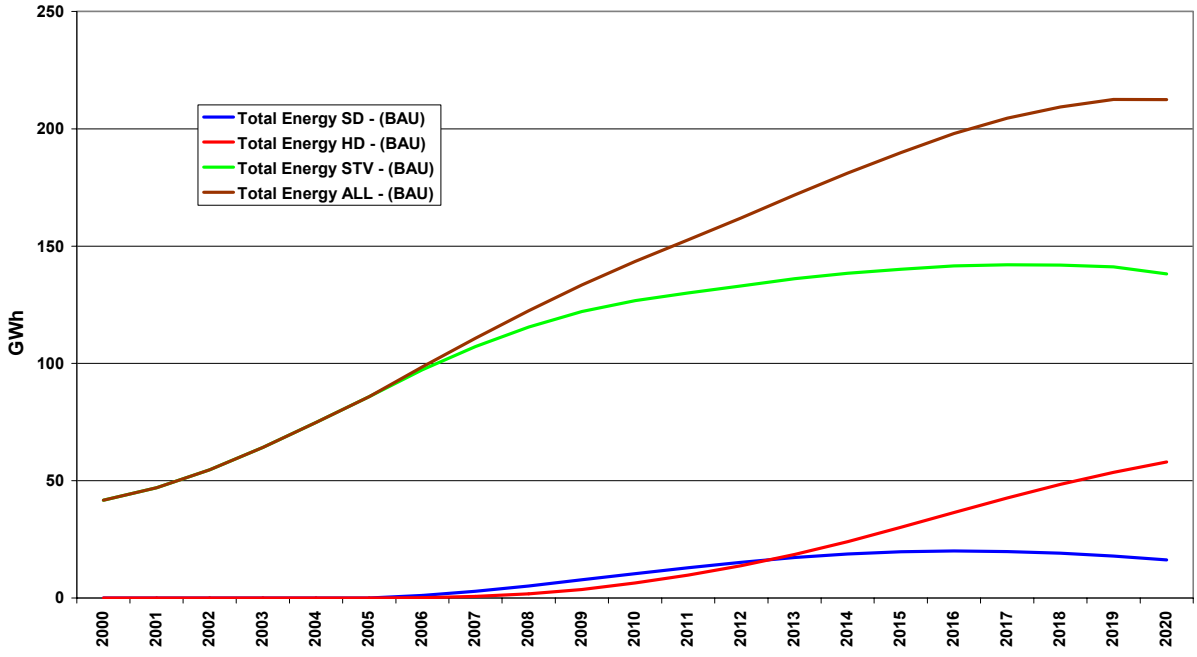


Figure 6: Net annual BAU energy consumption by STB Categories – New Zealand



It is evident from Figure 5 and Figure 6 that the rapid growth in net annual energy, which is closely related to annual sales, starts building up from 2006 (3-4 years from the expected phase out of analog TV transmission) that matures around 2015-16, when the analog TV transmission is expected to be completely phased out in both Australia and New Zealand.

Figure 7: Annual BAU GHG emissions by STB Categories – Australia

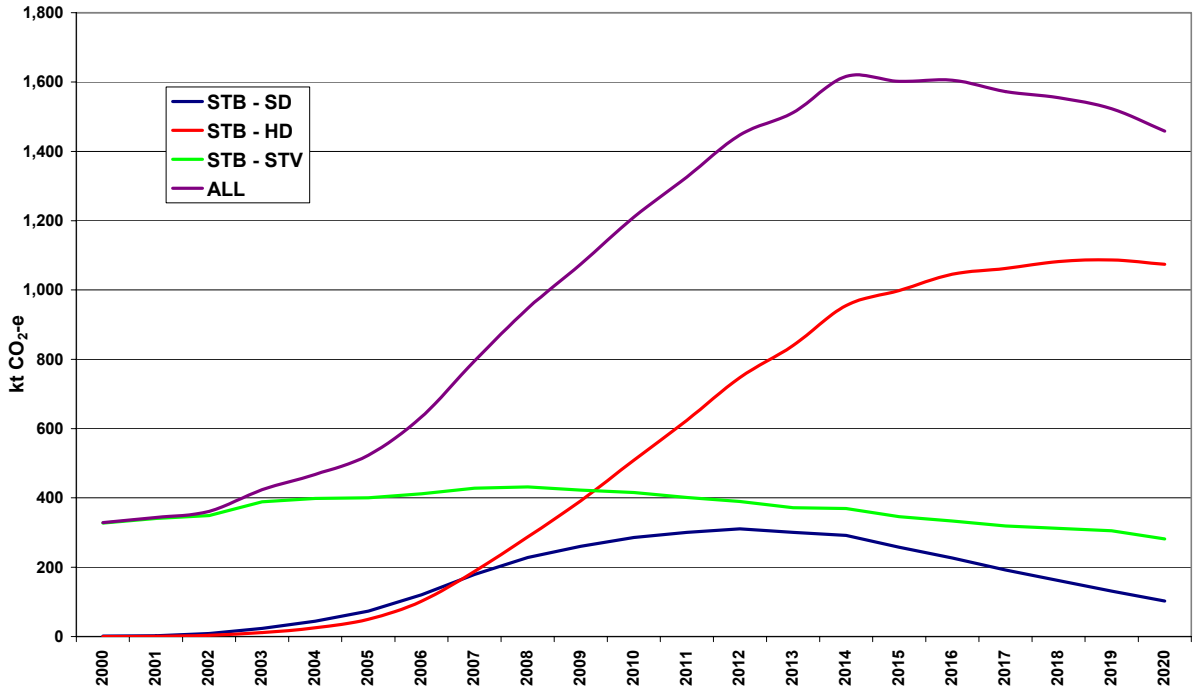
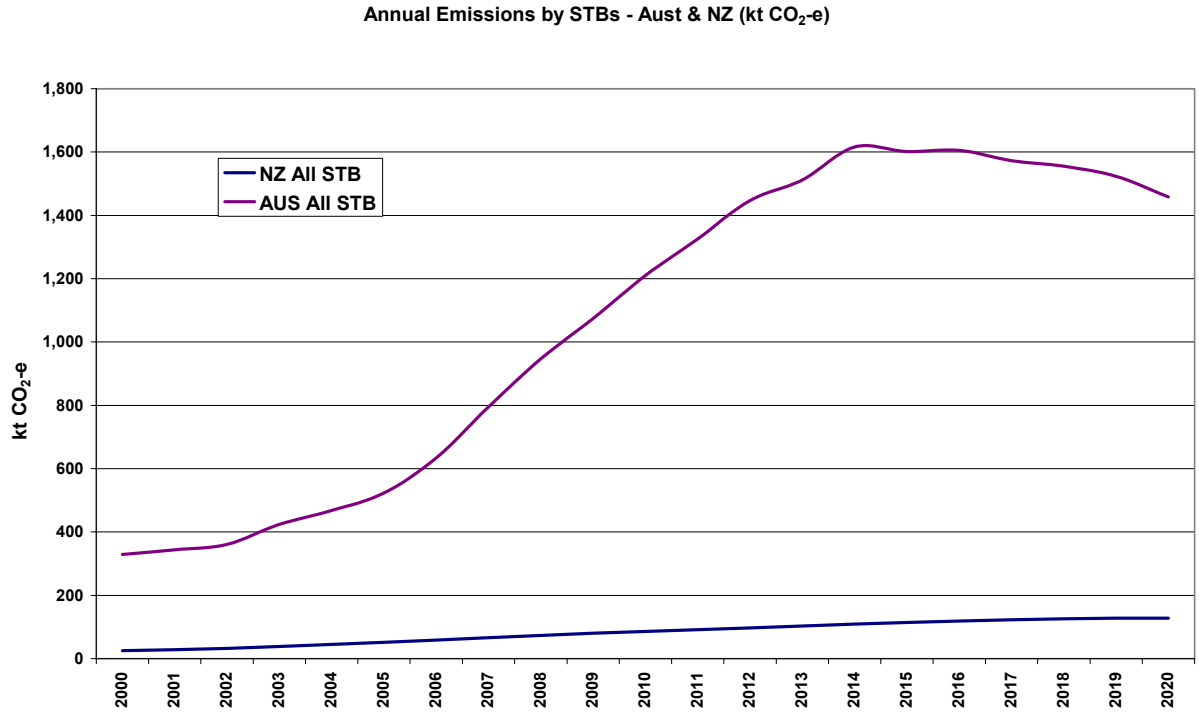


Figure 8: Annual BAU GHG emissions by STBs – Australia & New Zealand



Currently the overall electricity used by STBs accounts for nearly 1.5% of total household electricity usage. The share of STB energy in overall household energy is expected to rise to 2.6% by 2010. Similarly the share of STBs in overall electricity-related GHG emissions is expected to grow from 0.35% in 2006 to 0.85% in 2015.

2.3 STB Technologies and Energy Efficiencies

STB Technologies

Digital STBs first became available for FTA TV in Australia in 2001 to coincide with the launching of digital television. A digital STB may be referred to as a digital television adaptor, decoder or receiver. Essentially a digital set-top box is a device that acts as a decoder; it captures a digital signal and converts it into a signal compatible with the existing audiovisual display technology, including composite video, s-vhs or component video, and more recently digital video outputs such as DVI and HDMI. Additionally, STBs can be distinguished by the way they capture signals i.e. via the television antenna (terrestrial), cable or satellite. STBs also are available as standard definition STB (SD) and high definition STB (HD). The difference between these products is that a HD STB connected to an HD display device will enable the user to view high definition and standard definition video.

Set top boxes can be used for receiving terrestrial broadcast TV or subscription/pay TV services delivered via cable or satellite. The STBs for pay TV are usually supplied with

the pay TV service and are configured differently to STBs for digital terrestrial broadcast TV. The two major Australian pay TV service providers are Foxtel and Austar. All new pay TV services in Australia are now digital, since the conversion of the Foxtel network. Austar have been providing digital satellite pay TV since the service began in 1995. The STBs used for digital pay TV require security features to ensure that users are subscribers to the service. In addition pay TV STBs typically download the program guide and other software on a regular basis and some allow interaction with the service provider (i.e., selection of pay-per-view services) by modem uplink to the service provider.

STBs can have a range of options, from the basic box, which allows the user to watch digital TV channels, to those that include extra options such as interactive services like email and home shopping. These options are accessed through features such as multi-channelling, basic electronic program guides, closed captions, the ability to receive data and Dolby Digital surround sound. A STB may also include a hard disk for recording and playing back programs, however these are not being considered in the scope of these CBA options. Also excluded from the scope of this CBA are integrated digital televisions (IDTV) which include an integrated receiver and decoder (IRD). These products will be addressed separately in the proposals for TVs.

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 STBs

Digital STBs available in Australia and New Zealand generally have three operational modes: ON mode, active standby mode and passive standby mode. Some STBs also have an OFF mode. The definitions shown in Table 2 are based on international definitions and are those proposed to be used in Australia by AS/NZS 62087.2:200X.

Table 2: Definition of Power Modes

Mode	Definition
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 fulfil 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 fulfil 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 of a STB, 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 STBs, the way ON mode

functions means the in-use status has similar power usage characteristics to the **active standby mode.** STBs can be left in this in-use or active standby mode for extended periods either while producing no visible output or while the connected display device is turned off or in passive standby. The **passive standby mode** is a standard feature of STBs 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 STBs 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, the E3 Committee has commissioned store surveys of products available for sale in major retail stores. 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 digital STBs being new to the market, products have only been measured since January 2003.

Set top boxes were measured in 2003 but were not reported on as only four models were found. In the latest survey undertaken over 2005/06, 24 different models were measured. The average load when in use/active standby was 13.2W with a minimum of 6.6W and a maximum of 20.9W. In passive standby mode of 23 units, the load was measured ranged from 2.2W to 19.4W. The average passive standby load was 9.5W. Only six set top boxes had an off mode. All of these consumed zero watts in this mode. Table 3 summarises these results.

Table 3: Digital Set Top Box Measurements: Survey 2005/06

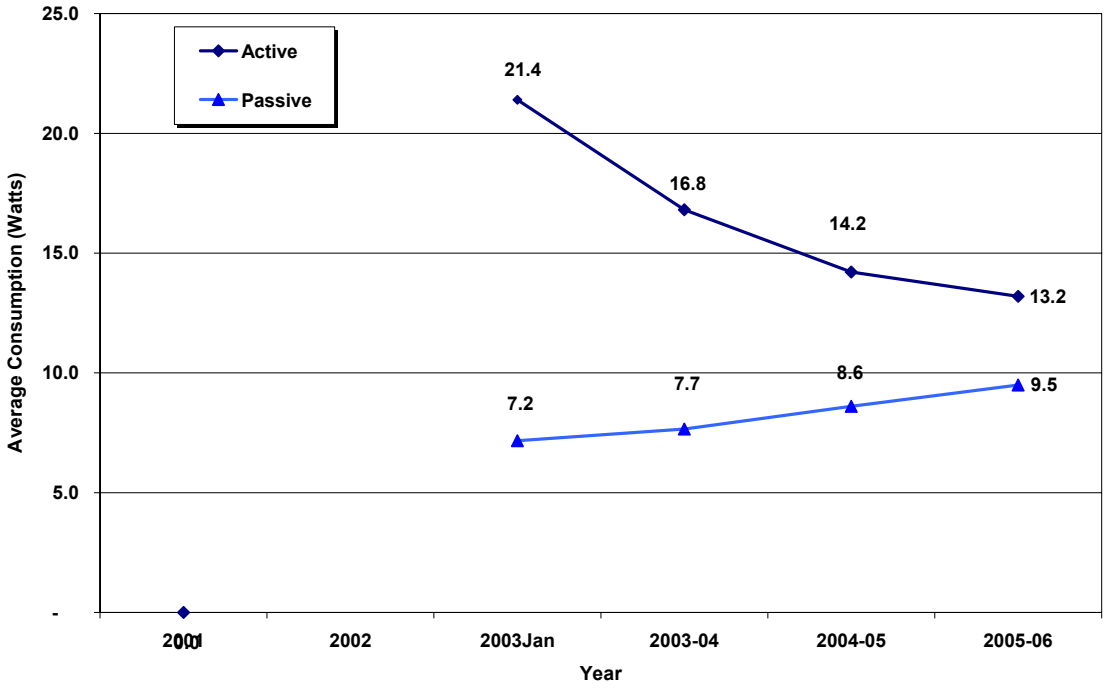
Mode	Number of Measurements	Average Power (W)	Power Max (W)	Power Min (W)
In Use/Active	24	13.2	20.9	6.6
Passive	23	9.5	19.4	2.2
Off	6	0.0	0.0	0.0
Total Number of Units	**24**			

In most electronic equipment key areas of energy loss are the power supply transformer, electrical motors or other mechanical mechanisms, lighting and light emitting diodes (LEDs), electromagnetic components, e.g. speakers and repays, and some electronic components such as transistors, etc. A number of factors contribute to the energy consumption and energy loss by STBs. 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 STB by power managing the supply to different circuits depending on conditions and external

signals/controls. Consequently the power use of STBs in active, passive and off mode varies significantly between different models as shown in Table 3.

Figure 9 shows the average power consumption of STBs over the four surveys. The average power of STBs in active standby mode has been trending lower; however the average power use in passive standby mode has been trending higher.

Figure 9: Power measurements for digital STBs: on/active mode



The trend to increasing power consumption in passive standby mode is leading to increased overall energy usage of STBs as they are usually in that mode for longer periods of time. The trend shows that the power consumption of STBs does not alter, or only decreases by 1 or 2 W when the unit is put in passive standby mode. This indicates that suppliers are not designing the STB to effectively manage the power use, or not enabling the power management functions that are provided by the integrated circuit suppliers.

Testing Standards for STBs

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.

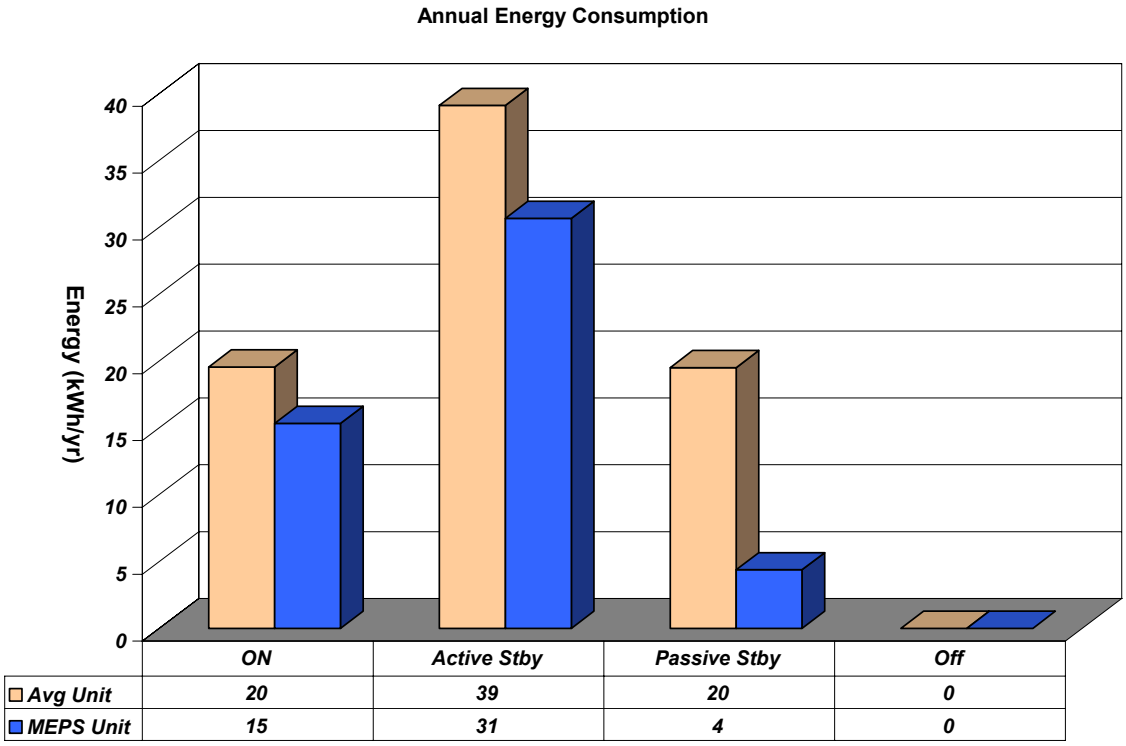
2.4 Assessment of Market Deficiencies and Failures

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 supplier to give any serious consideration to energy efficiency.

STBs are expected to become "high volume low profit" products. 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 passive standby power use has been increasing over the last 3 years. In the UK market this trend has also been observed (Harrison 2004). These STBs with low standby power consumption were available in the market in the UK previously, however manufacturers report that cost pressures have meant they had to forgo energy management features to compete (EC 2006). In discussions with UK experts, they have also suggested that many of the STBs have integrated circuits that have power management built-in, however designers have not paid attention to utilising these features.

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 many 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 connected to the reception medium (FTA TV or STV services) in order to download program updates/guides. Figure 10 shows the energy consumption of an average SD-STB and a STB that is MEPS-compliant when in-use, active and passive standby and off mode. As the figure demonstrates, 75% of the energy consumption occurs when the product is not being used. The MEPS-compliant STB saves 40% of the standby power alone compared to the average STB.

Figure 10: Annual Energy Consumption per STB: Average vs. MEPS-compliant



These figures and the evidence from overseas markets shows the market deficiencies in the current STB market, where consumers are not able to consider the life cycle costs of the product (Siderius 2006).

3 Objectives of Strategies

3.1 Objective

The objective of the proposed strategies for STBs 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.

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

4.1 Status Quo (BAU)

Net energy consumption from all types of STB's in Australia is currently estimated to be approximately 620 GWh per annum, equivalent to annual greenhouse emissions of 630 kt CO_2-e in 2006. If the current market and technology trends continue, the net energy resulting from the use of STBs is projected to grow to over 1,700 GWh 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 STBs. Detailed projections of sales are provided in Section 5.5, while Appendix 5 and Appendix 8 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.

Table 4: BAU Usage and Power Consumption by STB/Mode and Year for Australia

STB Category by Mode of Operation	Hours Usage	Weighted Average Power Consumption (W)				
Year	All	2000	2005	2010	2015	2020
STB - SD (ON)	6.0	12.0	9.6	8.5	8.5	8.5
STB - SD (Active Stby)	12.0	11.6	9.6	8.5	8.5	8.5
STB - SD (Passive Stby)	6.0	8.5	9.5	8.5	8.5	8.5
STB - SD (Off)	0.0	0.02	0.02	0.02	0.02	0.02
STB - HD (ON)	6.0	23.0	16.0	14.0	12.0	11.0
STB - HD (Active Stby)	12.0	23.0	16.0	14.0	12.0	11.0
STB - HD (Passive Stby)	6.0	10.0	10.0	10.0	10.0	8.0
STB - HD (Off)	0.0	0.04	0.04	0.04	0.04	0.04
STB - STV (ON)	6.0	25.0	20.0	18.0	15.0	15.0
STB - STV (Active Stby)	18.0	25.0	20.0	18.0	15.0	15.0
STB - STV (Passive Stby)	0.0	7.50	7.5	7.50	7.50	7.50
STB - STV (Off)	0.0	0.00	0.00	0.00	0.00	0.00

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 more than 10% for SD STBs in Active/ON and passive mode and 30% for HD STBs in Active mode form 2005, reflecting the natural rate of technology improvements for these devices. Based on technology trends, passive standby power consumption is forecast to remain relatively static for HD STBs. The BAU power consumption of STV STBs is also forecast to decline by 25% in ON mode. These BAU forecasts are based on conservative assumptions and consistent with observed power consumption measurements since 2002 (EES/EC 2002-2006).

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.

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 MEPS to have a significant impact on the energy efficiency of the products entering the market. Australia has over 40 STB suppliers and the number 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 STBs.

There are two major international examples of voluntary efficiency standards – US ENERGY STAR and the European Union Code of Conduct (EU CoC) 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 the UK STB market, where the Code of Conduct has been operating for some four years, the latest results from measurements of set-top boxes show the average standby passive consumption is 6.5 W. This is further compounded by the discovery that some manufacturers that have signed up to the Code of Conduct still produce boxes that do not comply with the Code of Conduct (EC 2006). In addition, the US ENERGY STAR currently does not cover STBs, which reduces its relevance. At the time of writing ENERGY STAR has released

draft criteria for STBs, but the successfulness of the program will still be limited due to its voluntary nature.

Neither of the major international programs can therefore be considered to present an effective approach to the use of voluntary efficiency standards for STBs or evidence as to why voluntary efficiency standards would be effective in Australia and New Zealand.

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 a STB is unlikely to be the primary driver of the purchase decision for the vast majority of consumers. For a voluntary certification program for STBs 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 the STB, 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 a community service. The participation in 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 and even smaller segment of people concerned with environmental issues and energy conservation.

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 Financial Instruments

One way of increasing the uptake by the market of more energy efficient STBs is to increase the purchase cost or operating costs of the inefficient STBs from the consumer's perspective. This can be done by raising the price of the STB equipment via a levy or by raising the price of the energy the STB consumes. Both options will be discussed.

Equipment Levy

The equipment levy involves imposing upon inefficient STB models a levy which would raise the prices of the inefficient STB models. The funds raised could be used to fund programs which would reduce the greenhouse impact of using the STB equipment. 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 as scheme could be justified in terms of its impact. It is also understood that the use of such levies are not currently government policy, so this option will not be considered further.

Electricity Levy

At present, 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 STBs. 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 STBs.

There is already considerable public debate about the need to impose a government levy or 'carbon tax' on the price of non-renewable energy, or to introduce an emissions trading scheme which would have the same effect, as at present energy prices do not reflect the environmental costs of the greenhouse gas emissions caused by the consumption of energy. 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 use of more extensive schemes, such as a carbon tax or a cap and trade greenhouse emissions trading scheme, could lead to the full cost of the greenhouse gas emissions impacts being reflected in energy prices.

The introduction of a carbon tax or trading schemes is not current government policy but even if such schemes were introduced it is unclear that such schemes alone would impact on the energy efficiency of STBs. The energy price rises that might flow from the introduction of carbon tax or trading schemes are unlikely to quickly lead to consumers being concerned about the energy efficiency of small appliances like STBs and consumers would still lack information on the energy usage of the STBs even if they were more concerned. Consequently a government levy on electricity or emissions trading on its own is unlikely to affect STB 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 many cases, any benefit in terms of reduced energy consumption relies upon the selection of the appliance by the consumer.

If labelling were applied to STBs, the benefit to the consumer of selecting a higher star rated product compared to the standard STB may not be sufficient to influence the decision, as the difference in running costs are currently between $4/yr to $6/yr pa. For STV STBs, the consumer does not have a choice of STB as they are provided by the STV service provider.

Australian energy performance labelling originated by aiming at larger home appliances commonly known as whitegoods. Consequently the label is large in design to provide effective visual impact on the buyer. The size and design of labels under 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 existing labelling scheme. Any new design and development initiative would be likely to cover a number of products other than just STBs.

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 performance standards (and so is a voluntary label). The impact of this program is not well known in Australia but is probably not as effective as in the United States due to the relatively low profile of the ENERGY STAR brand here and the lower penetration of conforming appliances.

Conclusions

Mandatory Energy labelling for STBs 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 State and Territory or New Zealand legislation. These requirements apply to products covered by the standard which are sold in Australia and New Zealand.

A proposed MEPS that covers STBs suitable for free-to-air (FTA) broadcast TV and subscription (or pay) TV (STV) 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 Code of Conduct (CoC) and the mandatory requirements for digital television adapters in California. This Australian/New Zealand MEPS is tailored to mirror international requirements, while being moderated to address local industry technical issues. Detailed consultation was conducted with the local

industry and specific requirements were developed to provide for Australian and New Zealand subscription TV services and high definition broadcasts.

The proposed MEPS includes requirements for passive standby, active standby and in-use modes, separate requirements for standard definition and high definition STBs as well as free-to-air and subscription TV services. The maximum power levels for MEPS are based on the power consumption of a basic platform configuration. The MEPS for a particular configuration of STB is made up of this maximum power level and an allowance for additional features. Finally, the total allowable power consumption for a STB is not to exceed a specified amount, regardless of the number and type of features that are included in the STB. The proposed regulation also includes a high efficiency level that can provide recognition for those devices that automatically switch to passive standby after 4 hours of non-use and no user activity or that utilise a HDMI connection (which provides for automatic switching of the STB and the display device).

To meet the proposed MEPS, a FTA STB shall meet either the Option 1 or Option 2 conditions shown in Table 5 for either High Definition, Standard Definition FTA STB or STV STB as applicable. Compliance with MEPS is determined by taking the maximum platform allowance (MPA) according to features included in the applicable basic platform as shown in Table 7, adding the additional features allowance (AFA) as specified in

Table 6, if applicable, and ensuring that the total of MPA plus AFA is no greater than the maximum power level (MPL), as shown in the formula below:

MPA + AFA ≤ MPL

Where MPA is Maximum Power Allowance
AFA is Additional Features Allowance
MPL is Maximum Power Limit

Table 5: Maximum Power Levels for STB (From AC Supply)

Product type		Passive standby–Max power (W)	Active standby–Max power (W)	On mode –Max power (W)
			MPA/MPL	MPA/MPL
FTA SD STB	Option 1	1.0 W	8 W/15 W	8 W/15 W
	Or Option 2	2.0 W	7 W/15 W	7 W/15 W
FTA HD STB	Option 1	1.0W	12 W/19 W	15 W/22 W
	Or Option 2	2.0W	11 W/19 W	14W/22W
STV STB		Not Used	9 W/15W	Not Specified

Table 6: Additional Power Consumption Allowance

Feature	Additional power consumption (Active Standby Mode)	Additional power consumption (On Mode STB FTA only)
SCART Port	1.0 W	1.0 W
IEEE1394 interface	0.8 W	0.8 W
Ethernet interface 100 Mb	0.4 W	0.4 W
Wireless interface	2.5 W	2.5 W
SPDIF port	0.1 W	0.1 W
Serial USB interface (low power mode)	0.3 W	0.3 W
Home automation interface	0.4 W	0.4 W
Broadband (ADSL) modem	2.7 W	2.7 W
Cable modem	2.7 W	Not applicable
LNB/masthead amplifier feed	No allowance	No allowance
Additional tuner	2.0 W	2.0 W
Powered remote IR receiver	0.25 W	Not applicable
HDMI	0.5	1 W

The features of a STB specified in the basic platform for use in the proposed MEPS are shown in Table 7.

Table 7: Specification of Basic Platforms of STBS

Functional Block	STB–Free-to-Air (FTA)	STB–Subscription TV (STV)	STB–Subscription TV (STV)
	Terrestrial	Cable	Satellite
Single tuner /demodulator	✓	✓	✓
Single MPEG Decoder	✓	✓	✓
Single LNB feed			✓
Single masthead amplifier feed	✓		
RF Modulator / Loop-through	✓	✓	✓
IR Remote Control	✓	✓	✓
Support for Over-the-air Software Upgrades	✓	✓	✓
Smart Card Interface		✓	✓
RS232 Serial Port	✓	✓	✓
Common Interface / Data port		✓	✓
Support for remote IR Receiver / IR Blaster		✓	✓
PSTN Modem	*	✓	✓

* A PSTN modem is not currently a basic feature of FTA STBs, but may be included for interactivity

purposes in the future.

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 not likely to reduce GHG emissions from BAU. In addition, mandatory labelling is not practical or appropriate for STBs.

The proposed MEPS regime for STBs 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. Many suppliers 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 New Zealand a small number of suppliers dominate the market, while an increase in suppliers is expected with Free to Air TV introduced this year.

In conclusion, the most effective way to reduce GHG emissions for STB is MEPS. This is the option that is subsequently assessed in the CBA 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 STBs.

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 Committee and Standards meetings etc);
- Cost of maintaining a registration and approval capability;
- Random check testing to protect the integrity of the program;
- Costs of producing leaflets and other consumer information; and
- Consultant costs for standards development, market research, RIS, etc.

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

- Salary and overheads for officials administering the program: $50,000 per year;
- Check testing, research and other costs underpinning the program: $75,000 per year, half of it borne by the Commonwealth and the other half by other jurisdictions in proportion to their population, in accordance with long-standing cost-sharing arrangements for E3 Committee 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 STB. This CBA assumes that any increases in STB 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 guide to the calculation of the costs for compliance with the MEPS. The costs of compliance were identified as follows:

- 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 STBs 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 8.

Table 8: 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 STBs in laboratory	$2000/test per model supplied	Testing laboratory
Permission	Complete MEPS registration	16 hours per model supplied	Estimated from other MEPS programs
Record Keeping	Maintain documents for 5 years	8 hours/year per supplier	Estimated from other MEPS programs
Other inputs:		Staff costs $40/hr	*Australian Jobs 2006*

The total costs of business compliance for the MEPS are in proportion to the number of businesses importing/suppling STBs and the number of models of STBs supplied. Overall, some 70 models are currently available, from approximately 40 suppliers, or an average of approximately 2 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. This document's 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 STB MEPS. The total costs calculated are shown in Table 9.

Table 9: Business Compliance Costs for STB MEPS

Category	Task	Costs / business	Costs / model
Education	Train staff, keep up-to-date with regulations	$640	$229
Permission	Test STBs in laboratory	$5,600	$2,000
Permission	Complete MEPS registration	$640	$229
Record Keeping	Maintain documents for 5 years	$320	$114
Total		$7,200	$2,571

These costs represent approximately $180,000 to the suppliers in the first year of MEPS, based on 25 suppliers of STBs. This document's cost-benefit analysis 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 STB supply market, there are estimated to be approximately 40 suppliers; some are specific suppliers of STBs while others are multi-national consumer electronics companies. All STBs 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 STBs, 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 STB MEPS are modelled in the CBA starting at $2.20 in 2007 and reducing to zero by 2015. The estimated incremental cost increase to meet the MEPS requirements ranges from $0.67 AUD (EC 2002) to $6.45 (ACEEE 2004). Recent industry sources note that many of the STB models will be able to meet the MEPS requirements without any increase in costs (Digital CEnergy 2006). Table 10 presents the estimated incremental price increase due to the MEPS requirements by year for the Base scenario modelled in the CBA.

Table 10: Incremental Price Increase Due to MEPS Requirements by Year

STB Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SD	$3.00	$2.60	$2.20	$1.80	$1.40	$1.00	$0.80	$0.60	$0.40	$0.20	$0.00
HD	$3.00	$2.60	$2.20	$1.80	$1.40	$1.00	$0.80	$0.60	$0.40	$0.20	$0.00
STV	$3.00	$2.60	$2.20	$1.80	$1.40	$1.00	$0.80	$0.60	$0.40	$0.20	$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 STB suppliers as a group is neutral. However the STV service providers may choose to absorb these additional costs and not pass them on to their subscribers, as they do not charge the subscriber directly for the STB. The cost-benefit assessment provided in Section 5.4 assumes that the STV service providers recover the costs via an increase in the subscription fee for the service, in the same way that FTA STB suppliers increase the costs of the STB 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 for both the FTA and STV markets.

The supplier's ability to use internationally recognised testing standards reduces the need for testing of STBs for different regions. In collaboration with the US EPA (ENERGY STAR), the European Union, Korea and China, Australia have adopted the IEC 62087 test method.

Trade

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

There are no local manufacturers of STBs in Australia or New Zealand. All units are imported with suppliers either specifying STB designs in their own company or purchasing units from the various contract OEM suppliers. The vast majority of STB 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 and STB suppliers design their own STBs 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 to 18 months depending upon the specification and component availability. Overall, in the FTA market, models are available for 12 months before they are replaced by new or upgraded models. The STV service providers however will typically utilise the same model for up to 3 years, however this depends on the functionality and requirements of the service provider. In addition, STV service providers will "re-birth" older models that are returned/replaced by subscribers by upgrading components and software. The scope of the MEPS does not include these "re-birthed" STBs. The STV service providers in Australia and New Zealand generally provide a specification for tender when they undertake a new sourcing contract for STV STBs, and the MEPS requirements can be included in these specifications. In fact, the two major Australian STV service providers have been considering the draft MEPS proposals under development in Standards Australia within their current specification for the supply of STBs.

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 STBs addressed in the CBA 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. China, one of the world's major sources of STBs has also adopted the same test procedure, along with the EU. Plans are also underway by the USA ENERGY STAR to develop a test method and minimum energy requirements. The ENERGY STAR program is considering the use of the IEC 62087 test method (EPA 2006)

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 STB tests conducted in other countries under comparable standards. There may also be scope for accepting an STB that may comply with MEPS in its country of origin (e.g., in the EU) 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 may 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).

The TTMRA is an issue that may arise if New Zealand or Australia does not implement the MEPS requirements, in accordance with the Standard, at the same time. However,

the Australian and New Zealand regulators are working together within the E_3 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 STB, not the overall performance of the unit, so consumer choice will not be affected. Energy consumption allowances for additional features are allowed for in the proposed MEPS and STBs with multiple features are not penalised. Much of the market is typified by original equipment manufacturers of STBs supplying models to consumer electronics companies. The market is becoming highly competitive with the number of brands increasing in Australia and other regions worldwide. Internationally, it is estimated that over 100 million STBs were sold in 2005 and over 500 million will be sold over the subsequent 5 years to 2010 as digital TV services become increasing available worldwide. Given the substantial number of international manufacturers of STBs, 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 STB models and hence consumer choice in Australia and New Zealand.

International suppliers of integrated circuits and STBs have low power STB silicon chips or designs that meet the scope of the proposed MEPS, including: Philips with 7W in ON mode (Philips 2003), Zarlink with 4W in On Mode (Zarlink 2002) and STMicroelectronics (STM 2006).

Another factor that is contributing to the lower power use of STBs is the increasing availability of integrated components for STBs, which generally lowers the power consumption of these products. As more functions are integrated on the one chip, energy efficiency increases. In the case of STMicroelectronics, a new chip will use less power, provide greater functionality and cost less than $6 USD each compared to earlier models which cost $15USD (STM 2007). However, the correct application of power management features in these STBs is essential to the improved energy performance.

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 STBs, 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 at costs of less than $6 USD (STM 2007).

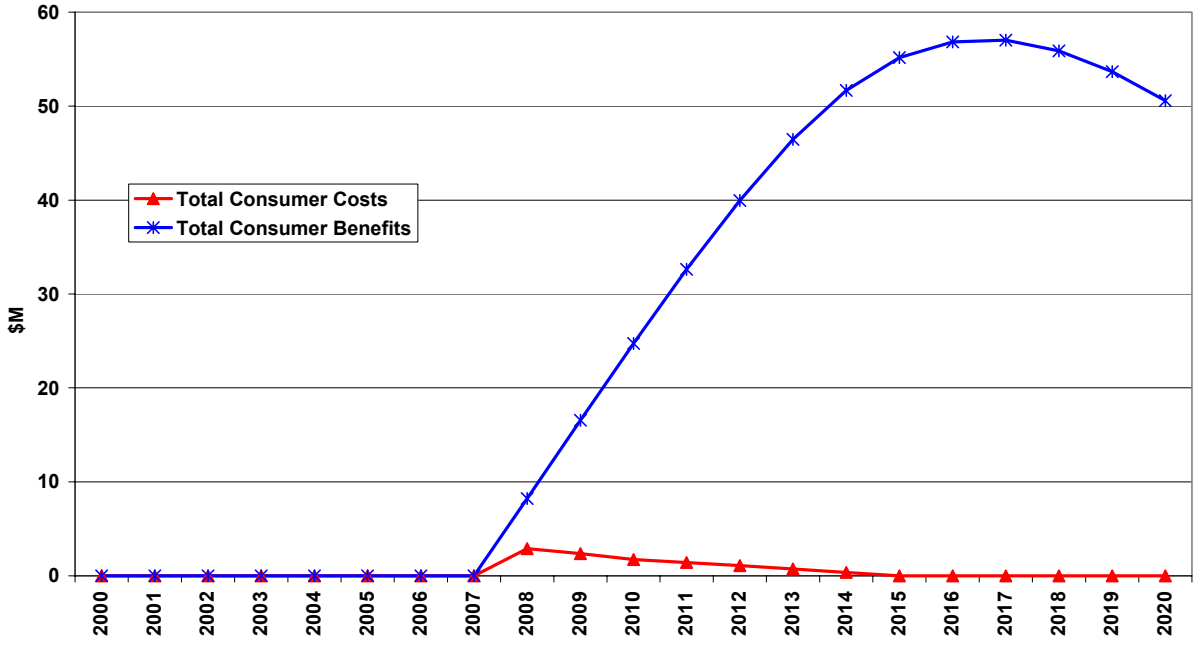
5.4 Consumer Costs and Benefits

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 STB, while the costs include the estimated incremental price increase due to suppliers meeting the MEPS requirements.

Consumer Perspective

Calculations of the cost-benefit performed with the CBA model are shown in Figure 11. The undiscounted benefits peak at $57M in 2017, while the costs are estimated at $2.8M in 2008.

Figure 11: Consumer Cost-Benefit of MEPS (Aus)



The benefits start to decrease after 2017 as the predicted BAU efficiency improvements for STBs come closer to the MEPS requirements. The consumer benefits continue to grow even though the incremental cost of the more efficient STBs falls to zero by 2015, This is a result of cohorts of new, more efficient STBs (compared to the BAU) coming into use each year until the total number plateaus at around 15 million in 2016. After this period, the energy savings attributed to the MEPS reduce due to the lower sales of STBs 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 $3 for the STB in 2005, and in many cases the hardware cost may be zero.

(There would simply be a software change to power manage the STB) Current retail prices from the Store Survey show that SD STB range from $99 - $469 and HD STB from $250 - $750. It is assumed that by 2008 the estimated average increase in retail price due to the proposed MEPS is $1.80. This represents a price increase of between 1.8% and 0.2%.

The individual consumer costs and benefits of the MEPS in 2008 are shown in Table 11. The present value of the benefits is discounted over an estimated average 8 service year life of the STB (see Appendix 2).

Table 11: Present Value Costs and Savings - STB MEPS, 7.5% Disc Rate

STB Category	Incremental Retail Price Increase	Estimated Annual Energy Savings (kWh/yr)	Energy Costs Savings/year	Present Value Cost Savings (8yrs)
SD	$1.80	28	$3.53	$20.67
HD	$1.80	42	$5.40	$31.60
STV	$1.80	68	$8.68	$50.83

As Table 11 demonstrates, the value of the benefits is substantially larger (by a factor of at least 10) compared to the costs regardless of the STB category. This assumes an average of 6 hours/day watching TV, 12 hours/day in active standby mode and 6 hours/day in passive standby mode.

Cost of Forgoing Product Features

The design of STBs is controlled by standards/specifications covering areas such as electrical safety, interference and digital receivers. The MEPS allows for the additional in-use power consumption of various features of STBs 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 STB and will not result in the loss of product features.

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 MEPS analysis. Table 12 shows the impact for usage where the consumer only watches TV with the STB for 2 hours/day in the low scenario and 12 hours/day for the high scenario. Full details of these scenarios are shown in Appendix 5, Table 31. Data for the base MEPS analysis is as per Table 11, which is the NPV analysis over 8 years at 7.5% discount rate.

Table 12: Present Value Costs and Savings: Varying Usage - STB MEPS, 7.5% Disc Rate

STB Category	Usage Case	Estimated Annual Energy Savings (kWh/yr)	Energy Costs Savings/year	Present Value Cost Savings (8yrs)
SD	Low	53	$6.76	$39.60
HD	Low	64	$8.12	$47.57
STV	Low	68	$8.68	$50.83
SD	High	17	$2.14	$12.56
HD	High	33	$4.23	$24.76
STV	High	68	$8.68	$50.83

The low usage case increases the benefits to the consumer compared to the normal scenario, while the high usage case decreases the consumer benefit. This is due to the larger power savings potential in passive standby mode form the MEPS compared to the active/ON mode, i.e., higher usage usually means the STB is left in passive standby mode for less time. For STV STBs, there is no change as the power use of a STV STB does not change when the device is placed in standby (active standby is the lowest power mode for these STBs). For FTA STBs, the present value savings in the worst case (high usage) are still almost seven times greater than the incremental cost of the MEPS requirements.

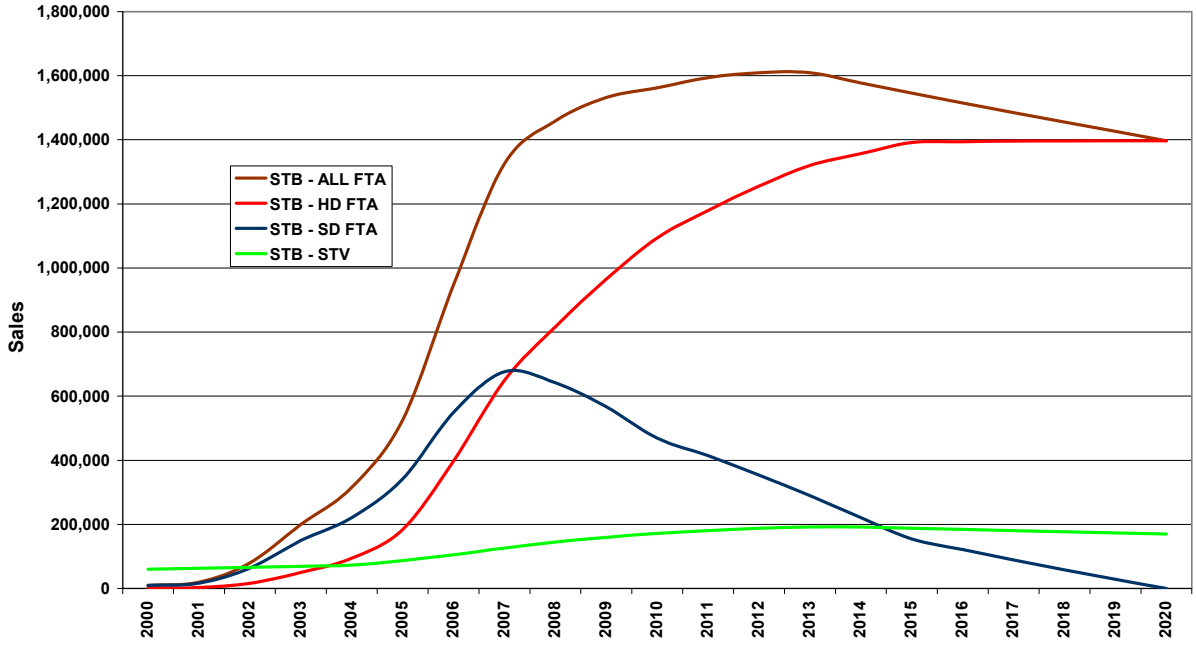
5.5 Impact on Energy Use and Greenhouse Gas Emissions

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 CBA; a Base Sales scenario with STB sales trending higher until 2013 and then slowing declining, and a Low Sales scenario with sales declining from 2008. This section provides the results of this analysis for Australia. For clarity, the results for New Zealand are provided separately in Section 6 of this report. Figure 12 shows the forecast sales of STBs to 2020 by STB category.

Annual sales by category of STB are forecast from trends produced from the sales data reported by Digital Broadcasting Australia (DBA), a not for profit industry organisation funded by industry representing the broadcasters, consumer electronic suppliers, retailers and installers/designers (DBA 2007). DBA have been reporting sales since 2003 of STB by category (SD and HD) and sales of integrated digital televisions (IDTV). The historical and forecasts sales figures developed for the CBA take into account the split of sales of effectively competing technologies (STBs and IDTVs). Recent trends show that the sales of IDTV are increasing; however there is a stock of over 15 million TVs that will require a STB in order to receive digital transmissions. In view of this very recent trend (since mid 2006) the CBA models a low sales scenario to determine the sensitivity of the cost-benefit impacts of sales changes.

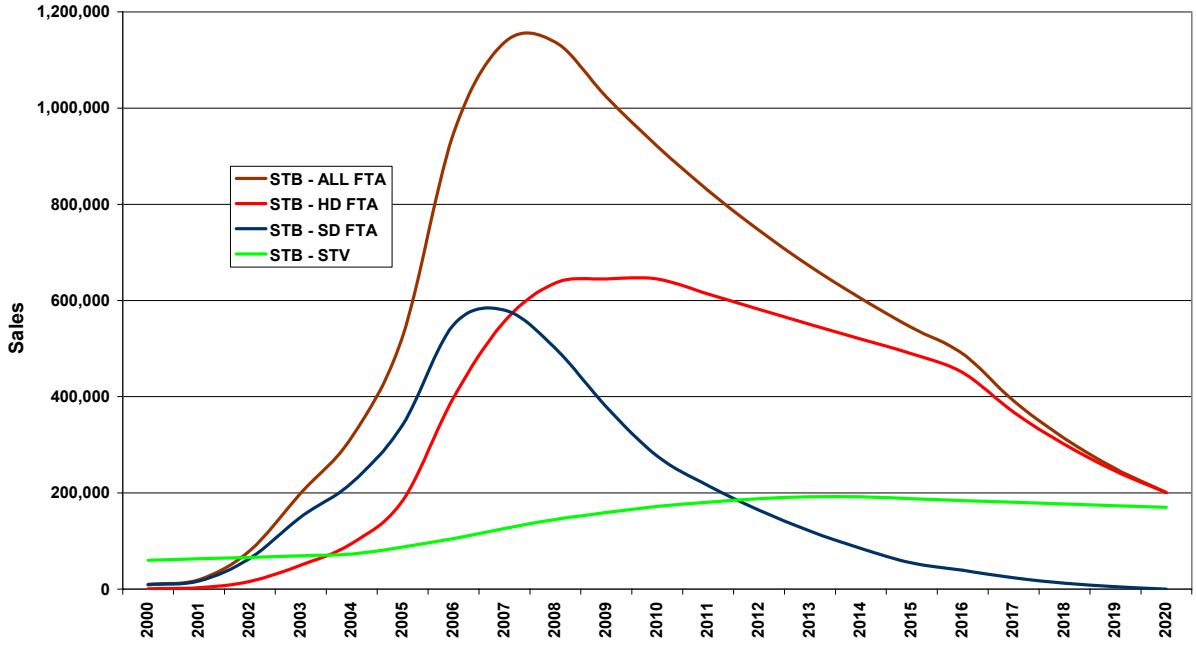
Figure 12: Forecast Sales of STBs - Base Sales Scenario Australia



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 STBs sales may decrease with the increasing sales of integrated digital TVs, and the integration of STBs in DVD recorders/hard disk recorders (also known as personal video recorders). On the other hand, as new digital services are rolled out, those consumers with IDTVs may need to purchase a new STB to receive the new services (such as interactive TV).

To simulate the impact of these "competing" devices, a forecast for STBs under a Low Sales scenario for Australia was undertaken and is shown in Figure 13. The sales of STBs under this scenario are forecast to decline from over 1M pa in 2008 to under 500,000 pa over the next decade. The low sales forecast is based on a stock of approximately 7 million FTA STBs in the period 2012 to 2015. This scenario assumes that most households would convert one analog TV to digital and have either purchased a new IDTV or a PVR with an integrated digital tuner for the second TV. It is considered unlikely that this scenario would develop given the stock of analog TVs in use, so this low sales forecast scenario is utilised for sensitivity analysis of the CBA impact projections.

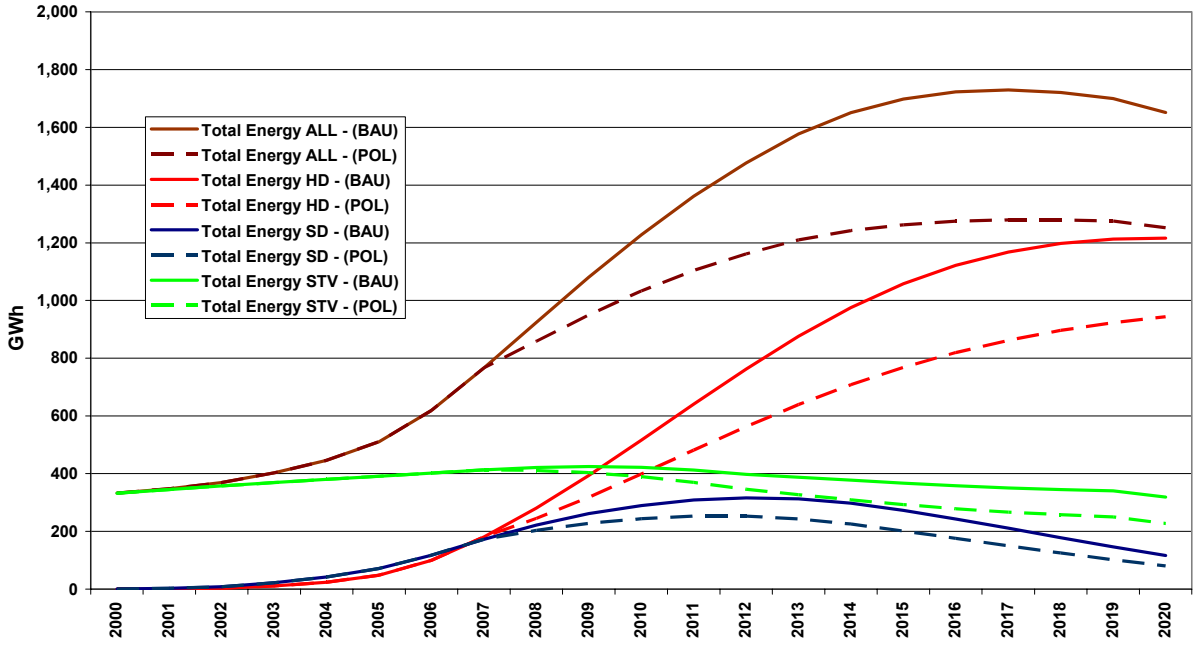
Figure 13: Forecast Sales of STBs - Low Sales Scenario Australia



Energy and Greenhouse Impacts

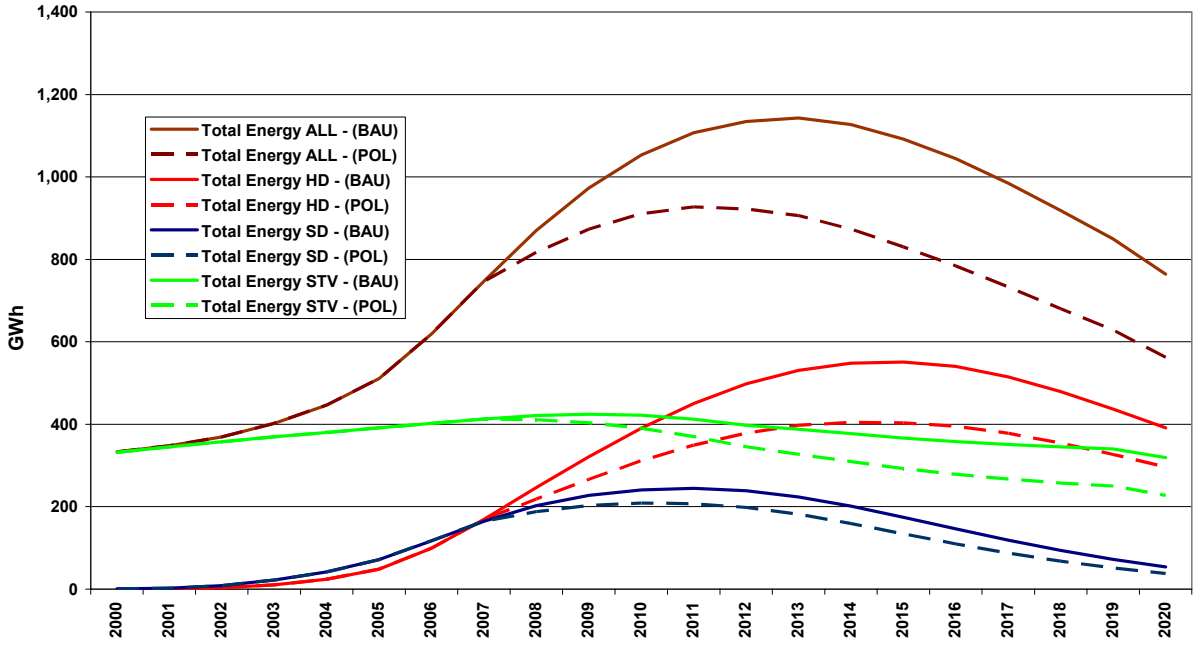
The MEPS impact is based on an implementation date of 2008 for this CBA impact assessment. For the Base Sales scenario, the net energy impact of the proposed MEPS for each category of STB is shown in Figure 14, where the estimated impact of MEPS is shown as the policy (POL) line compared to business as usual (BAU). Annual net energy savings are estimated at 450 GWh per year by 2017 for all STBs as a result of the MEPS with high definition STBs representing approximately 68% of the total net energy savings.

Figure 14: Net Annual Energy - BAU and MEPS: Australia Base Sales Scenario



The MEPS impact for the Low Sales scenario is shown in Figure 15, with total net energy savings of 250 GWh per year by 2015.

Figure 15: Net Annual Energy - BAU and MEPS: Australia Low Sales Scenario



The resulting estimated GHG emission reduction from the MEPS for STBs is shown in Figure 16, with a 450 kt CO_2-e/yr emission reduction for the Base Sales scenario in 2017.

Figure 16: GHG Emissions - BAU and MEPS: Australia Base Sales Scenario

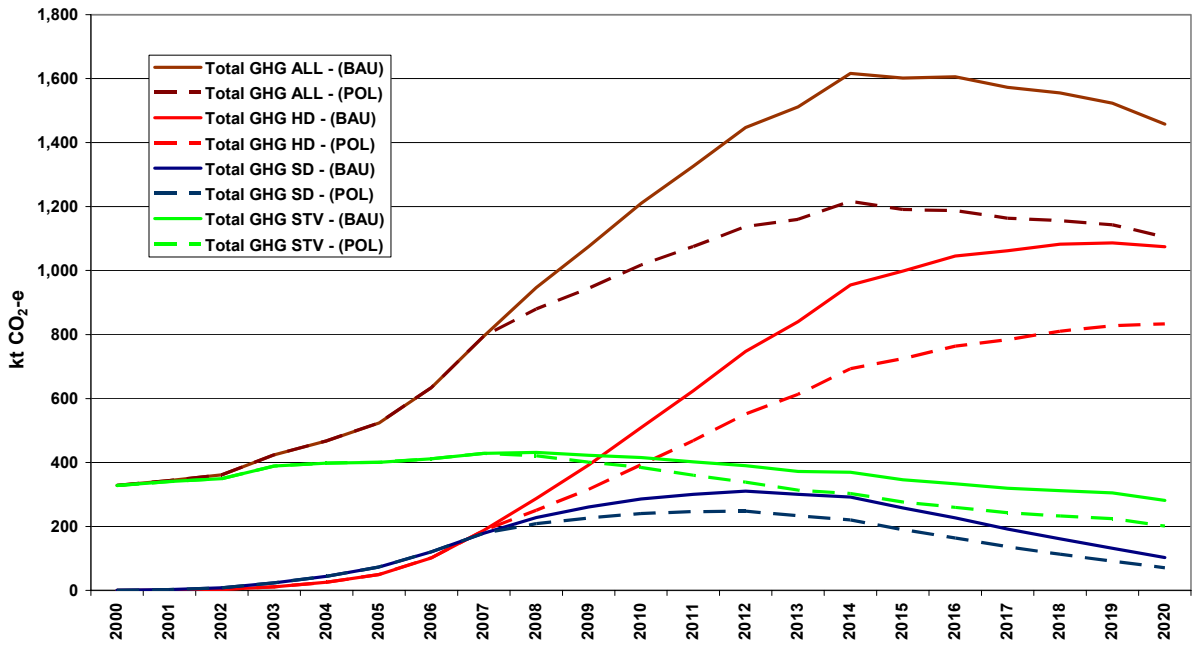
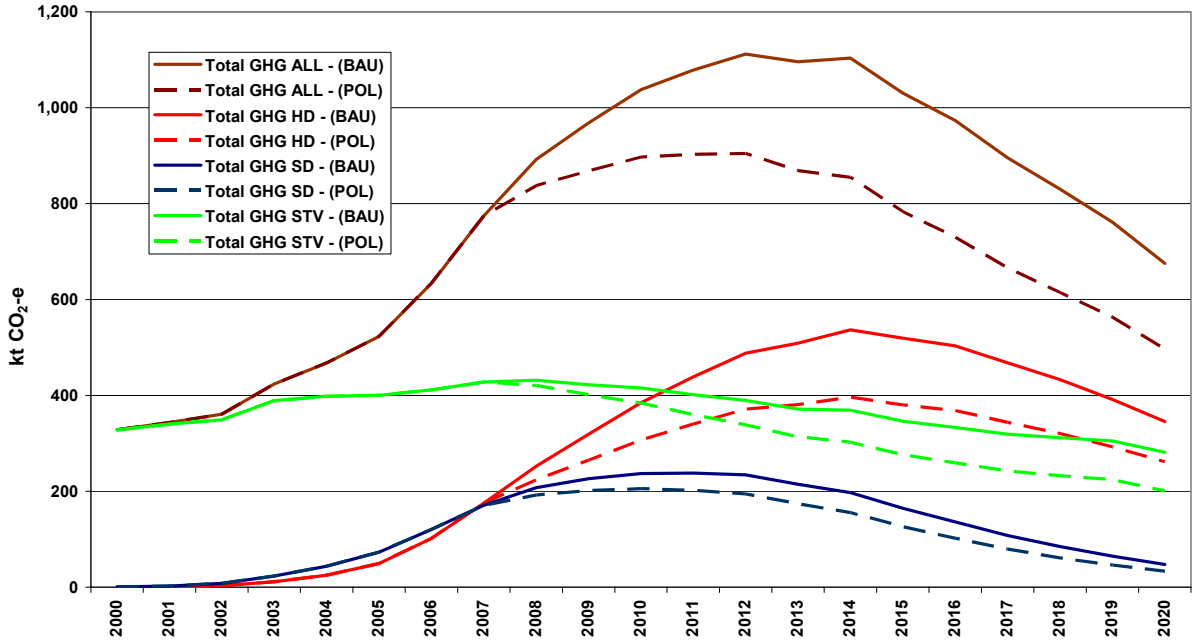


Figure 17 shows the resulting GHG emission reduction for the Low Sales scenario. It is estimated that greenhouse emissions would be approximately 250 kt CO_2-e lower if the MEPS is implemented compared to BAU under this scenario.

Figure 17: GHG Emissions - BAU and MEPS: Australia Low Sales Scenario



5.6 National and State Costs and Benefits - Australia

Community Analysis, with Benefits Valued at Marginal Electricity Tariffs

This section provides estimates of the national, state and territory costs and benefits for Australia. For clarity, the results for New Zealand are provided separately in Section 6.

Table 13 shows the Net Present Value and Benefit-Cost Ratios (BCR) for Australia for a range of discount rates. All data tables are based on the incremental real price increase for STBs as per Table 10 for MEPS-compliant STBs. In addition, all State and Federal program costs are included in the costs.

The benefits are valued at the marginal electricity tariffs for each state as per Appendix 4. The rationale for using retail prices is that the economic value of the electricity saved is the reduction in consumers' expenditure on electricity. (An alternative valuation method is provided in the following section where the foregone profits of electricity retailers are deducted from the electricity savings benefits.)

Table 13: Financial Analysis – Australia Base Sales Growth

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$15,564,301	$8,807,660	$6,742,181	$5,214,216
Total Benefits	$549,359,641	$251,856,345	$174,458,592	$122,567,039
Net Benefits	$533,795,340	$243,048,686	$167,716,411	$117,352,823
Benefit-Cost Ratio	35.3	28.6	25.9	23.5

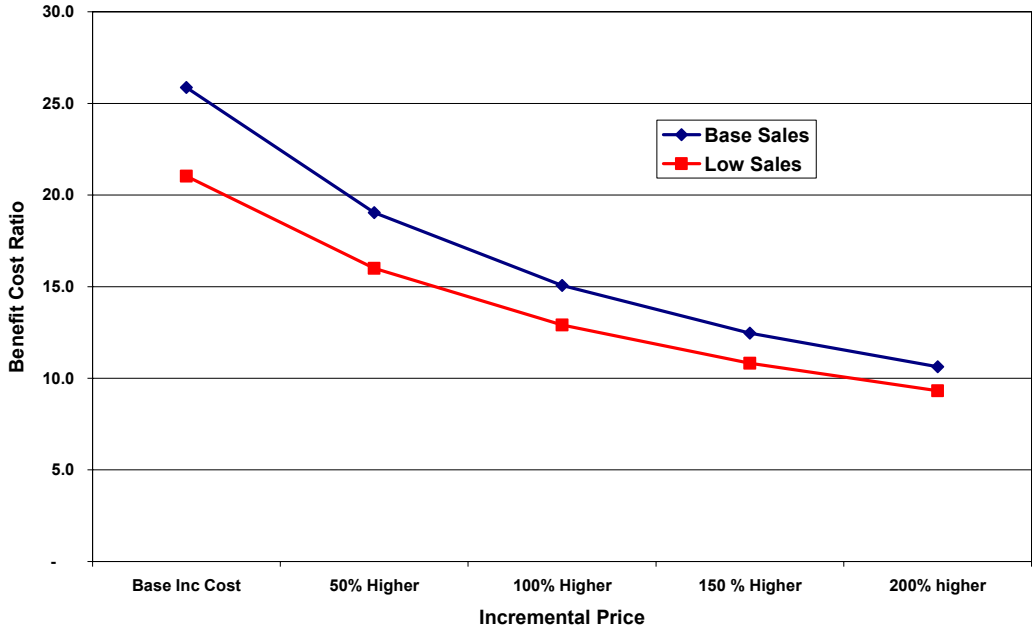
Table 14 presents the NPV benefits and costs of the proposed MEPS for the Low Sales scenario.

Table 14: Financial Analysis – Australia Low Sales Growth

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$11,930,222	$6,722,599	$5,143,021	$3,978,232
Total Benefits	$330,915,990	$154,676,000	$108,168,474	$76,709,290
Net Benefits	$318,985,768	$147,953,401	$103,025,454	$72,731,059
Benefit-Cost Ratio	27.7	23.0	21.0	19.3

To assess the potential sensitivity of the benefit-costs to the estimated incremental price increase for STBs due to the MEPS, a number of options were modelled. The incremental price increase of STBs was increased by 50% increments to 3 times the base scenario price assumed for the MEPS analysis. Figure 18 shows the change in the national BCR if the price of MEPS-compliant STB is up to 200% higher than the price increase estimated in Table 10. As the figure demonstrates, the net present benefits are still significantly higher than the costs under these conditions.

Figure 18: Benefit-Cost Ratio as a Function of Incremental Price Increase



The benefit-cost ratios for all the Australian states are shown in Table 15 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 15: 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	26.5	21.4	19.4	17.6
NT	50.4	40.8	37.0	33.6
QLD	37.8	30.6	27.7	25.2
SA	36.7	29.8	26.9	24.5
TAS	29.1	23.6	21.4	19.4
VIC	38.2	31.0	28.0	25.4
WA	41.3	33.4	30.3	27.5

The benefit-cost ratios for all the Australian states are shown in Table 16 under the Low Sales scenario. Again, in all states the BCR is well above 1.

Table 16: 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	20.8	17.3	15.8	14.5
NT	39.6	32.9	30.0	27.5
QLD	29.7	24.6	22.5	20.6
SA	28.9	23.9	21.9	20.1
TAS	22.9	19.0	17.4	15.9
VIC	30.0	24.9	22.8	20.9
WA	32.4	26.9	24.6	22.5

Figure 19 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 2006 and 2007 which reflect the government costs associated with the establishment of the MEPS program and systems before the implementation date of 2008, however these do not show in the figure due to their size (less than $300,000 for all states).

Figure 19: Annual Net Benefit $M: Base Sales Growth Scenario

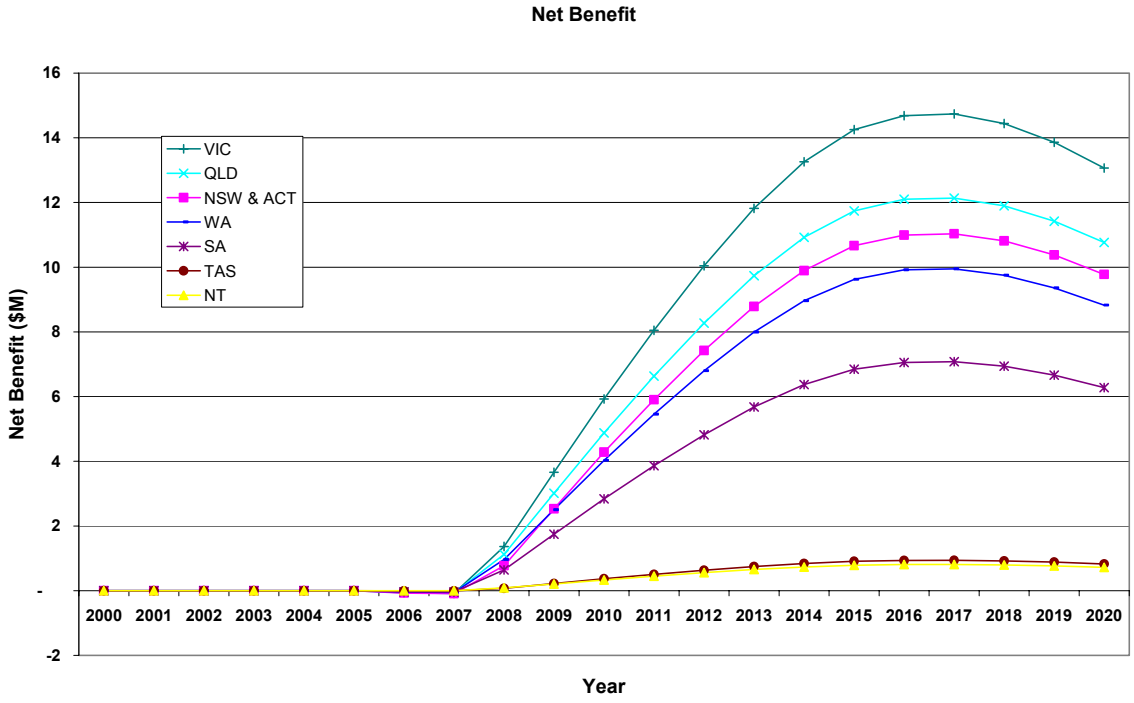
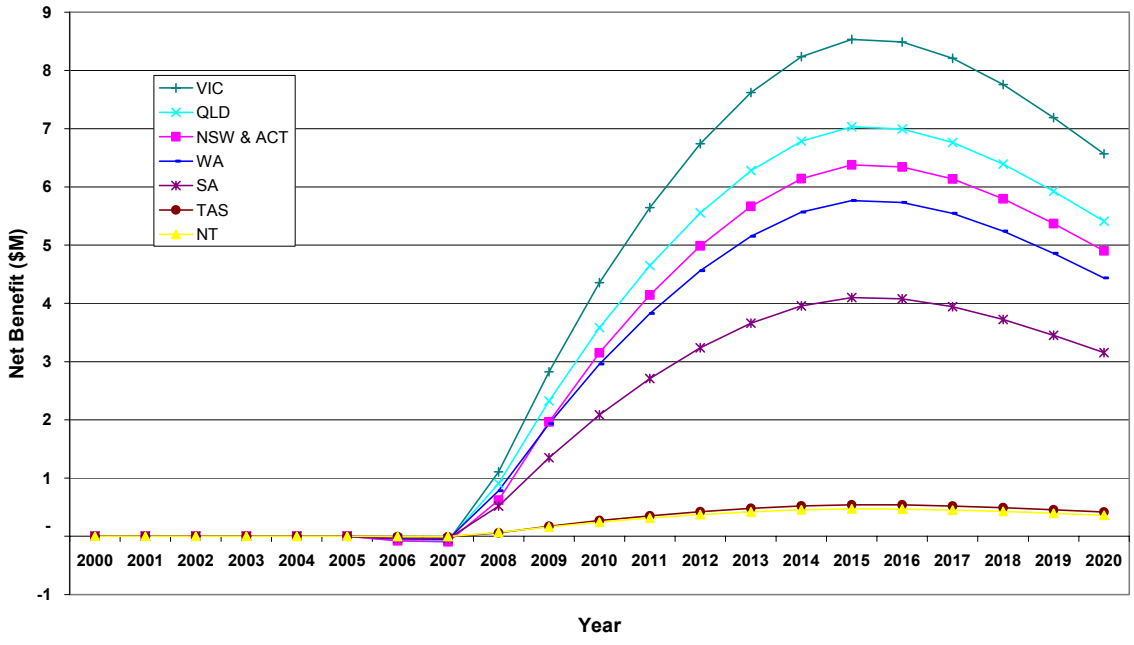


Figure 20 shows the forecast net benefit by State over the period 2000 to 2020 at a discount rate of 7.5% for the Low Sales scenario.

Figure 20: Annual Net Benefit $M: Low Sales Growth Scenario



Summary Data for Alternative BAU Sales Scenarios

The impact of changes to the forecast sales of STBs is shown for the two scenarios in Table 17.

Table 17 Summary Data for Alternative BAU Sales Australia – 7.5% Discount Rate

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	4,339 GWh	2,613 GWh
GHG Emission Reduction (cumulative)	4.1 Mt CO_2-e	2.5 Mt CO_2-e
Total Benefit	$174M	$108M
Total Investment	$6.7M	$5.1M
Benefit-Cost Ratio	25.9	21.0

Community Analysis, with Loss of Profit to Electricity Retailers Deducted from Benefits

This section provides an alternative scenario of the national, state and territory costs and benefits for Australia that considers the foregone profits of electricity suppliers retailers.

From the point of view of electricity retailers, any energy efficiency improvements lead to less energy supply and hence lower revenue/profits from the reduction in energy supply. In any national assessment of costs and benefits, however, this decrease in energy sales is offset by the increase in sales of other goods and services from consumers spending the money saved from their lower consumption of energy. Therefore, from the national point of view, the foregone energy sales and profits should not be considered as a 'cost' in a cost-benefit analysis framework.

The reduction in electricity retailers' sales and profits also needs to be weighed up against possible benefits of reduced energy and peak demand and their effect on capital expenditure of building additional generation capacity particularly for the peak load period. So for the electricity supply industry, the 'cost' is the notional profit on foregone sales for retailers (which is in the region of 5% of the $/kWh paid by customers) less any 'benefits' of reduced energy and peak demand for generators.

To assess the worst case scenario of loss of profit and no benefit for the electricity supply industry (and disregarding offsetting increases in profits in other economic sectors), this section provides an analysis which assumes the lost profit to the retailer is 5% of the tariff charged to the consumer.

In the following tables, the analysis covers the worst case scenario, to 2020, of loss of profit and no benefits whatsoever to the electricity supply sector. Table 18 shows the NPV lost profit ($M) by states and discount rate for the Base Sales Scenario.

Table 18: NPV Electricity Retailer Lost Profit ($M) by States & Discount Rate: Base Sales Scenario

State	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
NSW & ACT	6.4	3.0	2.0	1.4
NT	0.4	0.2	0.1	0.1
QLD	5.9	2.7	1.9	1.3
SA	3.4	1.6	1.1	0.8
TAS	0.5	0.2	0.1	0.1
VIC	7.1	3.3	2.3	1.6
WA	4.8	2.2	1.5	1.1
Total	28.5	13.2	9	6.4

Table 19 shows the NPV lost profit ($M) by states and discount rate for the low Sales Scenario.

Table 19: NPV Electricity Retailer Lost Profit ($M) by States & Discount Rate: Low Sales Scenario

State	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
NSW & ACT	3.9	1.8	1.3	0.9
NT	0.2	0.1	0.1	0.1
QLD	3.5	1.7	1.2	0.8
SA	2.0	1.0	0.7	0.5
TAS	0.3	0.1	0.1	0.1
VIC	4.3	2.0	1.4	1.0
WA	2.9	1.4	0.9	0.7
Total	17.1	8.1	5.7	4.1

Table 20 compares the benefit-cost ratios for the two cases of loss of retailer profit not included (i.e. electricity savings benefits valued at marginal electricity tariffs) and with retailer losses included (i.e. electricity savings benefits have lost retailer profits deducted). This demonstrates a relatively small impact on the benefit-cost ratios to the community at large.

Table 20: Benefit-Cost Ratio for Australia: With Loss of Electricity Retail Profit

BCR	Base Sales Scenario		Low Sales Scenario	
Disc Rate	**No loss**	**With loss**	**No loss**	**With loss**
Nil (0%)	35.3	33.5	27.7	26.3
Low (5%)	28.6	27.1	23.0	21.8
Med (7.5%)	25.9	24.5	21.0	19.9
High (10%)	23.5	22.3	19.3	18.3

6 New Zealand Impacts

This section details the CBA assessment where data is specific to New Zealand. The STB stock modelling framework is explained in Appendix 2: Stock and Sales. All projections for FTA and STV digital TV are based on the modelling undertaken by the NZ Ministry of Culture and Heritage (MCH 2006). Free to Air TV transmission is being launched in New Zealand in May 2007.

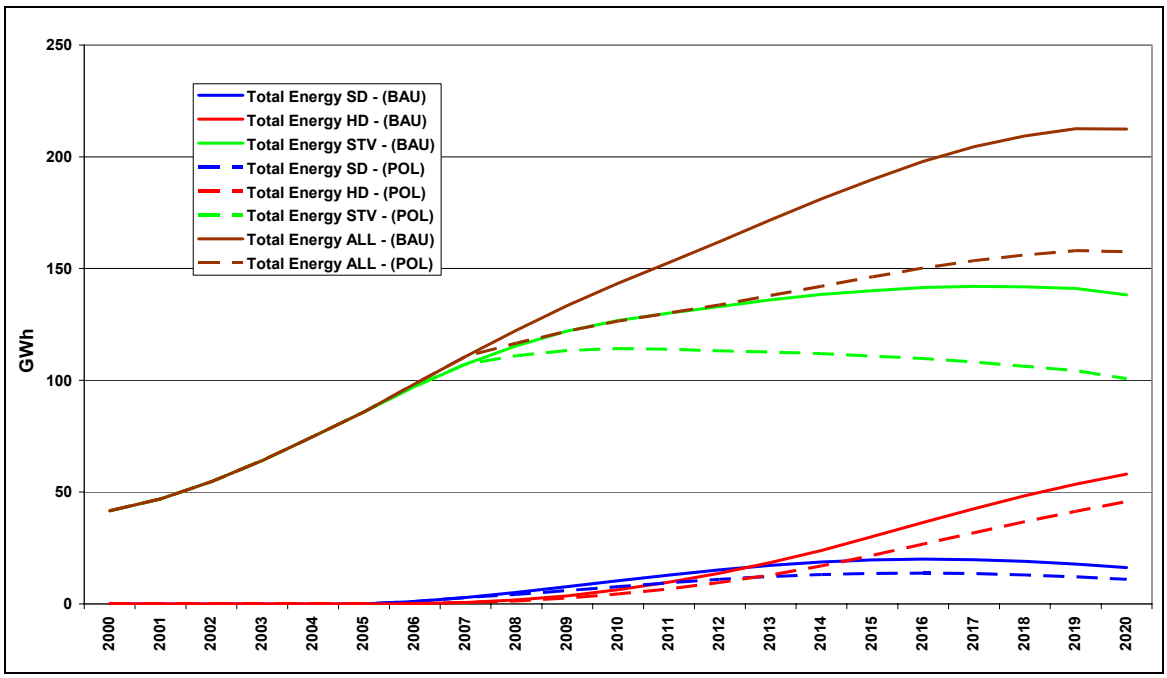
Most of the assumptions that apply to Australia also apply to New Zealand as the STBs likely to be sold in NZ are similar to Australia, with the following differences:

- Modelling is based on the NZ Digital TV Plans announced in 2006 (Analog system switch off in 2015)
- High definition digital broadcasts were not originally scheduled to begin in the early years of the transition to digital TV (MCH 2006). However new information has been provided (EECA 2007) that suggests that HD STB are likely to be more dominant in sales compared to SD STB as HD broadcasts are to begin in NZ in 2008.

6.1 Energy and Greenhouse Gas Emissions

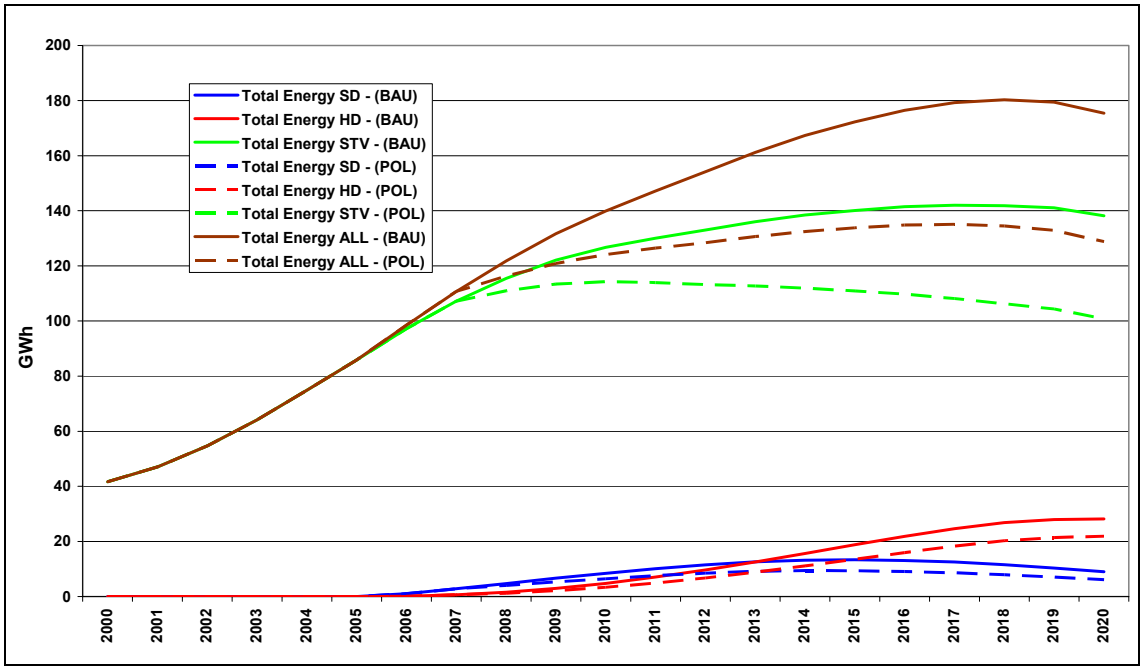
The MEPS impact is based on an implementation date of 2008 for this CBA impact assessment. For the Base Sales scenario, the net energy impact of the proposed MEPS for each category of STB is shown in Figure 21, where the estimated impact of MEPS is shown as the policy (POL) line compared to business as usual (BAU). Annual net energy savings are estimated at 55 GWh per year by 2020 for all STBs as a result of the MEPS with STV STBs representing approximately 68% of the total net energy savings.

Figure 21: Net Annual Energy - BAU and MEPS: NZ Base Sales Scenario



The MEPS impact for the Low Sales scenario is shown in Figure 22, with total net energy savings of 47 GWh per year by 2015.

Figure 22: Net Annual Energy - BAU and MEPS: NZ Low Sales Scenario



The resulting estimated GHG emission reduction from the MEPS for STBs is shown in Figure 23, with a 33 kt CO_2-e emission reduction for the Base Sales scenario.

Figure 23: GHG Emissions - BAU and MEPS: NZ Base Sales Scenario

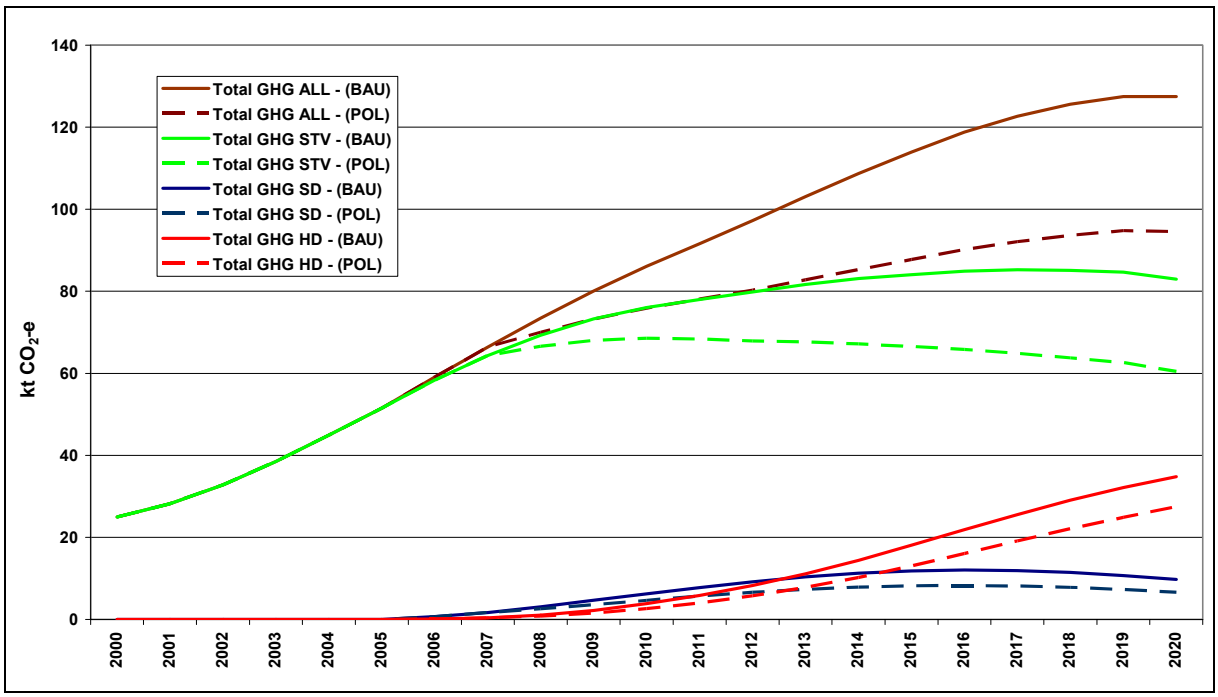
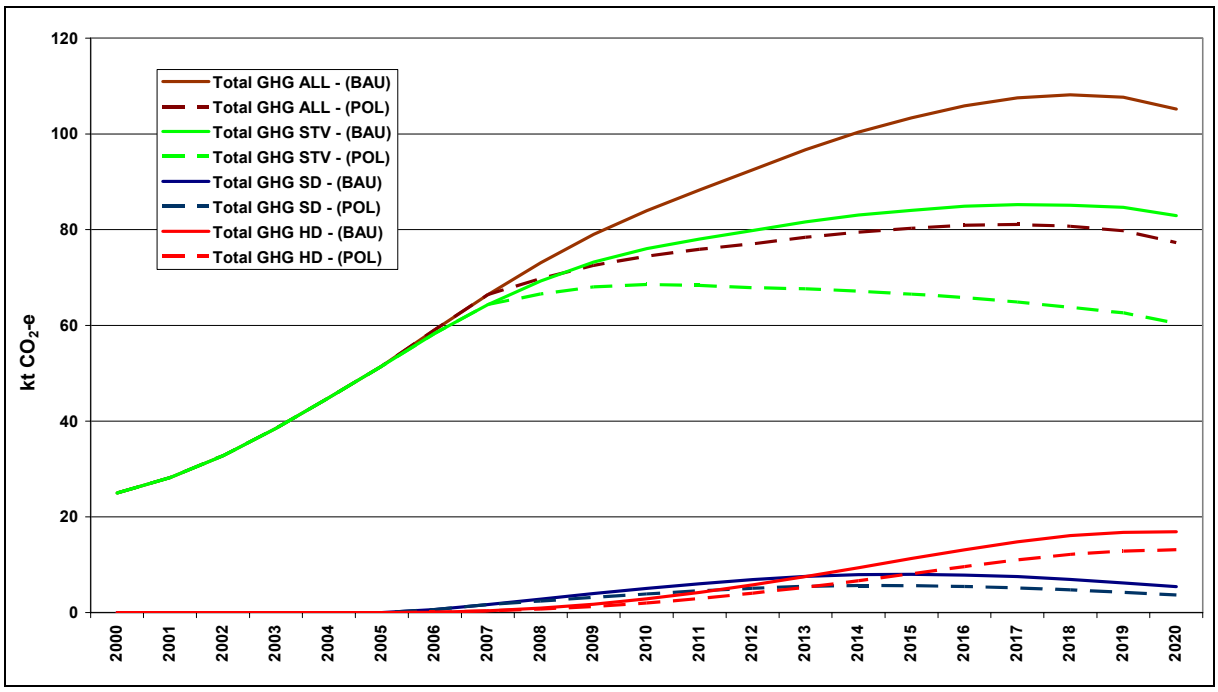


Figure 24 shows the resulting GHG emission reduction for the Low Sales scenario. It is estimated that greenhouse emissions would be approximately 28 kt CO_2-e lower if the MEPS is implemented compared to BAU under this scenario.

Figure 24: GHG Emissions - BAU and MEPS: NZ Low Sales Scenario



6.2 Costs and Benefits

Table 21 shows the Net Present Value and Benefit-Cost Ratios for New Zealand valued at the marginal electricity tariff from Appendix 4 for a range of discount rates. All data tables are based on the incremental real price increase for STBs as per Table 10 for MEPS-compliant STBs. In addition, part of the program costs is apportioned to NZ in proportion to NZ sales of STBs relative to Australian sales of STBs. All values are expressed in NZ dollars, converted at 1.1NZD to 1 AUD.

Table 21: Financial Analysis – NZ Base Sales Scenario

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$1,553,127	$856,350	$648,407	$496,615
Total Benefits	$80,608,644	$36,117,039	$24,743,627	$17,199,641
Net Benefits	$79,055,517	$35,260,690	$24,095,220	$16,703,026
Benefit-Cost Ratio	51.9	42.2	38.2	34.6

Table 22 presents the NPV benefits and costs of the proposed MEPS for the Low Sales scenario.

Table 22: Financial Analysis – NZ Low Sales Scenario

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$1,877,139	$980,363	$725,872	$545,183
Total Benefits	$70,906,187	$31,928,641	$21,929,594	$15,282,252
Net Benefits	$69,029,048	$30,948,278	$21,203,722	$14,737,069
Benefit-Cost Ratio	37.8	32.6	30.2	28.0

The benefit-cost ratio under the Low Sales scenario is lower than the Base Sales scenario and the total costs have increased. Under the Low Sales scenario, FTA STBs are lower while STV STB sales are unchanged; hence the proportion of costs allocated increases under this scenario.

7 Consultations and Comments

The following consultations have been undertaken in relation to the policy development for STBs:

- ***Launch of Standby Profile for Free to Air Digital Set Top Boxes: 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 STB workshop, the industry participants requested that government consider the inclusion of STV STBs in the program and expressed a desire to see MEPS for all STBs covering all modes of use.

  Following the launch of this standby power strategy for STBs, 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 MEPS for STBs, 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 MEPS Profile – Set Top Boxes: October 2004.*** Again at a well attended industry forum, the initial policy response of proposed MEPS for STBs was released. This profile 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 where sought from industry. The timeline for development of this policy option was explained and subsequently an Australian Standards working group was established to develop the technical requirements for a MEPS for STBs

  The STV industry responded to the proposal via the Australian Subscription Television and Radio Association (ASTRA), the peak industry body for subscription television. ASTRA asserted that they supported the thrust of the energy efficiency improvements for STBs however they did not support a regulated MEPS. The ASTRA preferred a Code of Conduct approach that was in place in the European Union. Although the organisation has not changed its view, ASTRA has been a highly active participant in the subsequent development of the Australian Standard

for MEPS and many technical issues have been addressed that specifically affect the STV STBs

- ***Industry Meeting - Set Top Boxes: November 2004.*** Further consultation between the STB industry and government was held at a meeting in Sydney on 16 November 2004.

These key policy/technical documents were also available on the public website, www.energyrating.gov.au and public comments invited.

Following these general industry consultations, the TE-001-00-3 working group was established and several meetings were held during 2005. This working group was changed to a sub-committee (TE-001-08) in early 2006. The working group comprised representatives of the Australian Subscription TV Association (ASTRA), CESA, STB suppliers, technical consultants, Standards Australia, government officers, subscription TV service providers and Free-to-air TV Australia. The meetings were focused on the development of STB minimum power levels for MEPS and the products that would be required to meet the MEPS. A Draft standard for public comment has been published and is expected to be adopted in early 2007. Considerable discussion was held with the industry over technical requirements for the MEPS in these Standards Australia meetings. The end result was the adoption of minimum energy performance criteria that was applicable to Australian industry conditions and based on the voluntary EU Code of Conduct and the mandatory California Energy Commission standard.

7.1 Summary of Comments

To be added after release of the draft for consultation.

7.2 Responses to Comments

To be added after release of the draft for consultation

8 Evaluation and Recommendations

8.1 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 STB MEPS, significant greenhouse gas emission reductions are possible.

Due to its non-voluntary nature, 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 STBs from the market, MEPS will most effectively address market failures, so that the average lifetime costs of STBs are reduced. All other options rely on voluntary mechanisms and are not 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 STBs to provide complying products. 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 early 2007, the program could be implemented in 2008.

8.2 Recommendations (Draft)

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

1. To implement mandatory energy performance standards for STBs in regulation.
2. That STBs covered by this CBA include those without a recording function (i.e. without a hard drive).
3. To the test method AS/NZS 62087:2004 which specifies methods of measurement for the power consumption of, amongst other home entertainment equipment, STBs for consumer use.
4. That STBs must meet or surpass the energy performance requirements set down in the draft Australian and New Zealand Standard AS/NZS 62087.2 (MEPS requirements for digital television STBs). A copy of the committee (TE-001 and TE-001-08) draft standard is attached as Appendix 10 at p A-36.
5. That the amendments take effect not earlier than 1 April 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 April 2008.

9 Implementation and Review

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

Once the States and Territories agree to mandatory requirements, their removal in any one jurisdiction would undermine the effect in all other jurisdictions, because of the Mutual Recognition agreements between the States and Territories. Under the co-operative arrangements for the management of the Equipment Energy Efficiency Program (E_3), 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 regulations for MEPS and labelling are also subject to regular review. The arrangements between the Commonwealth, State and Territory and New Zealand Governments and Standards Council in each country provide that the revision of any Standards called up in energy labelling and MEPS regulations are subject to the approval of the governments.

The E_3 Committee 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 CBA would therefore depend on date of their implementation. qqqqqqqIf implemented in April 2008, the E_3 Committee will not seek to change the regulation any earlier than April 2011, and it could well be that this future change might occur much later. However, it would be necessary to carry out a study well in advance of that time, so that adequate notice could be given to industry in the event that a change was justified.

Appendices

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Appendix 2: Stock and Sales

Australia

STB Market

The sales of terrestrial FTA STBs are increasing rapidly, with sales estimated at over 500,000 in 2005, and predicted to grow to 900,000 by the end of 2006 (DBA 2006). The total penetration of Free to Air Digital TV in households is 20% of Australian homes. Analog TV services are to be phased out from 2010, signifying STBs will certainly increase their market share. It is expected that millions of STBs will be required over the next decade with the majority sold in the next 5 years. Unless the consumer makes the decision to purchase a TV capable of receiving digital images, an STB will be the only option available for those who have an existing analog TV after analog services is phased out.

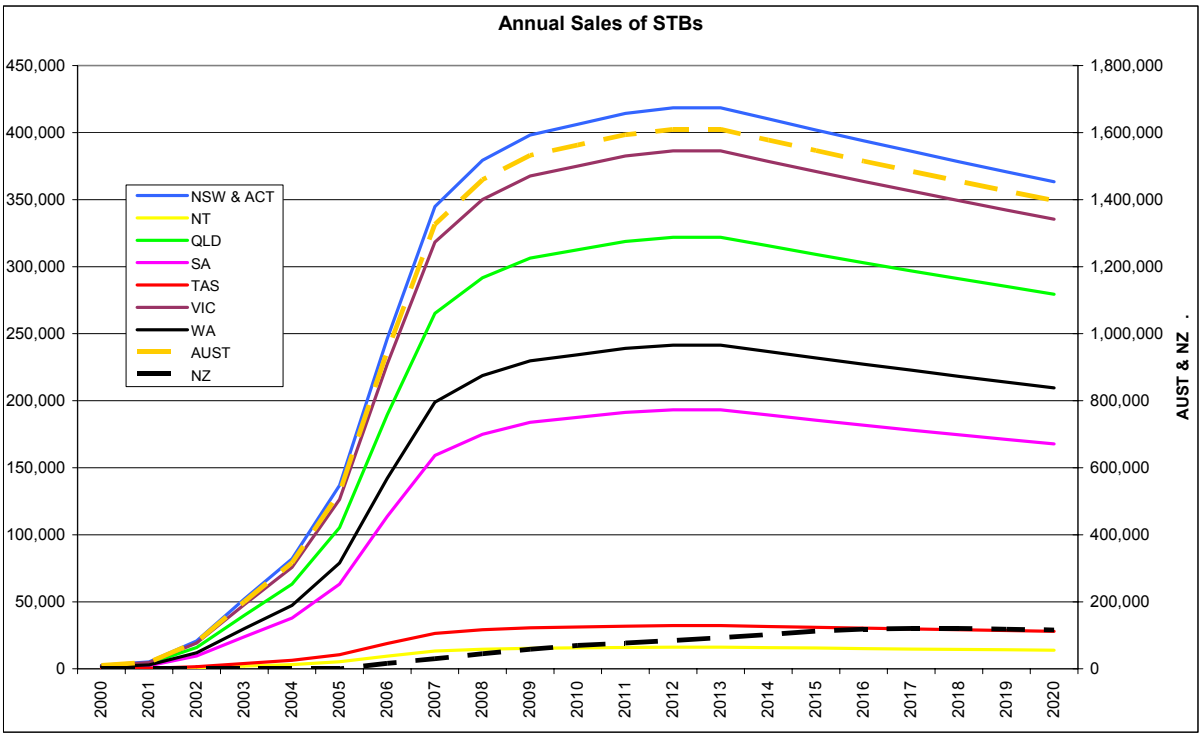
The total number of Pay TV subscribers is 1,841,000 as of June 2006 (AFC 2006). Over 1.27 million are with Foxtel/Optus and approximately 470,000 with Austar. While Austar have in place a digital platform, Foxtel have substantially converted their system to digital, with a change over to their digital STB for existing subscribers and all new subscribers. Both Foxtel and Austar supply STBs with the subscription TV service and the type of STB being provided varies depending on the date the subscriber joined or upgraded their service.

Based on such estimates the present annual sales of FTA STBs and trends for 2000-2020 have been estimated as shown in Table 23 while Figure 25 graphically illustrates the sales trends.

Table 23: Total annual sales of FTA digital STBs 2000-2020, by States, Australia as a whole and New Zealand

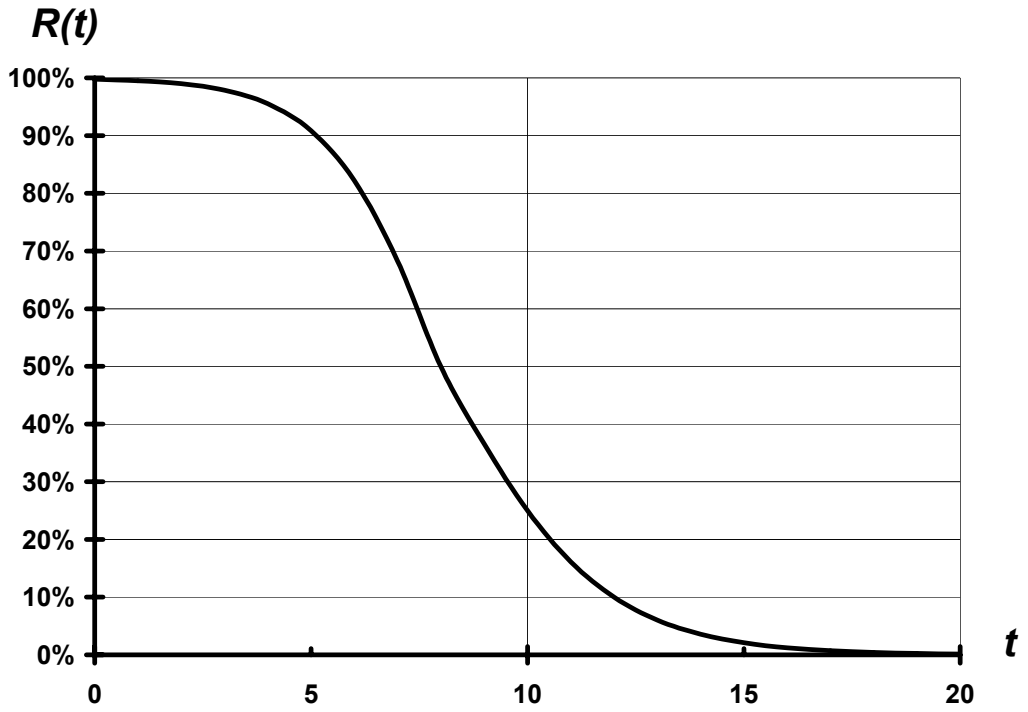
YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	2,600	100	2,000	1,200	200	2,400	1,500	**10,000**	**10**
2001	5,200	200	4,000	2,400	400	4,800	3,000	**20,000**	**10**
2002	20,800	800	16,000	9,600	1,600	19,200	12,000	**80,000**	**10**
2003	52,000	2,000	40,000	24,000	4,000	48,000	30,000	**200,000**	**10**
2004	82,105	3,158	63,158	37,895	6,316	75,789	47,368	**315,789**	**10**
2005	136,842	5,263	105,263	63,158	10,526	126,316	78,947	**526,316**	**110**
2006	246,316	9,474	189,474	113,684	18,947	227,368	142,105	**947,368**	**16,610**
2007	344,842	13,263	265,263	159,158	26,526	318,316	198,947	**1,326,316**	**29,898**
2008	379,326	14,589	291,789	175,074	29,179	350,147	218,842	**1,458,947**	**44,847**
2009	398,293	15,319	306,379	183,827	30,638	367,655	229,784	**1,531,895**	**58,301**
2010	406,258	15,625	312,507	187,504	31,251	375,008	234,380	**1,562,533**	**69,961**
2011	414,384	15,938	318,757	191,254	31,876	382,508	239,067	**1,593,783**	**76,957**
2012	418,527	16,097	321,944	193,167	32,194	386,333	241,458	**1,609,721**	**84,653**
2013	418,527	16,097	321,944	193,167	32,194	386,333	241,458	**1,609,721**	**93,119**
2014	410,157	15,775	315,505	189,303	31,551	378,606	236,629	**1,577,527**	**102,430**
2015	401,954	15,460	309,195	185,517	30,920	371,034	231,896	**1,545,976**	**112,673**
2016	393,915	15,151	303,011	181,807	30,301	363,614	227,258	**1,515,057**	**118,307**
2017	386,036	14,848	296,951	178,171	29,695	356,341	222,713	**1,484,756**	**120,673**
2018	378,316	14,551	291,012	174,607	29,101	349,214	218,259	**1,455,060**	**120,673**
2019	370,749	14,260	285,192	171,115	28,519	342,230	213,894	**1,425,959**	**118,260**
2020	363,334	13,974	279,488	167,693	27,949	335,386	209,616	**1,397,440**	**115,895**

Figure 25: Annual sales of FTA STBs by State, Australia and NZ



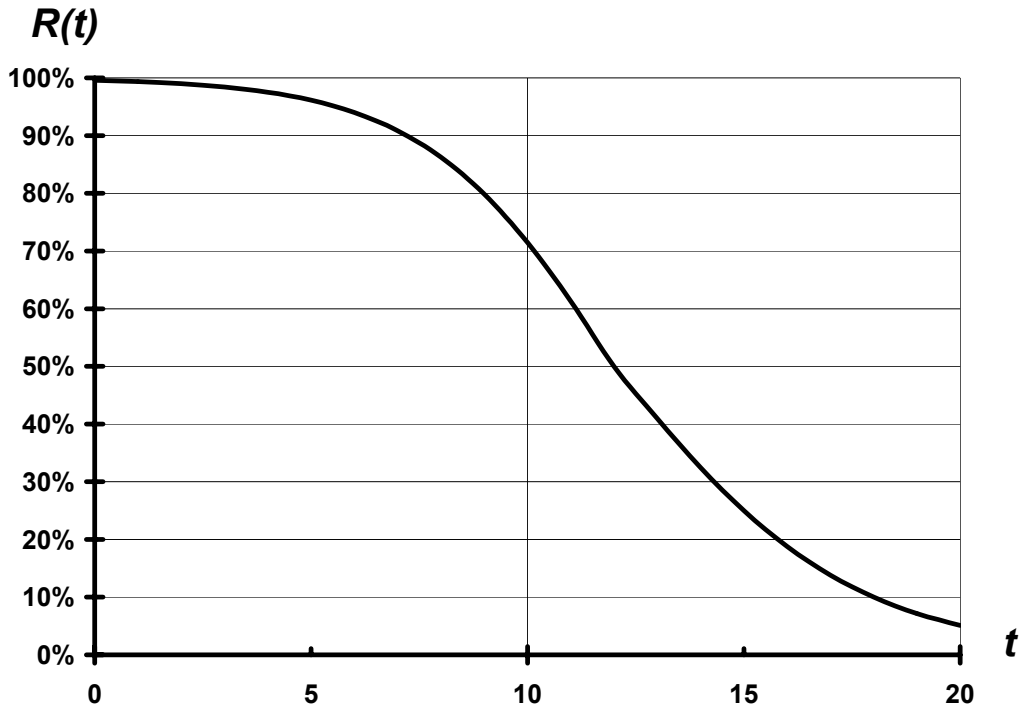
With rapid increase in sales, the stock of digital STBs also continues to grow. The stock is a function of life/age of the device and annual sales. In case of majority of electronic devices, that do not have a mechanical component, the physical life is often greater than 10 years. However, on the other hand due to rapid technological developments, that offer enhanced features to the users coupled with rapidly declining prices as the technology matures, the users tend to replace these devices far earlier than their actual physical lives. A similar situation applies to digital STBs. A US study has used a life of 5 years (Rainer 2004) however, because of higher saturation of TV ownership among consumers that tend to own STBs; the replaced STBs are not simply discarded but rather moved to the 2nd or 3rd TV in the house. Consequently the replaced STBs continue to operate, albeit operating for lesser number of hours than the STBs attached to main TV in the house. Based on such assumption 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 26 provides a graphical view of the percentage of STBs (Rt) in useful service over the life in years from purchase (t).

Figure 26: Survival Function of FTA STB for Australia and New Zealand



The survival function for STV STB is longer in general as the service providers keep their units longer to minimise costs and also re-birth their STBs, as shown in Figure 27

Figure 27: Survival Function of STV STB for Australia and New Zealand

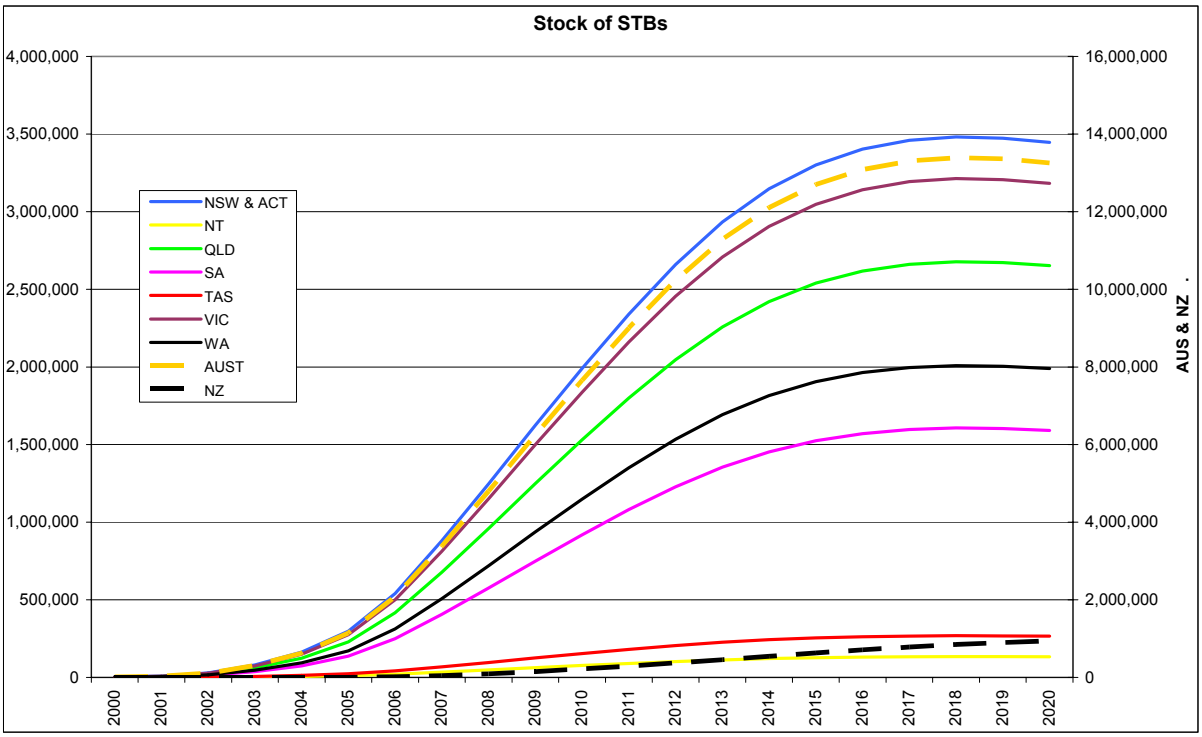


Our estimates of STB stock for the period between 2000 and 2020 by states, Australia as a whole and New Zealand are provided in Table 24 while Figure 28 shows the corresponding trend.

Table 24: Stock of FTA STBs 2000-2020, by States, Australia as a whole and New Zealand

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	2,594	100	1,996	1,197	200	2,395	1,497	**9,978**	**10**
2001	7,777	299	5,982	3,589	598	7,178	4,486	**29,910**	**20**
2002	28,504	1,096	21,926	13,156	2,193	26,312	16,445	**109,632**	**30**
2003	80,282	3,088	61,756	37,053	6,176	74,107	46,317	**308,778**	**40**
2004	161,849	6,225	124,499	74,699	12,450	149,399	93,374	**622,495**	**49**
2005	297,434	11,440	228,795	137,277	22,880	274,554	171,596	**1,143,975**	**158**
2006	540,895	20,804	416,073	249,644	41,607	499,287	312,055	**2,080,364**	**16,730**
2007	879,718	33,835	676,706	406,024	67,671	812,047	507,530	**3,383,530**	**46,518**
2008	1,247,159	47,968	959,353	575,612	95,935	1,151,223	719,515	**4,796,764**	**91,098**
2009	1,623,298	62,435	1,248,691	749,214	124,869	1,498,429	936,518	**6,243,453**	**148,805**
2010	1,990,473	76,557	1,531,133	918,680	153,113	1,837,360	1,148,350	**7,655,665**	**217,493**
2011	2,340,578	90,022	1,800,445	1,080,267	180,044	2,160,534	1,350,334	**9,002,224**	**291,802**
2012	2,660,155	102,314	2,046,273	1,227,764	204,627	2,455,528	1,534,705	**10,231,365**	**371,149**
2013	2,934,440	112,863	2,257,261	1,354,357	225,726	2,708,713	1,692,946	**11,286,306**	**454,271**
2014	3,147,741	121,067	2,421,339	1,452,803	242,134	2,905,607	1,816,004	**12,106,696**	**539,469**
2015	3,301,500	126,981	2,539,615	1,523,769	253,962	3,047,538	1,904,711	**12,698,075**	**626,126**
2016	3,402,907	130,881	2,617,621	1,570,573	261,762	3,141,145	1,963,216	**13,088,106**	**708,407**
2017	3,459,800	133,069	2,661,384	1,596,831	266,138	3,193,661	1,996,038	**13,306,921**	**782,616**
2018	3,480,866	133,879	2,677,589	1,606,553	267,759	3,213,107	2,008,192	**13,387,945**	**846,558**
2019	3,474,179	133,622	2,672,446	1,603,467	267,245	3,206,935	2,004,334	**13,362,228**	**898,337**
2020	3,447,078	132,580	2,651,599	1,590,959	265,160	3,181,919	1,988,699	**13,257,994**	**938,398**

Figure 28: Trend - Stock of Digital STBs



Subscription TV

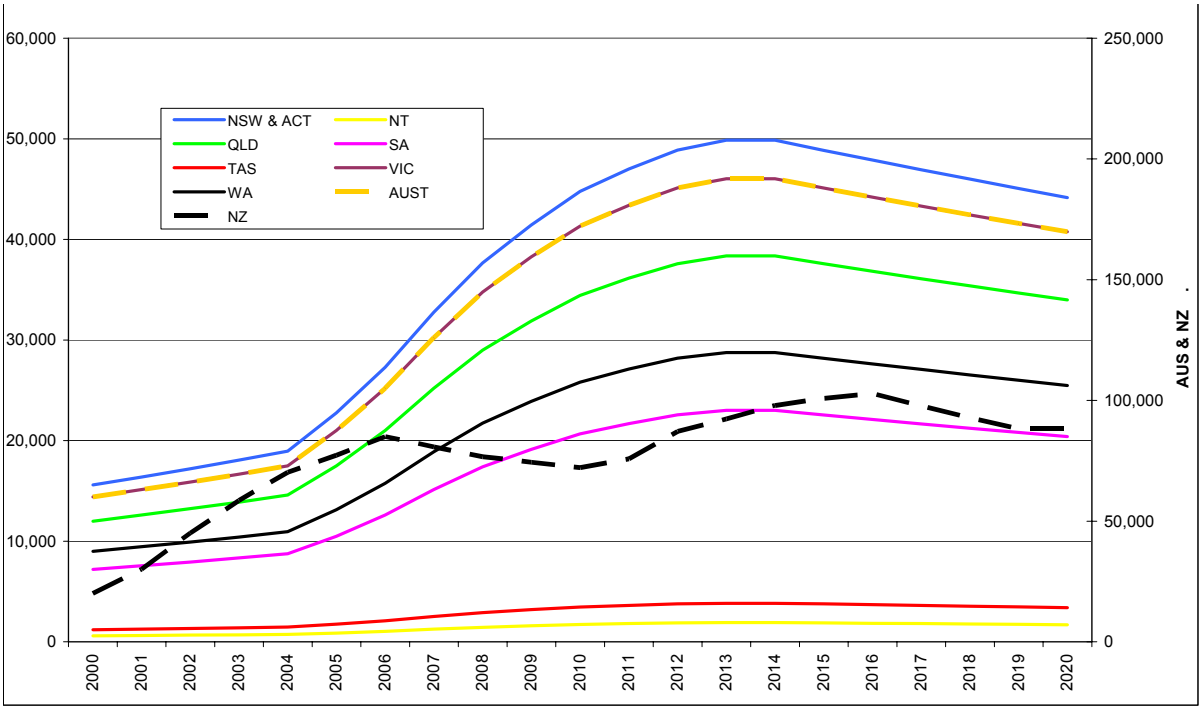
The total number of Australian Subscription TV subscribers is 1,841,000 as of June 2006 (AFC 2006). Over 1.27 million are with Foxtel/Optus and approximately 470,000 with AUSTAR. While AUSTAR have in place a digital platform, Foxtel have substantially converted their system to digital, with a change over to their digital STB for existing subscribers and all new subscribers. Both Foxtel and AUSTAR supply STBs with the subscription TV service and the type of STB being provided varies depending on the date the subscriber joined or upgraded their service.

Current trends show that customer numbers for Foxtel and Austar are increasing, with the number of new STBs delivered to STV subscribers in the order of 100,000 to 200,000 pa (including the change over of existing subscribers to new digital STBs). Table 25 contains annual number of new subscribers of Pay TV while Figure 29 illustrates the corresponding trend.

Table 25: Total annual number of new STBs for Subscription TV 2000-2020, by States, Australia as a whole and New Zealand

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	15,600	600	12,000	7,200	1,200	14,400	9,000	**60,000**	**20,000**
2001	16,380	630	12,600	7,560	1,260	15,120	9,450	**63,000**	**30,000**
2002	17,199	662	13,230	7,938	1,323	15,876	9,923	**66,150**	**45,000**
2003	18,059	695	13,892	8,335	1,389	16,670	10,419	**69,458**	**58,500**
2004	18,962	729	14,586	8,752	1,459	17,503	10,940	**72,930**	**70,200**
2005	22,754	875	17,503	10,502	1,750	21,004	13,127	**87,516**	**77,220**
2006	27,305	1,050	21,004	12,602	2,100	25,205	15,753	**105,020**	**84,942**
2007	32,766	1,260	25,205	15,123	2,520	30,246	18,904	**126,024**	**80,695**
2008	37,681	1,449	28,985	17,391	2,899	34,783	21,739	**144,927**	**76,660**
2009	41,449	1,594	31,884	19,130	3,188	38,261	23,913	**159,420**	**74,360**
2010	44,765	1,722	34,435	20,661	3,443	41,322	25,826	**172,174**	**72,130**
2011	47,003	1,808	36,156	21,694	3,616	43,388	27,117	**180,782**	**75,736**
2012	48,884	1,880	37,603	22,562	3,760	45,123	28,202	**188,014**	**87,096**
2013	49,861	1,918	38,355	23,013	3,835	46,026	28,766	**191,774**	**92,322**
2014	49,861	1,918	38,355	23,013	3,835	46,026	28,766	**191,774**	**97,862**
2015	48,864	1,879	37,588	22,553	3,759	45,105	28,191	**187,938**	**100,797**
2016	47,887	1,842	36,836	22,102	3,684	44,203	27,627	**184,180**	**102,813**
2017	46,929	1,805	36,099	21,660	3,610	43,319	27,074	**180,496**	**97,673**
2018	45,990	1,769	35,377	21,226	3,538	42,453	26,533	**176,886**	**92,789**
2019	45,071	1,733	34,670	20,802	3,467	41,604	26,002	**173,348**	**88,150**
2020	44,169	1,699	33,976	20,386	3,398	40,772	25,482	**169,881**	**88,150**

Figure 29: Annual number of new STBs for Subscription TV

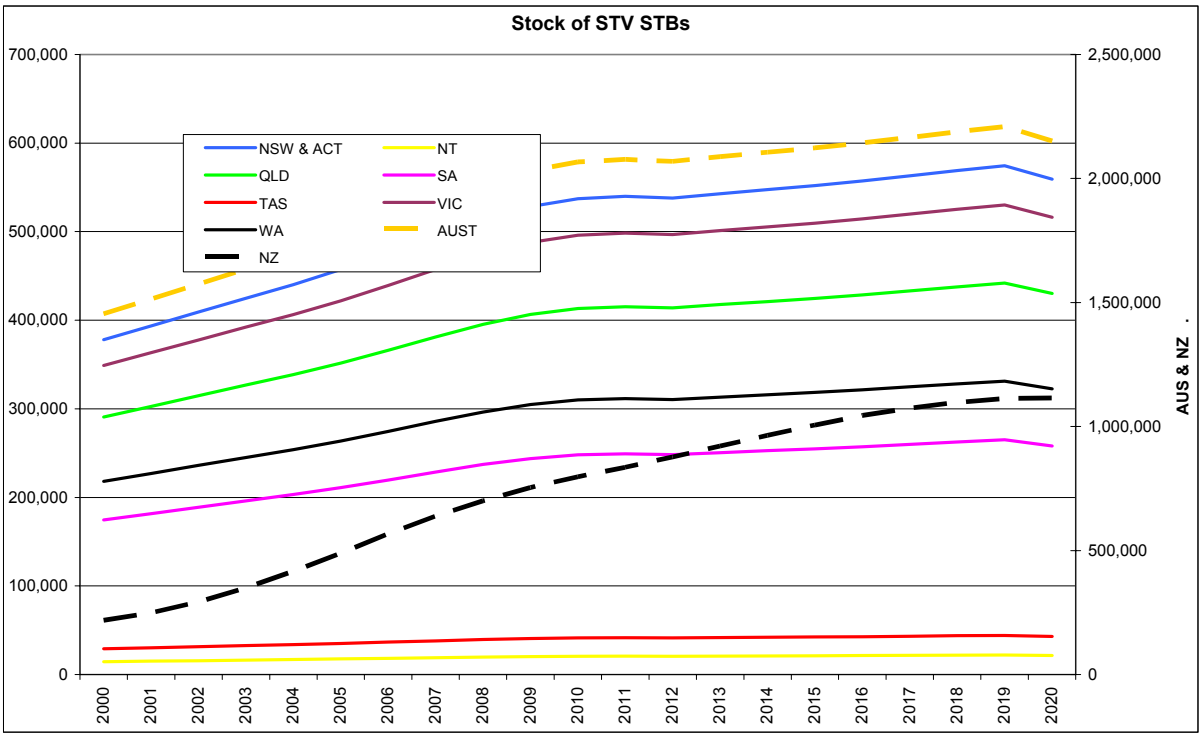


In case of STV STBs, generally one subscription supports one STB, although some consumers may hold more than 1 STB to service to their 2nd or 3rd TVs. Nonetheless, generally 1 STB to one subscription provides a reasonably accurate account of the stock of STV STBs. Consequently the stock of STV STBs becomes a function of number of new subscriptions and number of STBs changed over due to replacements with existing subscribers. As a result the stock of STV STBs is almost equal to the aggregated annual sales figures. Our estimates of STV STB stock for the period between 2000 and 2020 by states, Australia as a whole and New Zealand are provided in Table 26. Figure 30 shows the corresponding trend.

Table 26: Total Stock of STBs for Subscription TV 2000-2020, by States, Australia as a whole and New Zealand

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ
2000	378,077	14,541	290,828	174,497	29,083	348,994	218,121	1,454,141	219,117
2001	393,508	15,135	302,698	181,619	30,270	363,238	227,024	1,513,492	248,485
2002	409,210	15,739	314,777	188,866	31,478	377,732	236,083	1,573,885	292,429
2003	424,917	16,343	326,859	196,116	32,686	392,231	245,145	1,634,297	349,217
2004	440,205	16,931	338,619	203,171	33,862	406,343	253,964	1,693,095	416,692
2005	457,255	17,587	351,734	211,041	35,173	422,081	263,801	1,758,671	489,651
2006	475,818	18,301	366,014	219,608	36,601	439,216	274,510	1,830,068	568,010
2007	495,441	19,055	381,109	228,665	38,111	457,330	285,831	1,905,543	638,756
2008	513,917	19,766	395,321	237,192	39,532	474,385	296,491	1,976,604	700,716
2009	528,411	20,323	406,470	243,882	40,647	487,764	304,852	2,032,348	754,042
2010	537,350	20,667	413,346	248,008	41,335	496,016	310,010	2,066,732	797,353
2011	539,938	20,767	415,337	249,202	41,534	498,404	311,502	2,076,683	835,640
2012	538,029	20,693	413,869	248,321	41,387	496,643	310,402	2,069,344	876,837
2013	542,952	20,883	417,655	250,593	41,766	501,187	313,242	2,088,277	920,932
2014	547,486	21,057	421,143	252,686	42,114	505,372	315,857	2,105,715	964,435
2015	552,042	21,232	424,648	254,789	42,465	509,577	318,486	2,123,239	1,005,660
2016	557,275	21,434	428,673	257,204	42,867	514,408	321,505	2,143,365	1,044,571
2017	563,102	21,658	433,156	259,893	43,316	519,787	324,867	2,165,778	1,074,836
2018	569,023	21,885	437,710	262,626	43,771	525,252	328,282	2,188,550	1,097,370
2019	574,361	22,091	441,816	265,090	44,182	530,179	331,362	2,209,080	1,113,015
2020	559,252	21,510	430,194	258,116	43,019	516,232	322,645	2,150,968	1,115,410

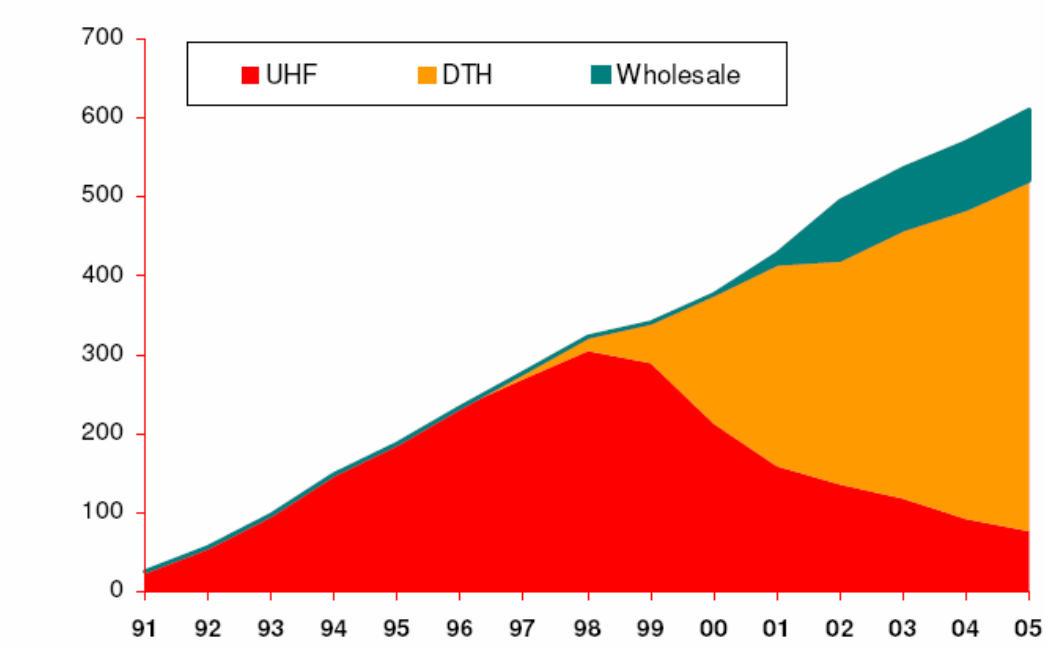
Figure 30: Trend - Stock of STV STBs



Ownership and Market Trends by STB Categories

The higher degree of penetration of FTA TV is likely to continue despite gradual transition to digital transmission and continuing increase in market share by subscription TV service providers. The growth of new STBs in the STV category is expected to grow at a steady rate of 5% per year in Australia. In New Zealand, the growth of STV services is likely to continue as a higher rate (Spectrum Strategy Consultants 2006). Figure 31 shows the predicted STV services for New Zealand where digital FTA TV is introduced.

Figure 31: STV Service: Subscribers Forecast in NZ



Source: Exhibit 15: Historical penetration of SKY ('000 HHs): Spectrum Strategy Consultants 2006

In case of FTA STBs in Australia, due to substantial price difference and lack of availability of high definition display devices, initially the sales of standard definition STBs (SD STBs) are expected to be much higher. However, SD STBs are expected to phase out gradually when high definition displays becomes more common and prices of high definition STBs become more competitive due to increased market volume.

In NZ, the initial FTA digital transmission is in standard definition, however high definition is expected to be phased in over time. The HD transmission is likely to be MPEG4 and this will require a different STB to the Australian market. However, the sales and stock of HD STBs in NZ is expected to increase as the HD service becomes available and similar trends to Australia are experienced with the penetration of HD display devices. STV STBs sales are modelled to closely result in the STV figures forecast by Spectrum Strategy Consultants for the New Zealand digital TV cost-benefit (Spectrum Strategy Consultants 2006). In this report, *Scenario 3: Digital FTA platform is launched and there is Analog Switch Off,* represents the government policy for digital FTA TV.

Figure 32 and Figure 33 show respectively such trends of STBs sales by three types for Australia and New Zealand.

Figure 32: Annual sales of STBs by Categories – Australia

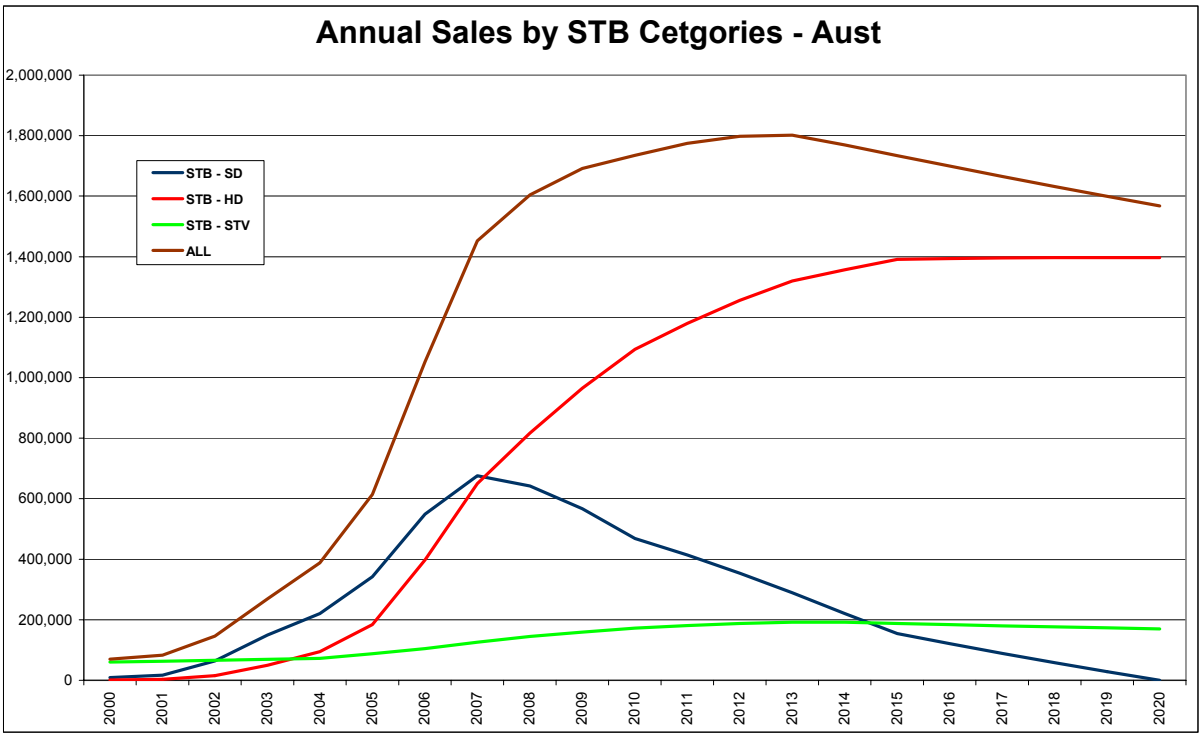
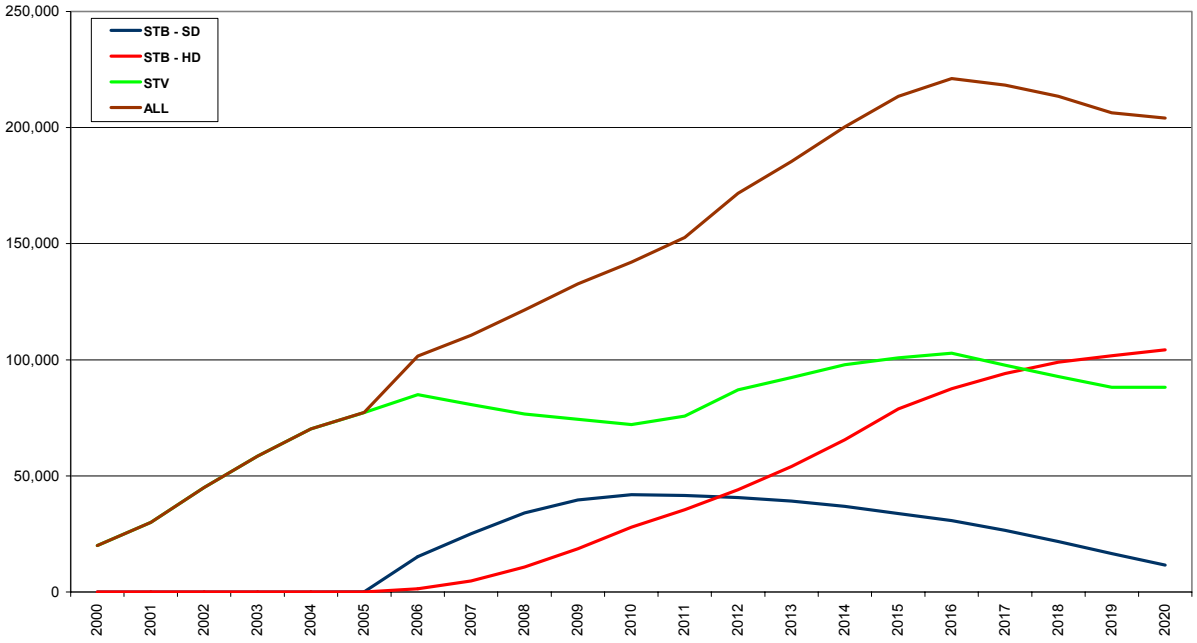


Figure 33: Annual sales of STBs by Categories – New Zealand



Following the sales trend as above, the stock of 3 types of STBs are shown in Figure 34 and Figure 35 by categories for Australia and New Zealand respectively.

Figure 34: Trend - Stock of STBs by Categories – Australia

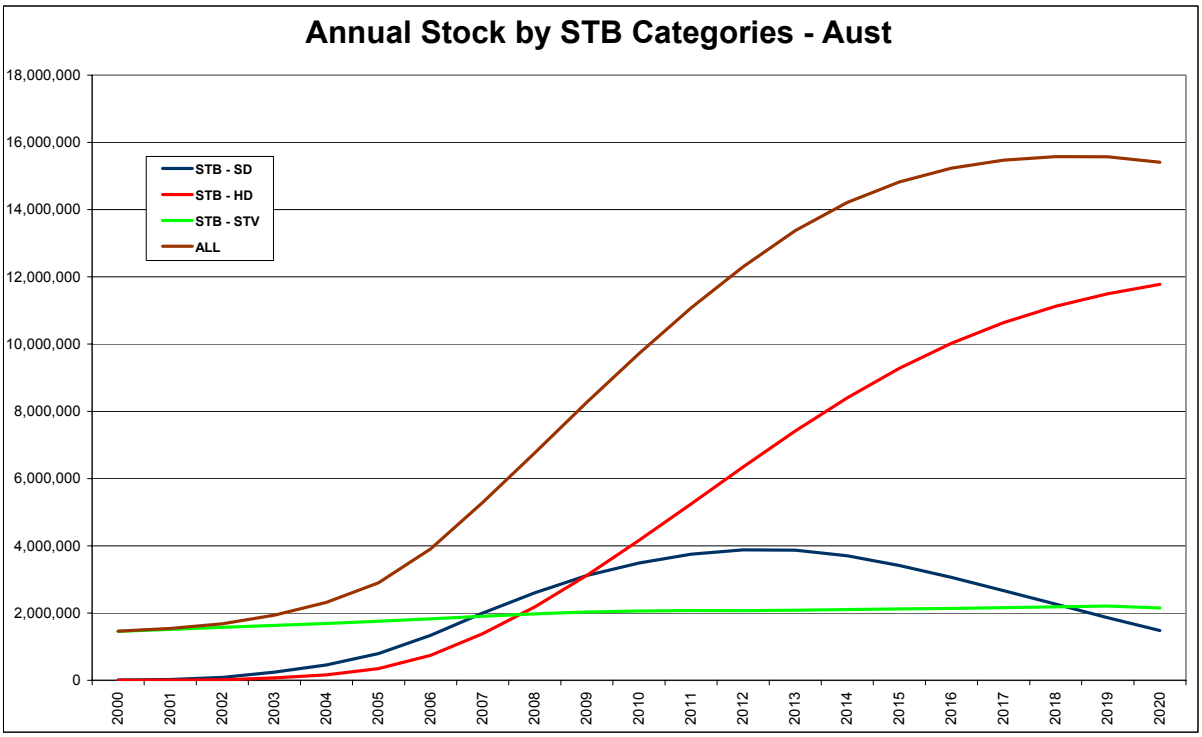
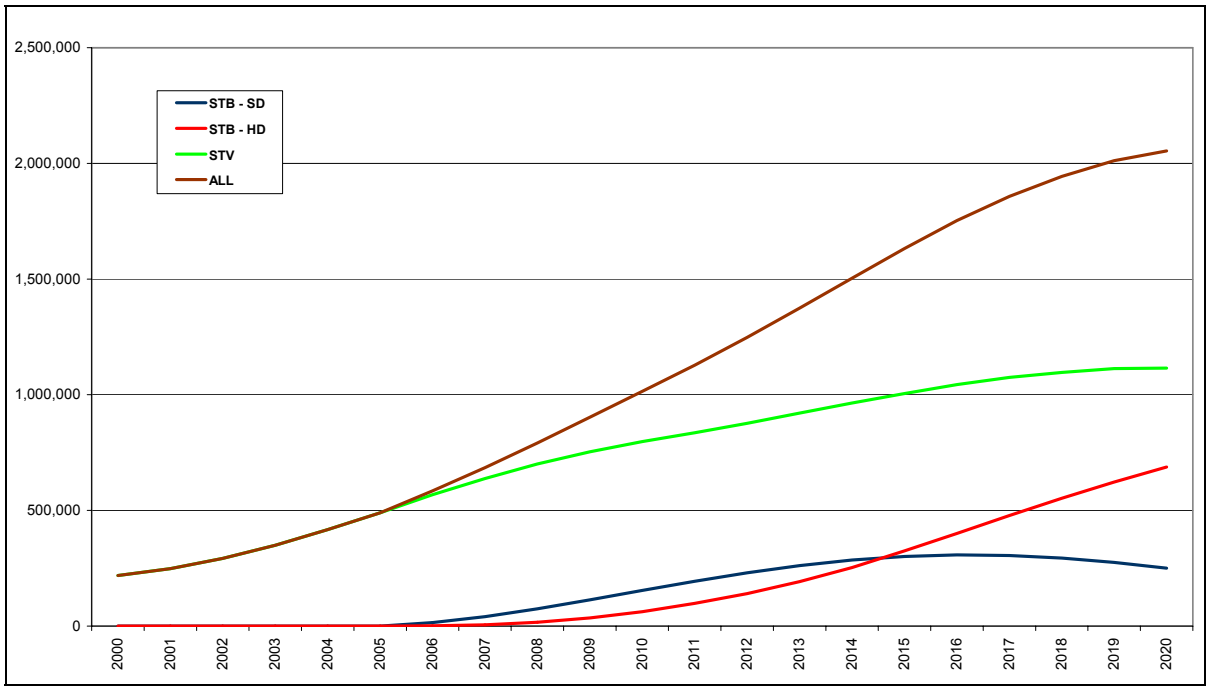
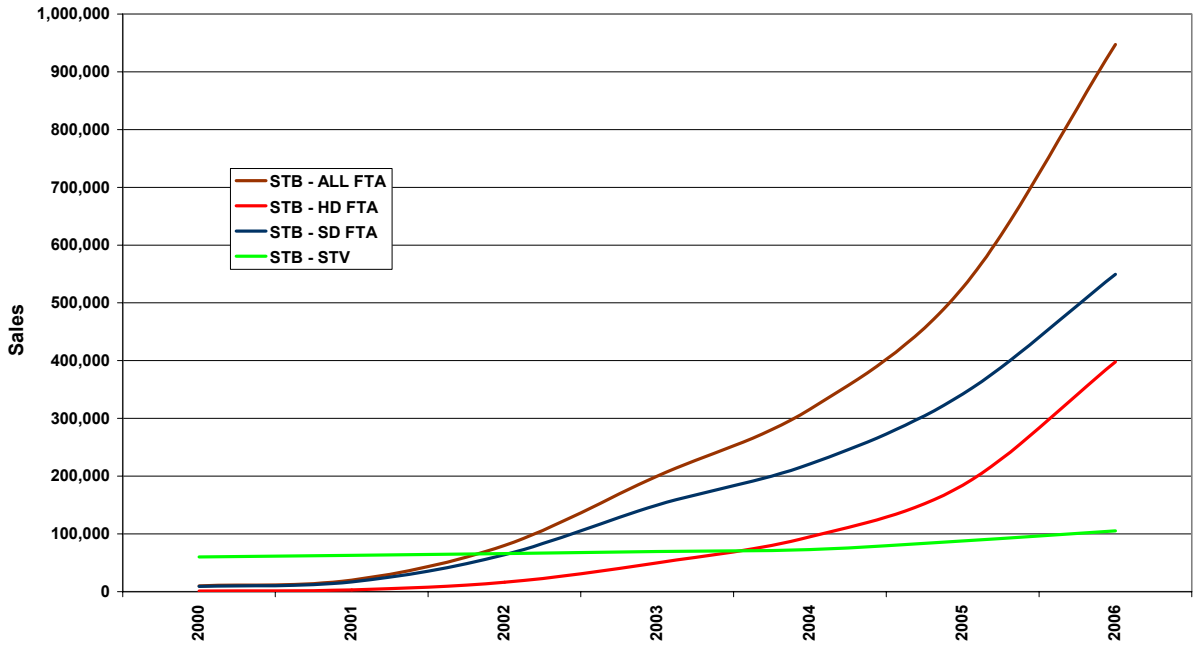


Figure 35: Trend - Stock of STBs by Categories – New Zealand



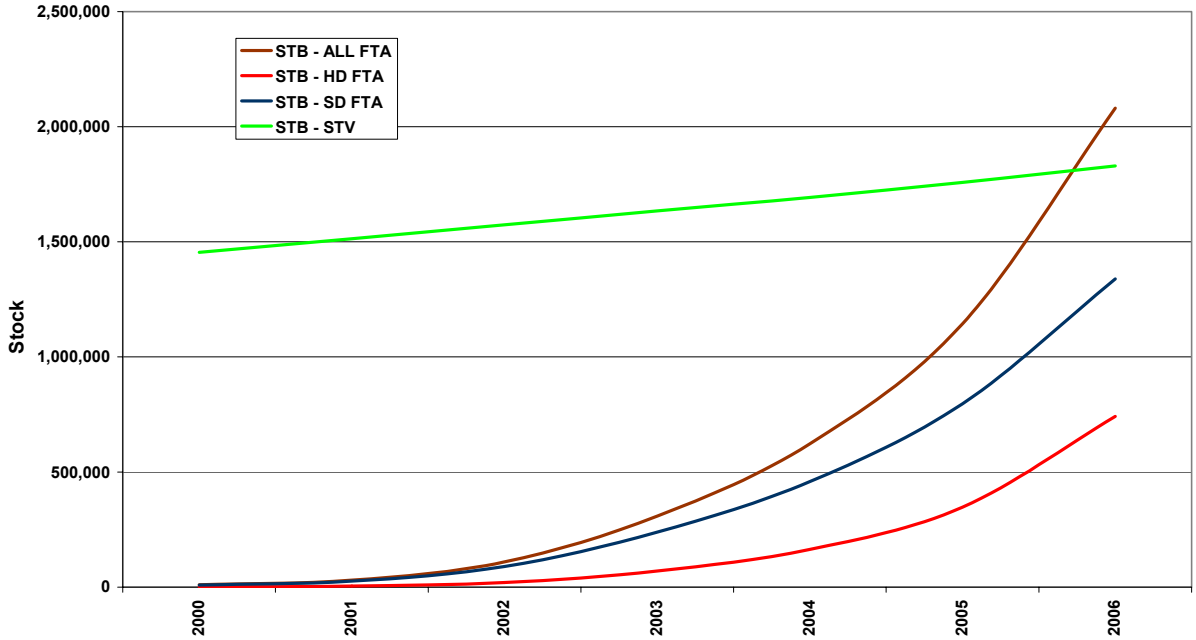
Total annual sales of STBs are shown in Figure 36 , with FTA STB shown separately for SD and HD STBs.

Figure 36: Annual Sales of STB – Australia



The total installed stock of STBs in Australia is shown in Figure 37 , with FTA STB shown separately for SD and HD STBs.

Figure 37: Total Installed Stock of STB – Australia



Appendix 3: Overseas Policies, Programs and Measures

This section reviews international practices related with specific energy efficiency requirements for Set Top Boxes.

ENERGY STAR

In the United States and internationally, the ENERGY STAR Program run by the United States Environmental Protection Agency (US EPA) aims to encourage industry best practice by forming partnerships with manufacturers and setting performance targets for appliances. The ENERGY STAR program is a voluntary program and is currently being specified for STBs. The development of the ENERGY STAR criteria will be undertaken with industry. In 2002, the ENERGY STAR criteria for STBs were developed and in 2004 the criteria were suspended due to industry reactions. The previous criteria were to be implemented in two phases. Tier 1 concluded on 31 December 2003 while Tier 2 was to commence on 1 January 2004. To qualify for an ENERGY STAR label in Tier 1, digital STBs were classified into 3 categories each with different requirements: digital TV converter boxes were required to consume less than or equal to 3W in standby mode; digital cable TV converter boxes were required to consume less than or equal to 15W in standby mode; and digital STBs with capabilities to perform additional functions such as internet access were required to consume less than or equal to 20W. In Tier 2 all STBs were required to meet the one specification being less than or equal to 7W. Specifications for Tier 2 were to apply to products that manufacturers began to ship after 31 December 2003.

The latest draft ENERGY STAR criteria were published in December 2006. These specifications match the CEC MEPS requirements shown in Table 27 but also include the requirement for the STB (DTA) to include an auto-power down feature to automatically switch from the On state to the Sleep state (passive standby) after a period of time without user input . More details can be found on www.energystar.gov.

USA - California

The California Energy Commission (CEC) is responsible for setting minimum energy performance standards in California and has included STBs as a regulated appliance. The latest rulemaking documents (Rulemaking 06-AAER-1) have proposed the minimum standby and in-use power levels for Digital TV Adaptor (DTA). The CEC defines DTAs as *"commercially-available electronic product which converts digital video broadcast signals for use by an analog video device such as a TV or VCR*". The DTA is essentially a basic STB, primarily used for digital terrestrial broadcast TV. The CEC have implemented the standards shown in Table 27 from 1 January 2008:

Table 27: MEPS for DTAs (STBs) in California USA

Device	Max Standby Power (W)	Maximum On Power (W)
DTA	1	8

Europe

European Commission

The European Commission has established a Code of Conduct for all digital TV service systems including, among other things, digital STBs. The Code of Conduct, which has several signatories including companies such as Philips, Sony, Pioneer, Nokia, Pace Micro Technology and Matsushita, aims to minimise the energy consumption of appliances listed in the code. The Code of Conduct is a voluntary agreement and signatories are obliged to provide, on a yearly basis, information concerning the power consumption of the equipment they produce. The maximum power consumption for STBs in passive standby mode is 6W while in active standby mode the maximum should not exceed 9W. The targets within the Code of Conduct became effective on January 1, 2003 and will remain in effect until December 31, 2005. In November 2003, targets were set for the 2006 - 2007 period and included different levels for different types of STBs, including the creation of the "simple converter" category. This category covers units that only transfer free digital signals to analog TVs and VCRs. All the target levels are summarised in Table 29.

While the European targets are set as maximum levels there are exceptions set out in the Code. If the STB has additional components, an additional power allowance can be added to the maximum targets. The features and the allowable power consumption for each are listed in Table 28. However, the Code does stipulate that the total maximum power consumption targets in active standby mode should not exceed 15W.

Table 28: Additional power consumption allowable for additional features

Feature	Additional power consumption
Internal hard disk drive	2.2W
IEEE1394 interface	0.8W
Ethernet interface 100 Mbit	0.4W
Wireless interface	0.7W
Serial USB interface	0.3W
Home automation interface	0.4W
ADSL modem	2.0W
Extra cable modem	0.7W
Additional LNB feed	1.3W
Additional tuner	2.0W
Powered remote IR receiver	0.25W

GEEA

The Group for Energy Efficient Appliances (GEEA), which is made up of representatives from a number of European national energy agencies and government departments, encourages industry best practice through a voluntary energy labelling scheme that covers a wide range of home electronics and office equipment. The criteria for each product are generally reviewed (although not necessarily altered) on an annual basis. The criteria vary depending on the type of STB and apply until December 31 2005. STBs have been categorised as integrated receiver decoders (IRDs) and digital to analog converters (simple converter STBs) with separate criteria as follows:

- If the STB has an on/off switch, the power consumption in off mode must be 0.5W or less (applies 2004 & 2005);
- In passive standby mode, (this mode is optional) the maximum consumption is 1W for digital IRD, and 2W for a digital to analog (simple) converter box (applies 2004 & 2005); and
- In active standby mode, digital IRDs the 2004 limit is 9W, however, there are exceptions for additional features up to a maximum of 15W as outlined in Table 28. In 2006 these levels will change to 6W for terrestrial, 7W for cable and 8W for satellite. However the maximum allowed with add ons remains at 15W for digital to analog STBs. The maximum limit is 11W for cable and terrestrial and 14W for satellite units until the end of 2005.

The GEEA label criteria is summarised in Table 29. More details can be found on www.gealabel.org/home.htm.

Korea

The Energy-Saving Office Equipment & Home Electronics Program (Energy Boy) is a voluntary labelling scheme that was implemented in April 1, 1999. The program is very similar to the USA's ENERGY STAR Program, however it is considered mandatory by

the Korean government. A passive standby level for STBs was introduced in 2002 with consumption required to be less than or equal to 3W.

In 2005, Korea launched its Standby Power Plan (Korea Standby 2010), where all STB will be required to meet a passive standby power level of <1W by 2010.

China

The Chinese standards organisation – China Certification Centre for Energy Conservation Products – CECP is one of the organizations charged with responsibility for fulfilling the requirements of the "Energy Conservation Law" of the Peoples Republic of China. At the IEA meeting in Paris in May 2004, CECP announced China's plans to label and regulate the energy use of set-top boxes, with over 30M STBs forecast to be in use by 2005. These plans are still being formalised, but Australia and USA have committed to assist with this program using a model of international cooperation based on the External Power Supplies project.

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 standby. Launched in 1999, this campaign aims to guide government policy-makers and appliance manufacturers towards equipment that consumes no more than 1W when in standby mode. The Australian Government has endorsed the 1W standby target for appliances sold in Australia. More details can be found in the Ministerial Council on Energy's standby strategy "Money isn't all you're saving" (MCE 2002).

In May 2004, the International Energy Agency hosted an international workshop on saving energy in STBs. The objective of the workshop was to establish an informal agreement among the various players in the international STB "community" on procedures to greatly reduce the energy consumption of STBs (including all kinds of converter boxes). Over 50 representatives attended the meeting including manufacturers of STBs, televisions, chips, TV service providers and staff from various voluntary energy efficiency programmes (such as ENERGY STAR, GEEA, METI, European Commission). Government regulators from the USA, Europe and China also attended and "agreed to take accelerated, coordinated, actions to improve this product's efficiency". The outcome of the workshop can be found at http://www.iea.org/Textbase/work/2003/set-top/outcome.pdf.

Summary

Internationally, California in the USA and Korea are currently the only jurisdictions that plan to or impose a MEPS for STBs, however the European Commission agreement (Code of Conduct) with manufacturers covers several suppliers in Europe. Additionally, China is planning a MEPS for STBs within the next two years. The USA ENERGY STAR program sets voluntary targets for standby power of STBs but does not consider

in-use consumption. The Group for Energy Efficient Appliances (GEEA) Energy Tick in Europe also covers standby power use of STBs.

Table 29: Summary of program requirements for STBs - Internationally

	Mode	Dates	Criteria
ENERGY STAR	Passive standby DTA (STB)	From 31/1/2007	≤1W
	In Use DTA (STB)	From 31/1/2007	≤8W
California (MEPS)	Passive standby DTA (STB)	From 1/1/2008	≤1W
	In Use DTA (STB)	From 1/1/2008	≤8W
EC Code of Conduct	Passive standby	Until 31/12/2005	≤6W
	Active standby	Until 31/12/2005	≤9W[2]
	Passive standby	From 1/1/2006	≤3W
	Active standby Cable Terrestrial Satellite	From 1/1/2006	≤7W[2] ≤6W[2] ≤8W[2]
	Passive standby Simple converters	From 1/1/2005	≤2W
	On mode Simple converters Cable & Terrestrial Satellite	From 1/1/2005	≤11W ≤14W
GEEA, Europe	Off (must have off mode)	Until 31/12/2003 From 1/1/2004	≤0.5W NA
	Passive standby Digital STB	Until 31/12/2005	≤1W
	Active standby Digital STB Terrestrial Cable Satellite	Until 31/12/2004 From 1/1/2005	≤9W ≤7W[2] ≤6W[2] ≤8W[2]
	Passive standby Digital to analog	Until 31/12/2005	≤2W
	Active standby Digital to analog Terrestrial & Cable Satellite	Until 31/12/2005	≤11W[2] ≤14W[2]
Korea	Passive standby	From 1/1/2002 From 2010	≤3W ≤1W
China	Passive standby + in use	Under consideration	

Note: GEEA criteria are reviewed annually.

1. Tier 2 criteria cover all STBs including analogue and cable/satellite STBs.

2. If the STB has additional components an additional power allowance is permitted although the total maximum consumption in active standby mode should not exceed 15W.

Appendix 4: Energy Prices and Factors

Table 30: 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	
Australia (weighted)	**12.7**	
New Zealand	**17.42** NZ c/kWh	

Sources: Australian tariffs from EPS RIS 2006. NZ tariff of 17.42 NZ c/kWh retail price excluding GST provided by EECA, NZ, in 2007.

Appendix 5: Calculation Methodology

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

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

Power and Usage

Like any electrical appliance, the contribution of STBs 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 STB are shown in Appendix 8: BAU and MEPS STB 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 STBs is shown in Table 31 for 3 scenarios.

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

STB Category	Hours – Base	Hours – Low	Hours – High
STB - SD (ON)	6.0	2.0	12.0
STB - SD (Active Stby)	12.0	2.0	12.0
STB - SD (Passive Stby)	6.0	20.0	0.0
STB - SD (Off)	0.0	0.0	0.0
STB - HD (ON)	6.0	2.0	12.0
STB - HD (Active Stby)	12.0	2.0	12.0
STB - HD (Passive Stby)	6.0	20.0	0.0
STB - HD (Off)	0.0	0.0	0.0
STB - STV (ON)	6.0	2.0	12.0
STB - STV (Active Stby)	18.0	22.0	12.0
STB - STV (Passive Stby)	0.0	0.0	0.0
STB - STV (Off)	0.0	0.0	0.0

Hours of operation for the Base Scenario are estimated from the Intrusive Survey of Standby Power undertaken in 2005 (EES 2006) and TV viewing characteristics (AFC 2006).

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 STBs (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 Emission Factors in Appendix 6.

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 10. These costs are multiplied by the sales of STBs 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 – base and low Usage
- Several incremental cost scenarios were modelled as shown in Figure 18.

Appendix 6: Greenhouse Gas Emission Factors

Table 33: Projected Marginal Emission 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: see separate emission factor file for each State. Regional weightings by GWA All values state-wide average kg CO_2-e per kWh delivered, taking into account transmission and distribution losses (combustion emissions only).

Appendix 7: 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 8: BAU and MEPS STB Power Consumption Values

POWER (W) in YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
STB - SD (ON) - BAU	12.0	11.5	11.0	10.5	10.1	9.6	9.4	9.1	8.9	8.7	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
STB - SD (Active Stby) - BAU	11.6	11.2	10.8	10.4	10.0	9.6	9.4	9.1	8.9	8.7	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
STB - SD (Passive Stby) - BAU	8.5	8.7	8.9	9.1	9.3	9.5	9.3	9.1	8.9	8.7	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
STB - SD (Off) - BAU	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
STB - SD (ON) - MEPS	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
STB - SD (Active Stby) - MEPS	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
STB - SD (Passive Stby) - MEPS	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
STB - SD (Off) - MEPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STB - HD (ON) - BAU	23.00	21.60	20.20	18.80	17.40	16.00	15.60	15.20	14.80	14.40	14.00	13.60	13.20	12.80	12.40	12.00	11.80	11.60	11.40	11.20	11.00
STB - HD (Active Stby) - BAU	23.00	21.60	20.20	18.80	17.40	16.00	15.60	15.20	14.80	14.40	14.00	13.60	13.20	12.80	12.40	12.00	11.80	11.60	11.40	11.20	11.00
STB - HD (Passive Stby) - BAU	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	9.60	9.20	8.80	8.40	8.00
STB - HD (Off) - BAU	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
STB - HD (ON) - MEPS	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
STB - HD (Active Stby) - MEPS	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
STB - HD (Passive Stby) - MEPS	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
STB - HD (Off) - MEPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STB - STV (ON) - BAU	25.00	24.00	23.00	22.00	21.00	20.00	19.60	19.20	18.80	18.40	18.00	17.40	16.80	16.20	15.60	15.00	15.00	15.00	15.00	15.00	15.00
STB - STV (Active Stby) - BAU	25.00	24.00	23.00	22.00	21.00	20.00	19.60	19.20	18.80	18.40	18.00	17.40	16.80	16.20	15.60	15.00	15.00	15.00	15.00	15.00	15.00
STB - STV (Passive Stby) - BAU	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
STB - STV (Off) - BAU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STB - STV (ON) - MEPS	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
STB - STV (Active Stby) - MEPS	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
STB - STV (Passive Stby) - MEPS	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
STB - STV (Off) - MEPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 9: Annual Benefit and Cost Data

Table 34: Annual Consumer Energy, Benefits and Costs by State for Australia & New Zealand: 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
Australia																						
BAU Energy use	GWh/yr	333.0	348.2	369.3	402.6	446.4	511.1	619.6	766.7	923.8	1080.5	1228.2	1361.6	1476.6	1577.2	1650.6	1697.9	1723.1	1729.7	1720.7	1699.3	1651.2
With-program energy use	GWh/yr	333.0	348.2	369.3	402.6	446.4	511.1	619.6	766.7	858.9	949.7	1032.8	1104.0	1161.0	1210.2	1242.5	1262.3	1274.4	1279.4	1279.4	1275.5	1251.7
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.9	130.8	195.4	257.6	315.6	367.0	408.1	435.6	448.8	450.3	441.3	423.7	399.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.22	16.56	24.74	32.62	39.96	46.47	51.67	55.16	56.82	57.01	55.88	53.66	50.59
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.5	130.1	192.5	250.8	309.3	351.8	399.4	410.9	418.0	409.4	398.8	379.8	352.7
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.89	2.37	1.73	1.42	1.08	0.72	0.35	0.00	0.00	0.00	0.00	0.00	0.00
NSW&ACT																						
BAU Energy use	GWh/yr	90.0	94.0	99.8	108.7	120.6	138.1	167.4	207.1	249.6	291.9	331.8	367.8	398.9	426.1	445.9	458.7	465.5	467.2	464.8	459.0	446.1
With-program energy use	GWh/yr	90.0	94.0	99.8	108.7	120.6	138.1	167.4	207.1	232.0	256.6	279.0	298.2	313.6	326.9	335.7	341.0	344.3	345.6	345.6	344.6	338.1
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	35.3	52.8	69.6	85.3	99.1	110.2	117.7	121.2	121.6	119.2	114.5	107.9
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	3.23	4.82	6.36	7.79	9.06	10.08	10.76	11.08	11.12	10.90	10.46	9.86
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.9	34.9	51.5	67.0	82.3	93.7	105.9	108.1	110.3	107.4	105.9	100.8	93.5
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.62	0.45	0.37	0.28	0.19	0.09	0.00	0.00	0.00	0.00	0.00	0.00
NT																						
BAU Energy use	GWh/yr	3.9	4.1	4.3	4.7	5.2	6.0	7.3	9.0	10.8	12.7	14.4	16.0	17.3	18.5	19.4	19.9	20.2	20.3	20.2	20.0	19.4
With-program energy use	GWh/yr	3.9	4.1	4.3	4.7	5.2	6.0	7.3	9.0	10.1	11.2	12.1	13.0	13.6	14.2	14.6	14.8	15.0	15.0	15.0	15.0	14.7
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.5	2.3	3.0	3.7	4.3	4.8	5.1	5.3	5.3	5.2	5.0	4.7
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.24	0.35	0.47	0.57	0.66	0.74	0.79	0.81	0.81	0.80	0.77	0.72
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.2	1.8	2.4	2.7	3.2	3.5	3.8	3.9	3.9	3.9	3.7	3.5
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QLD																						
BAU Energy use	GWh/yr	77.8	81.4	86.3	94.1	104.3	119.4	144.8	179.2	215.9	252.5	287.0	318.2	345.1	368.6	385.7	396.8	402.7	404.2	402.1	397.1	385.9
With-program energy use	GWh/yr	77.8	81.4	86.3	94.1	104.3	119.4	144.8	179.2	200.7	222.0	241.4	258.0	271.3	282.8	290.4	295.0	297.8	299.0	299.0	298.1	292.5
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	30.6	45.7	60.2	73.8	85.8	95.4	101.8	104.9	105.2	103.1	99.0	93.4
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	3.55	5.30	6.98	8.56	9.95	11.06	11.81	12.17	12.21	11.96	11.49	10.83
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9	28.6	42.7	55.9	68.7	77.3	88.6	92.8	94.5	94.1	90.1	85.6	81.1
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.47	0.35	0.28	0.22	0.14	0.07	0.00	0.00	0.00	0.00	0.00	0.00

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SA																						
BAU Energy use	GWh/yr	35.2	36.8	39.0	42.5	47.2	54.0	65.5	81.0	97.6	114.2	129.8	143.9	156.1	166.7	174.4	179.4	182.1	182.8	181.8	179.6	174.5
With-program energy use	GWh/yr	35.2	36.8	39.0	42.5	47.2	54.0	65.5	81.0	90.8	100.4	109.2	116.7	122.7	127.9	131.3	133.4	134.7	135.2	135.2	134.8	132.3
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	13.8	20.6	27.2	33.4	38.8	43.1	46.0	47.4	47.6	46.6	44.8	42.2
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	2.07	3.09	4.07	4.99	5.80	6.45	6.89	7.09	7.12	6.98	6.70	6.32
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	15.4	22.6	29.9	37.4	41.8	47.1	46.7	47.1	46.9	45.7	44.8	40.3
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.28	0.21	0.17	0.13	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00
TAS																						
BAU Energy use	GWh/yr	5.6	5.8	6.2	6.7	7.5	8.6	10.4	12.8	15.5	18.1	20.5	22.8	24.7	26.4	27.6	28.4	28.8	28.9	28.8	28.4	27.6
With-program energy use	GWh/yr	5.6	5.8	6.2	6.7	7.5	8.6	10.4	12.8	14.4	15.9	17.3	18.5	19.4	20.2	20.8	21.1	21.3	21.4	21.4	21.3	20.9
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.2	3.3	4.3	5.3	6.1	6.8	7.3	7.5	7.5	7.4	7.1	6.7
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.27	0.41	0.54	0.66	0.77	0.85	0.91	0.94	0.94	0.92	0.89	0.84
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.3	3.3	4.3	5.3	6.2	6.9	7.6	7.4	7.3	7.0	6.8	6.5
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.05	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
VIC																						
BAU Energy use	GWh/yr	70.2	73.4	77.9	84.9	94.1	107.8	130.7	161.7	194.8	227.9	259.0	287.2	311.4	332.6	348.1	358.1	363.4	364.8	362.9	358.4	348.2
With-program energy use	GWh/yr	70.2	73.4	77.9	84.9	94.1	107.8	130.7	161.7	181.1	200.3	217.8	232.8	244.9	255.2	262.1	266.2	268.8	269.8	269.8	269.0	264.0
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	27.6	41.2	54.3	66.6	77.4	86.1	91.9	94.6	95.0	93.1	89.4	84.3
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	4.30	6.43	8.47	10.38	12.07	13.43	14.33	14.76	14.81	14.52	13.94	13.14
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5	30.2	44.3	59.0	73.5	84.0	95.7	96.3	96.8	94.2	92.6	86.2	78.9
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.57	0.42	0.34	0.26	0.17	0.08	0.00	0.00	0.00	0.00	0.00	0.00
WA																						
BAU Energy use	GWh/yr	50.3	52.6	55.8	60.8	67.4	77.2	93.6	115.9	139.6	163.3	185.6	205.7	223.1	238.3	249.4	256.5	260.4	261.4	260.0	256.8	249.5
With-program energy use	GWh/yr	50.3	52.6	55.8	60.8	67.4	77.2	93.6	115.9	129.8	143.5	156.1	166.8	175.4	182.9	187.7	190.7	192.6	193.3	193.3	192.7	189.1
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	19.8	29.5	38.9	47.7	55.4	61.7	65.8	67.8	68.0	66.7	64.0	60.4
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44	2.91	4.34	5.72	7.01	8.15	9.06	9.68	9.97	10.00	9.80	9.41	8.87
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7	17.6	26.4	32.3	39.4	45.6	51.7	55.6	58.0	55.6	53.6	51.7	48.9
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.36	0.26	0.21	0.16	0.11	0.05	0.00	0.00	0.00	0.00	0.00	0.00
NZ																						
BAU Energy use	GWh/yr	41.7	47.0	54.7	64.2	74.9	85.8	98.5	110.7	122.4	133.4	143.5	152.7	162.0	171.8	181.1	189.9	198.0	204.5	209.3	212.5	212.5
With-program energy use	GWh/yr	41.7	47.0	54.7	64.2	74.9	85.8	98.5	110.7	116.6	122.0	126.5	130.2	133.8	138.0	142.1	146.3	150.3	153.5	156.1	158.0	157.6
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	11.4	17.0	22.5	28.3	33.8	39.0	43.6	47.7	51.0	53.3	54.5	54.9
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.99	2.96	3.92	4.92	5.89	6.80	7.59	8.31	8.88	9.28	9.50	9.56
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	6.9	10.2	13.5	17.0	20.3	23.4	26.2	28.6	30.6	32.0	32.7	32.9
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.20	0.16	0.13	0.11	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00

Table 35: Annual Consumer Energy, Benefits and Costs by State for Australia & New Zealand: 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
Australia																						
BAU Energy use	GWh/yr	333.0	348.2	369.3	402.6	446.4	511.1	619.6	746.9	870.2	973.3	1053.4	1107.2	1134.3	1142.9	1127.2	1092.1	1044.4	984.6	918.2	849.5	764.4
With-program energy use	GWh/yr	333.0	348.2	369.3	402.6	446.4	511.1	619.6	746.9	817.3	872.9	910.6	927.2	922.8	906.3	873.3	830.3	784.0	732.6	680.1	628.6	562.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.9	100.4	142.9	180.0	211.5	236.6	254.0	261.8	260.5	251.9	238.1	220.9	202.0
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.69	12.71	18.09	22.79	26.78	29.96	32.16	33.15	32.98	31.90	30.15	27.97	25.57
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.2	99.8	140.7	175.2	207.3	226.8	248.6	247.0	242.6	229.1	215.2	198.0	178.3
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	1.66	1.09	0.81	0.56	0.35	0.16	0.00	0.00	0.00	0.00	0.00	0.00
NSW&ACT																						
BAU Energy use	GWh/yr	90.0	94.0	99.8	108.7	120.6	138.1	167.4	201.8	235.1	262.9	284.6	299.1	306.4	308.7	304.5	295.0	282.1	266.0	248.0	229.5	206.5
With-program energy use	GWh/yr	90.0	94.0	99.8	108.7	120.6	138.1	167.4	201.8	220.8	235.8	246.0	250.5	249.3	244.8	235.9	224.3	211.8	197.9	183.7	169.8	151.9
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	27.1	38.6	48.6	57.1	63.9	68.6	70.7	70.4	68.1	64.3	59.7	54.6
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31	2.48	3.53	4.44	5.22	5.84	6.27	6.46	6.43	6.22	5.88	5.45	4.99
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	26.8	37.6	46.8	55.1	60.4	65.9	65.0	64.0	60.1	57.1	52.6	47.2
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.43	0.28	0.21	0.15	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00
NT																						
BAU Energy use	GWh/yr	3.9	4.1	4.3	4.7	5.2	6.0	7.3	8.8	10.2	11.4	12.4	13.0	13.3	13.4	13.2	12.8	12.3	11.6	10.8	10.0	9.0
With-program energy use	GWh/yr	3.9	4.1	4.3	4.7	5.2	6.0	7.3	8.8	9.6	10.3	10.7	10.9	10.8	10.6	10.3	9.7	9.2	8.6	8.0	7.4	6.6
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.2	1.7	2.1	2.5	2.8	3.0	3.1	3.1	3.0	2.8	2.6	2.4
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.18	0.26	0.33	0.38	0.43	0.46	0.47	0.47	0.46	0.43	0.40	0.37
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9	1.3	1.6	1.8	2.0	2.2	2.3	2.3	2.2	2.1	2.0	1.8
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QLD																						
BAU Energy use	GWh/yr	77.8	81.4	86.3	94.1	104.3	119.4	144.8	174.6	203.4	227.5	246.2	258.7	265.1	267.1	263.4	255.2	244.1	230.1	214.6	198.5	178.6
With-program energy use	GWh/yr	77.8	81.4	86.3	94.1	104.3	119.4	144.8	174.6	191.0	204.0	212.8	216.7	215.6	211.8	204.1	194.0	183.2	171.2	158.9	146.9	131.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	23.5	33.4	42.1	49.4	55.3	59.4	61.2	60.9	58.9	55.6	51.6	47.2
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	2.72	3.87	4.88	5.73	6.41	6.88	7.10	7.06	6.83	6.46	5.99	5.48
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	21.9	31.2	39.1	46.1	49.8	55.1	55.8	54.8	52.6	48.6	44.6	41.0
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.33	0.22	0.16	0.11	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00

Year	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
SA																						
BAU Energy use	GWh/yr	35.2	36.8	39.0	42.5	47.2	54.0	65.5	78.9	92.0	102.9	111.3	117.0	119.9	120.8	119.1	115.4	110.4	104.1	97.0	89.8	80.8
With-program energy use	GWh/yr	35.2	36.8	39.0	42.5	47.2	54.0	65.5	78.9	86.4	92.3	96.2	98.0	97.5	95.8	92.3	87.7	82.9	77.4	71.9	66.4	59.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	10.6	15.1	19.0	22.4	25.0	26.8	27.7	27.5	26.6	25.2	23.3	21.3
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	1.59	2.26	2.85	3.34	3.74	4.02	4.14	4.12	3.98	3.76	3.49	3.19
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	11.8	16.5	20.9	25.0	27.0	29.3	28.1	27.3	26.3	24.6	23.3	20.4
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.20	0.13	0.10	0.07	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
TAS																						
BAU Energy use	GWh/yr	5.6	5.8	6.2	6.7	7.5	8.6	10.4	12.5	14.6	16.3	17.6	18.5	19.0	19.1	18.9	18.3	17.5	16.5	15.4	14.2	12.8
With-program energy use	GWh/yr	5.6	5.8	6.2	6.7	7.5	8.6	10.4	12.5	13.7	14.6	15.2	15.5	15.4	15.2	14.6	13.9	13.1	12.3	11.4	10.5	9.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.7	2.4	3.0	3.5	4.0	4.2	4.4	4.4	4.2	4.0	3.7	3.4
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.21	0.30	0.38	0.44	0.49	0.53	0.55	0.54	0.53	0.50	0.46	0.42
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.7	2.4	3.0	3.5	4.0	4.3	4.5	4.3	4.1	3.8	3.6	3.3
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VIC																						
BAU Energy use	GWh/yr	70.2	73.4	77.9	84.9	94.1	107.8	130.7	157.5	183.5	205.3	222.2	233.5	239.2	241.0	237.7	230.3	220.3	207.7	193.7	179.2	161.2
With-program energy use	GWh/yr	70.2	73.4	77.9	84.9	94.1	107.8	130.7	157.5	172.4	184.1	192.0	195.6	194.6	191.1	184.2	175.1	165.3	154.5	143.4	132.6	118.6
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	21.2	30.1	38.0	44.6	49.9	53.6	55.2	54.9	53.1	50.2	46.6	42.6
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74	3.30	4.70	5.92	6.96	7.78	8.36	8.61	8.57	8.29	7.83	7.27	6.65
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	23.2	32.4	41.2	49.3	54.1	59.6	57.9	56.2	52.7	50.0	45.0	39.9
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.40	0.26	0.19	0.13	0.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00
WA																						
BAU Energy use	GWh/yr	50.3	52.6	55.8	60.8	67.4	77.2	93.6	112.9	131.5	147.1	159.2	167.3	171.4	172.7	170.3	165.0	157.8	148.8	138.7	128.4	115.5
With-program energy use	GWh/yr	50.3	52.6	55.8	60.8	67.4	77.2	93.6	112.9	123.5	131.9	137.6	140.1	139.4	136.9	131.9	125.5	118.5	110.7	102.8	95.0	85.0
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	15.2	21.6	27.2	32.0	35.8	38.4	39.6	39.4	38.1	36.0	33.4	30.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	2.23	3.17	4.00	4.70	5.26	5.64	5.82	5.79	5.60	5.29	4.91	4.49
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	13.5	19.3	22.6	26.4	29.4	32.2	33.4	33.6	31.1	28.9	27.0	24.7
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.25	0.16	0.12	0.08	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00
NZ																						
BAU Energy use	GWh/yr	41.7	47.0	54.7	64.2	74.9	85.8	98.5	110.7	121.8	131.7	140.0	147.2	154.2	161.2	167.3	172.3	176.5	179.2	180.3	179.4	175.4
With-program energy use	GWh/yr	41.7	47.0	54.7	64.2	74.9	85.8	98.5	110.7	116.3	120.9	124.1	126.5	128.4	130.7	132.5	133.8	134.8	135.1	134.5	132.9	128.8
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	10.8	15.8	20.7	25.7	30.5	34.8	38.4	41.6	44.1	45.8	46.5	46.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97	1.89	2.76	3.61	4.49	5.31	6.07	6.70	7.25	7.69	7.98	8.11	8.11
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	6.5	9.5	12.4	15.4	18.3	20.9	23.1	25.0	26.5	27.5	27.9	27.9
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.18	0.13	0.11	0.09	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 10: Draft Standard

Standards Australia
Information in fields should be filled in if known or left as is.

Power consumption of audio, video and related equipment

Part Title:	Minimum energy performance standard (MEPS) requirements for digital television set top boxes
Designation:	AS/NZS 62087.2:200X
Part Number:	2
Supersedes Standard No:	Click here and type Superseded Standard Number
AustralianORJoint:	Australian/New Zealand
Creation Date:	2005-11-03
Revision Date:	2006-10-17
Issue Date:	Click here and type Date Issued "Month YYYY"
Committee Number:	TE-001
Committee Title:	Safety of Electronic Equipment
Subcommittee Number:	TE-001-08
Subcommittee Title:	MEPS for digital television set top boxes
Project Manager:	Colin Doyle
PMs Email Address:	colin.doyle@standards.org.au
WP Operator:	Wong
Project Number:	7250
Combined Procedure?:	No
Committee Doc No.:	62087.2 VPB
Stage:	POSTAL BALLOT DRAFT
Committee Reps:	Australian Chamber of Commerce and Industry Australian Communications and Media Authority Australian Electrical and Electronic Manufacturers Association Australian Greenhouse Office, Department of the Environment and Heritage Australian Information Industry Association Australian Subscription Television and Radio Association Certification Interests (New Zealand) Consumer Electronics Association of New Zealand Consumer Electronics Suppliers Association Department of Defence (Australia) Electrical Compliance Testing Association Electrical Regulatory Authorities Council Energy Efficiency & Conservation Authority of New Zealand Energy Networks Association Free TV Australia Ministry of Consumer Affairs (New Zealand) SingTel Optus Pty Limited Telstra Corporation Limited
Additional Interests:	Click here and type organisation names using shift return for new line
Product Type	JS
Document Status	Current
Document Availability	Private
Synopsis Public Comment	Proposes minimum energy performance standard (MEPS) requirements for free to air and subscription type digital television set top boxes. Requirements for set top boxes to be designated as high efficiency products are included.

Public Enquiry

DR Number:	DR 06093
Publication Date	27 February 2006
Close of Comment Date	4 May 2006
DR Price Code	Click here and type DR Price Code
PMs Facsimile No:	02 8206 6021

PREFACE

This Standard was prepared by the members of the Joint Standards Australia/Standards New Zealand Technical Committee TE-001, Safety of Electronic Equipment.

The objective of this Standard is to provide designers, manufacturers, importers, test laboratories, regulators and users of digital television set top boxes with minimum energy performance standard (MEPS) requirements for these devices.

This Standard was prepared in response to the publication of a plan for the regulation of set top boxes under the National Appliance and Equipment Energy Efficiency Program (NAEEEP) in 2004. It is published with the approval of Australian and New Zealand regulatory authorities and is structured to be suitable for reference in regulations. It refers to AS/NZS 62087.1 for test procedures.

This series consists of 2 parts. These are:

AS/NZS	
62087	Power consumption of audio, video and related equipment
62087.1	Part 1: Methods of measurement
62087.2	Part 2: Minimum energy performance standard (MEPS) requirements for digital television set top boxes (this Standard)

Part 1 contains the test methods for measuring the power consumption of various audio, video and related equipment, including set top boxes.

Part 2 specifies minimum energy performance standard (MEPS) requirements and high efficiency levels for digital television set top boxes. Regulatory authorities have advised that it is intended to mandate this Part 2 Standard in regulations in Australia and New Zealand no earlier than 1 April 2008.

Regulators advise that transitional arrangements, also known as grandfathering, exist for products that are manufactured in Australia or imported into Australia prior to the MEPS implementation date. Such products can continue to be sold without registration or MEPS compliance until stocks are exhausted. Products that are manufactured in Australia or imported after the MEPS implementation date must hold a valid registration at the time of sale which indicates compliance with the relevant MEPS requirements. Further information can be found in the Administrative Guidelines at the http://www.energyrating.gov.au website.

Administrative arrangements during the transition period may vary. Although it is expected that regulators will be able to call the requirements of this Standard into regulations by 1 April 2008, due to legislative variations in different jurisdictions, not all regulators may have regulations in place by that date. Suppliers should contact energy efficiency regulators to obtain detailed requirements with respect to the application date for registration and holding of records in a particular jurisdiction.

During the development of this Standard, consideration was given to the target power consumption limits and time schedules for similar products listed in the Code of Conduct on Energy Efficiency of Digital TV Service Systems, revision 12, 19 November 2003, published by the European Commission, Directorate-General Energy and Transport.

The terms ‘normative’ and ‘informative’ are used in this Standard to define the application of the Appendix to which they apply. A normative appendix is an integral part of a Standard, whereas an informative appendix is for information and guidance.

Statements expressed in mandatory terms in notes to figures, are deemed to be requirements of this Standard. ‘Shall’ indicates a requirement is mandatory, while ‘should’ indicates a recommendation and good practice.

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Australian/New Zealand Standard

Power consumption of audio, video and related equipment

Part 2: Minimum energy performance standard (MEPS) requirements for digital television set top boxes

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies minimum energy performance standard (MEPS) requirements for digital television (DTV) set top boxes (STBs).

This Standard further specifies the following—

(a) Requirements of 'high efficiency' units.

(b) Test report format.

NOTE: This Standard specifies, predominantly, energy efficiency requirements for simple stand alone DTV STBs associated with terrestrial DTV broadcasts. Regulatory Authorities have advised that energy efficiency requirements, other than those specified in this standard, for more complicated STBs, such as those associated with cable and satellite DTV broadcasting, will be considered in conjunction with International developments.

1.2 EXCLUSIONS

This Standard does not apply to digital receivers that are integrated with other equipment such as television receivers, digital recorders and DVD players. This Standard also does not apply to devices designed to receive television signals via broadband internet services.

NOTE: Energy efficiency requirements for integrated or multifunction equipment are under consideration. As information becomes available regarding such products, it will be added to the http://www.energyrating.gov.au website.

This Standard does not specify electrical safety requirements.

1.3 APPLICATION

This Standard shall be read in conjunction with AS/NZS 62087.1.

SECRETARY NOTE: It is proposed to renumber the current AS/NZS 62087 as AS/NZS 62087.1.

1.4 REFERENCED DOCUMENTS

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard:

AS
2706 Numerical values—Rounding and interpretation of limiting values

4933 Digital television—Requirements for receivers
4933.1 Part 1: VHF/UHF DVB-T television broadcasts

AS/NZS
62087 Power consumption of audio, video and related equipment
62087.1 Part 1: Methods of measurement

IEC
60050-300 International Electrotechnical Vocabulary—Electrical and electronic measurements and measuring instruments

IEEE
100 The Authoritative Dictionary of IEEE Standards Terms

1.5 DEFINITIONS

For the purpose of this Standard, the definitions of AS/NZS 62087.1, IEC 60050-300, IEEE 100 and those below apply.

1.5.1 DTV STB–Free-to-Air (FTA)

A commercially available electronic product with a primary purpose to receive and decode FTA terrestrial digital television broadcast signals, for use by a video display device or a recording device.

1.5.2 DTV STB–Subscription TV (STV)

An electronic product with a primary purpose to receive, decode and descramble digital television broadcast signals from a cable or satellite source, for use by a video display device or a recording device. Products intended to receive and decode FTA digital television broadcast signals from a cable or satellite source are included in this definition.

1.5.3 Standard definition (SD) decoding

The ability to decode video transport streams that are MPEG 2 MP@ML. (For additional requirements refer to AS 4933.1.)

1.5.4 High definition (HD) decoding

The ability to decode video transport streams that are MPEG 2 MP@HL. (For additional requirements refer to AS 4933.1.)

1.5.5 Off power mode

The device is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, an external or internal signal.

1.5.6 Passive standby power mode

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.

1.5.7 Active standby power mode

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.

1.5.8 On mode (in-use)

The device is connected to a power source and fulfils the main function of a STB, including the provision of signals to supported devices.

1.5.9 Maximum platform allowance (MPA)

The maximum power allowance based on the power consumption for each basic platform configuration as shown in Table 1.

1.5.10 Additional feature allowance (AFA)

The sum of the power allowances for additional features as specified in Table 4.

1.5.11 Maximum power level (MPL)

The total maximum power consumption that is allowed regardless of MPA and AFA, as specified in Table 2 and Table 3 as applicable.

1.5.12 LNB definition

A Low Noise Block amplifier and frequency downconverter, forming part of the satellite receiving antenna, which receives the microwave frequencies used in digital satellite transmissions.

1.5.13 Remote IR receiver /IR blaster

A feature that allows remote control of a receiver that is located away from a second TV via the same coaxial cable that is delivering the RF signal to the second TV set.

1.6 MEASURED QUANTITIES

Quantities used in this Standard shall be measured during tests carried out in accordance with AS/NZS 62087.1.

1.7 ROUNDING

Unless otherwise stated, numbers shall be rounded and recorded to four significant figures in accordance with AS 2706.

SECTION 2 MINIMUM ENERGY PERFORMANCE STANDARDS

2.1 MINIMUM ENERGY PERFORMANCE STANDARD REQUIREMENTS

When measured in accordance with AS/NZS 62087.1—

(a) A FTA DTV STB shall meet the passive standby, active standby and on mode MPA and MPL limits as specified in Section 4 of this Standard.

(b) A STV DTV STB shall meet the active standby MPA and MPL limits as specified in Section 5 of this Standard.

Compliance with MEPS is determined by taking the maximum power allowance (MPA) according to features included in the applicable basic platform shown in Table 1, adding the additional features allowance (AFA) as specified in Table 4, if applicable, and ensuring that the total of MPA plus AFA is no greater than the maximum power level (MPL).

NOTES:

1 The test procedures require that an appropriate input signal be provided to the STB under test. Where a STB provides power to a masthead amplifier or LNB converter, the power consumption of these devices is excluded from the power measurements of the STB for the purpose of determining compliance with MEPS requirements.

2 Interfaces capable of providing power to external equipment are not loaded during power measurements for compliance with MEPS requirements.

TABLE 1

SPECIFICATION OF BASIC PLATFORMS OF STBs

Functional Block	STB–Free-to-Air (FTA)	STB–Subscription TV (STV)	STB–Subscription TV (STV)
	Terrestrial	Cable	Satellite
Single tuner /demodulator	√	√	√
Single MPEG Decoder	√	√	√
Single LNB feed			√
Single masthead amplifier feed	√		
RF Modulator / Loop-through	√	√	√
IR Remote Control	√	√	√
Support for Over-the-air/cable Software Upgrades	√	√	√
Smart Card Interface		√	√
RS232 Serial Port	√	√	√
Common Interface / Data port		√	√
Support for remote IR Receiver / IR Blaster		√	√
PSTN Modem	√*	√	√

* A PSTN modem is not currently a basic feature of FTA STBs, but may be included for interactivity purposes in the future.

Deleted: (games interface)

Deleted: (games interface)

SECTION 3 HIGH EFFICIENCY LEVEL

3.1 HIGH EFFICIENCY LEVEL REQUIREMENTS

3.1.1 General

A DTV STB may be designated as ‘high efficiency’ only if, in addition to the requirements of Section 2, the product has a maximum passive standby power of 1W and also meets the requirements of Clause 3.1.2 and/or Clause 3.1.3.

3.1.2 Automatic standby

Automatic standby is a feature that ensures that the DTV STB automatically switches itself into passive standby mode after a period of time in the on mode following the last user interaction. This period of time may be user adjustable but shall not be able to be set to a period of more than 8 hours. The DTV STB should allow the viewer to continue watching beyond the set period by prompting the viewer to confirm that the STB is still in use. The automatic standby feature may however be able to be overridden by a user for a period up to 1 month.

3.1.3 High definition multimedia interface (HDMI) standby

High definition multimedia interface (HDMI) standby is a feature that ensures that the DTV STB automatically switches itself into passive standby mode, by recognizing through consumer electronic communications protocol (CEC), that a display device has switched to standby mode.

SECTION 4 DETERMINING PERFORMANCE OF FTA DTV STB

4.1 FREE TO AIR DIGITAL TV SET TOP BOXES (FTA DTV STB)

4.1.1 Determining the Maximum Platform Allowance (MPA)

A FTA DTV STB shall meet either Option 1 or Option 2 MPA conditions in Table 2 for either High Definition or Standard Definition receivers as applicable.

4.1.2 Determining the Additional Feature Allowance (AFA)

A FTA DTV STB may have additional features as specified in Table 4. The allowance for additional features (AFA) specified in Table 4 shall be added to the MPA determined from Table 4 as appropriate.

4.1.3 Maximum Power Limit (MPL)

The total power consumption of the FTA DTV STB shall not exceed the applicable MPL specified in Table 2 for each mode of operation i.e.—

$$MPA + AFA \leq MPL \quad \text{4(1)}$$

TABLE 2
MAXIMUM POWER LEVELS FOR FTA DTV STB
(FROM AC SUPPLY)

Product type		Passive standby–Max power (W)	Active standby–Max power (W)	On mode –Max power (W)
			MPA/MPL	MPA/MPL
Standard Definition	Option 1	1.0 W	8 W/15 W	8 W/15 W
	or Option 2	2.0 W	7 W/15 W	7 W/15 W
High Definition	Option 1	1.0W	12 W/19 W	15 W/22 W
	or Option 2	2.0W	11 W/19 W	14W/22W

SECTION 5 DETERMINING PERFORMANCE OF STV DTV STB

5.1 SUBSCRIPTION DIGITAL TV SET TOP BOXES (STV DTV STB)

5.1.1 Determining Maximum Platform Allowance (MPA)

A STV DTV STB shall meet the active standby MPA in Table 3.

5.1.2 Determining the Additional Feature Allowance (AFA)

A STV DTV STB may have additional features as specified in Table 4. The active standby allowance for additional features (AFA) specified in Table 4 shall be added to the MPA as determined from Table 3.

5.1.3 Maximum Power Limit (MPL)

The total power consumption of the STV DTV STB shall not exceed the MPL specified in Table 3 i.e.—

MPA + AFA ≤ MPL ..... 5(1)

TABLE 3

MAXIMUM POWER LEVELS FOR STV STB (FROM AC SUPPLY)

Product type	Passive standby–Max power (W)	Active standby–Max power (W)	On mode –Max power (W)
		MPA/MPL	MPA/MPL
STV DTV STB	Not Used	9 W/15W	Not Specified

TABLE 4

ADDITIONAL POWER CONSUMPTION ALLOWANCE

The following additional power consumption allowances are for features which are additional to those already included in the basic platform features listed in Table 1. These allowances can be added to the MPA up to the MPL for STBs that have these additional features. Multiple implementations of the same feature attract multiple allowances.

Feature	Additional power consumption (Active Standby Mode)	Additional power consumption (On Mode STB FTA only)
SCART Port	1.0 W	1.0 W
IEEE1394 interface	0.8 W	0.8 W
Ethernet interface 100 Mb	0.4 W	0.4 W
Wireless interface	2.5 W	2.5 W
SPDIF port	0.1 W	0.1 W
Serial USB interface (low power mode)	0.3 W	0.3 W
Home automation interface	0.4 W	0.4 W
Broadband (ADSL) modem	2.7 W	2.7 W
Cable modem	2.7 W	Not applicable
LNB/masthead amplifier feed	No allowance	No allowance
Tuner	2.0 W	2.0 W
Powered remote IR receiver	0.25 W	Not applicable
PSTN Modem	0.7 W[1]	0.7 W[1]
HDMI	0.5	1W

[1]This allowance only applies if a second PSTN modem is present. The initial PSTN modem power consumption is included in the basic features platform in Table 1. Secretary Note: It is proposed to delete PSTN Modem and this note from Table 4. It is not included in the European Code of Conduct and is highly unlikely for a product to have a second PSTN modem

Deleted: 0.7 W
Deleted: 0.7 W
Deleted: 2.0 W
Deleted: 2.0 W
Deleted: 0.7 W
Deleted: TBA[2]
Deleted: TBA[2]

SECTION 6 APPLICATION AND TEST RESULT FORMATS

6.1 APPLICATION FOR REGISTRATION

6.1.1 General

Where the relevant regulatory authority requires registration or approval of MEPS requirements, Clauses 5.1.2 to 5.1.5 shall apply.

NOTE: At the date of publication of this Standard, the requirements of Clause 5.1.1 are applicable in Australia.

6.1.2 Registration

For MEPS registration of a DTV STB brand and model, or type, an application in the format shown in Appendix A of this Standard shall be submitted.

NOTE: Applications in the form of computer printouts, which present all the application data in a similar layout to the forms in Appendix A, are equally acceptable.

To register, contact the relevant state regulatory authority.

NOTE: Details of the relevant regulatory bodies, regulations and electronic copies of application for registration forms, as well as online registrations are available at the http://www.energyrating.gov.au website.

6.1.3 Test report format

A test report summary in accordance with Appendix B for each model tested should be submitted with the MEPS application.

Where a summary report in accordance with Appendix B is not submitted, the source of data in the MEPS application shall be indicated in the application for registration form.

6.1.4 Availability

All supporting documents and test reports used in the MEPS application and any summary report in Appendix B shall be made available to the relevant regulatory authority upon request. These records shall be retained for at least five years after the last date of manufacture or import, whichever is applicable.

6.1.5 MEPS transition

From the date of publication of this Standard, it is anticipated that regulatory authorities will register products in accordance with this Standard.

Regulatory authorities have advised that DTV STB products within the scope of MEPS, manufactured or imported for sale into Australia on or after 1 April 2008, will be required to meet the MEPS requirements specified in this Standard and such units will be required to hold a valid registration. Information on transitional arrangements (grandfathering) is given in the Administrative Guidelines available at http://www.energyrating.gov.au website.

6.2 PRODUCT LISTING

6.2.1 General

Where product listing is required for MEPS, Clauses 6.2.2 and 6.2.3 shall apply..

NOTE: Clauses 6.2.2 and 6.2.3 apply to New Zealand.

6.2.2 Data

If the appliance is not registered in Australia, the supplier (manufacturer or importer) shall list appliances with the New Zealand regulator. To fulfill the requirements of listing, the prescribed form is Appendix A, Paragraph A4, Sections 1 to 6. This shall be completed and submitted to the regulator..

NOTES:

1 This can be done online at www.energyrating.gov.au This is the preferred method for listing in New Zealand, however the form can be completed on paper and submitted to the regulator.

2 If the appliance is already registered in Australia listing is not required.

6.2.3 Test report

A report in the form specified in Appendix B for each model tested shall be held by the appliance supplier. The test report shall be made available to the regulator upon request within five working days..

APPENDIX A

APPLICATION FOR REGISTRATION OF DIGITAL TV SET TOP BOXES FOR MEPS

(Normative)

A1 SCOPE

This Appendix sets out the required format for submitting an application for registration and record keeping.

NOTES:

1 The contact details supplied by applicants in this form or online may be used by other Government agencies to keep applicants informed of forthcoming regulatory changes that may affect the product registered under this Standard. Otherwise, contact details are treated as private and confidential.

2 NOTICE OF RIGHT TO DISCLOSE INFORMATION—The information you submit on this application will be used for the purposes of assessing your application and the performance of statutory responsibilities. The information which you have submitted may be disclosed to other state, territory or New Zealand energy efficiency government bodies (or their agents) who may use the information for the purposes of carrying out their duties and or responsibilities including comparing efficiency claims. The information will also be entered onto the Online Registration Database. Publicly accessible data and more information are available at http://www.energyrating.gov.au website.

A2 GUIDANCE ON THE USE OF THIS APPLICATION FORM

The preferred method of making an application for MEPS is via the online registration system. To use this system, you need to apply for a user name and password. Once a user name has been issued, you will have full access to the online system. Details on how to apply for a user name and password and how to log on to the online system can be found at http://www.energyrating.gov.au website.

A3 SUBMISSIONS TO THE NEW ZEALAND REGULATOR

Applications for listing with the New Zealand regulator can be made online at http://www.energyrating.gov.au website.

Applicants who have listed their product with the New Zealand regulator and intend to rely on the goods access provisions of the Trans Tasman Mutual Recognition Arrangement to sell that product in Australia without registering it with an Australian regulator shall comply with the following conditions:

(a) The company responsible for the manufacture or importation of this product shall have its registered offices in New Zealand.

(b) In respect of the product imported or manufactured by the applicant, this product shall be either imported into New Zealand (but not directly into Australia) or manufactured in New Zealand (not in Australia).

(c) If this product is imported into Australia, then it shall be imported through New Zealand.

A4 APPLICATION FORM

APPLICATION FOR REGISTRATION OF A DTV STB FOR MEPS

(Please type or print)

SECTION 1 APPLICATION DETAILS		
Name of applicant: Company name of applicant: Company Australian Business Number:		....
Company street address of applicant:		....
Company postal address of applicant:		....
Contact person: (A name, address and contact details for a person in Australia or New Zealand shall be provided)	Name: Address: Position/Title: Telephone: Facsimile: E-mail: Website:	....
The Standard under which this application is made:		AS/NZS 62087.2:2006
If the applicant is not the manufacturer or importer of the product to be registered you must confirm that you have lodged a letter of authority to make this registration application: (Indicate correct answer)		Confirmed Not confirmed
Is the application meant for a single model or a family of models? (Identify one)		Single Family

SECTION 2 DESCRIPTION OF DTV STB			
Brand name:			
Model designation: (List all models covered by this application. This can be either a number or name or combination of the two that will identify the particular product. Add additional rows if more than 3 models)	Model 1:		
	Model 2:		
	Model 3:		
Family model designation, if applicable, for above models:			
Does this model or family replace or supplement another model or family with identical MEPS characteristics? (Indicate correct answer)	Yes		No
If yes, indicate relevant details:	Model name:	Model number:	Registration number:
Operating platform: (Identify one – refer to Table 1)	STB FTA Terrestrial	STB STV Cable	STB STV Satellite
Decoding: (Identify one)	SD only		HD and SD
Country of manufacture:			
In what countries are these models to be sold? (Indicate each country) NOTE: The response will determine how the model will be displayed on Government energy rating websites in Australia and/or New Zealand. If a model is not indicated as being available in a country, the model will not appear on the website specific to that country.	Australia New Zealand Others (online users may have access to others)		
Year and month in which the model will be/was first available in Australia or New Zealand: NOTE: The registration will not appear on the energyrating website before that date.	Year:		Month:
Does the model have any markings to indicate date, serial number or batch number? (Indicate correct answer)	Yes If yes provide details		No

SECTION 3 TESTING AND TEST REPORT		
Is a test report attached? (Indicate correct answer)	Yes	No
If no test report is attached note the source registration number of the appliance upon which this application relies for its test report: (Proceed to Section 4 if no report attached)		
Test laboratory type: (identify one)	Own 'in-house' or manufacturer's laboratory	Independent laboratory
Test laboratory name:		
Test laboratory address:		
Test laboratory location: (indicate correct answer)	Australia New Zealand Other — (please specify):	
Test laboratory accreditation: (Identify one)	NATA NATA recognized (please specify) Unknown/none Other (please specify)	
Test Standard used: (Identify one)	AS/NZS 62087.1:2006 Other — (please specify)	
Name of test report signatory:		
Test report number(s) and date(s):	Report number(s): Report date(s):	
Comments regarding the product, the test procedure or test results that should be taken into consideration when assessing the product for compliance: E.g. model name different to intended name.		

SECTION 4 SPECIFIC PRODUCT DETAILS				
Nameplate input voltage (V):				
Nameplate input frequency (Hz):				
Nameplate input current (A) and/or Nameplate input power (W):				
SECTION 5 TEST AND CALCULATED RESULTS Data below is based on test results and should be supported with a summary test report in accordance with Appendix B				
(Add the results for each test undertaken)	[Test 1]		[Test 2]	
Input supply frequency (Hz): (indicate at least one)				
Input voltage (V): (indicate at least one)				
Passive standby power (W):				
Active standby power (W):				
On mode power (W):				
SECTION 6 MINIMUM ENERGY PERFORMANCE STANDARDS MEPS are mandatory for all DTV STBs within the scope of this Standard (see Clauses 1.1 and 1.2). Detailed MEPS requirements are set out in Clause 2.1 of this Standard.				
Applicable MEPS levels				
Passive standby power (W):				
Active standby power (W):	MPA:	AFA:	MPA+AFA:	MPL:
On mode power (W):	MPA:	AFA:	MPA+AFA:	MPL:
Performance prerequisite declaration				
Does this model comply with MEPS? (Indicate correct answer)	Yes		No	
HIGH EFFICIENCY DTV STB				
Does this model comply with the high efficiency requirements specified in Clause 3.1.1? (Indicate correct answer)	Yes		No	
If yes, indicate the feature(s) included. (Identify one)	Auto standby HDMI standby Both auto and HDMI standby			

SECTION 7 DECLARATION

I declare that the details stated in this application are correct.

Signature of Applicant: ..... Date: .....

Office use only

Date received:..... Registration number:.....

APPENDIX B

SUMMARY TEST REPORT FOR DIGITAL TV SET TOP BOX FOR MEPS

(Informative)

This appendix sets out the preferred format for a test report where the digital TV set top box is tested to AS/NZS 62087.1:2006.

TEST REPORT OF A DIGITAL TV SET TOP BOX FOR ENERGY PERFORMANCE

(Please type or print)

DESCRIPTION OF DTV STB	
Brand name:	
Model name or family name (if available):	
Model number or family number:	
Batch number:	
Nameplate input voltage (V):	
Nameplate input frequency (Hz):	
Nameplate input current (A) and/or Nameplate input power (W):	
Country of manufacture:	
Indicate which features are present in the STB	
Single tuner /demodulator:	
Single MPEG Decoder:	
Single LNB feed:	
Single masthead amplifier feed:	
RF Modulator / Loop-through:	
IR Remote Control:	
Support for Over-the-air/cable Software Upgrades:	
Smart Card Interface:	
RS232 Serial Port:	
Common Interface / Data port:	
Support for remote IR Receiver / IR Blaster:	
PSTN Modem:	
SCART Port:	
IEEE1394 interface:	

Ethernet interface 100 Mb:	
Wireless interface:	
SPDIF port:	
Serial USB interface:	
Home automation interface:	
Broadband modem:	
Extra cable modem:	
Extra LNB feed:	
Extra masthead amplifier feed:	
Additional tuner:	
Powered remote IR receiver:	
Automatic standby switching (other than HDMI): (Provide operation details)	
HDMI:	
HDMI standby switching:	
List other features not specified above:	
LABORATORY DETAILS	
Test laboratory type: (identify one)	Own 'in-house' laboratory Independent laboratory
Test laboratory name:	
Test laboratory location: (identify one)	Australia New Zealand Other — (please specify):
Test laboratory address:	
Test laboratory accreditation:	
Note: Laboratory details for each test are to be included, where more than one laboratory has been used.	

TEST AND CALCULATED RESULTS Tests should be undertaken in accordance with AS/NZS 62087.1:2006.			
Include the results for each test undertaken		[Test 1]	[Test 2]
Test report number:			
Date of test:			
Test Standard used:			
Input supply frequency (indicate at least one)			
Input voltage (indicate at least one)			
Passive standby power (W) Refer to AS/NZS 62087.2 Table 2 or Table 3 as applicable	Allowance:		
	Measured:		
Active standby power (W) Refer to AS/NZS 62087.2 Table 2 or Table 3 as applicable, and Table 4	Allowance:		
	Measured:		
On mode power (W) Refer to AS/NZS 62087.2 Table 2 or Table 3 as applicable, and Table 4	Allowance:		
	Measured:		

*** END OF DRAFT ***

PREPARATION OF JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

Joint Australian/New Zealand Standards are prepared by a consensus process involving representatives nominated by organizations in both countries drawn from all major interests associated with the subject. Australian/New Zealand Standards may be derived from existing industry Standards, from established international Standards and practices or may be developed within a Standards Australia, Standards New Zealand or joint technical committee.

During the development process, Australian/New Zealand Standards are made available in draft form at all sales offices and through affiliated overseas bodies in order that all interests concerned with the application of a proposed Standard are given the opportunity to submit views on the requirements to be included.

The following interests are represented on the committee responsible for this draft Australian/ New Zealand Standard:

Australian Chamber of Commerce and Industry

Australian Communications and Media Authority

Australian Electrical and Electronic Manufacturers Association

Australian Greenhouse Office, Department of the Environment and Heritage

Australian Information Industry Association

Australian Subscription Television and Radio Association

Certification Interests (New Zealand)

Consumer Electronics Association of New Zealand

Consumer Electronics Suppliers Association

Department of Defence (Australia)

Electrical Compliance Testing Association

Electrical Regulatory Authorities Council

Energy Efficiency & Conservation Authority of New Zealand

Energy Networks Association

Free TV Australia

Ministry of Consumer Affairs (New Zealand)

SingTel Optus Pty Limited

Telstra Corporation Limited

Additional interests participating in preparation of Standard: