Decision Regulatory Impact Statement:

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

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

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

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

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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
E3	Equipment Energy Efficiency Program (formerly NAEEEP)
EPA	Environment Protection Agency (USA)
EPS	External Power Supply
EU	European Union
E3 Committee	Equipment Energy Efficiency Committee (formerly NAEEEC)
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 E3 Committee)
NAEEEP	National Appliance & Equipment Energy Efficiency Program (now E3)
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

Executive Summary

This decision regulatory impact statement (RIS) proposes the introduction of common minimum energy performance standards (MEPS) in Australia and New Zealand for digital Set-Top Boxes (STBs).

An initial Cost-Benefit Analysis (CBA) of the proposal (E3 Committee 2007) was released in April 2007.[1] It was prepared and issued by the Equipment Energy Efficiency Committee (E3 Committee) under the Ministerial Council on Energy of the Australian federal, state and territory governments and the New Zealand Government. Stakeholder submissions called for changes to that proposal and the Consultation RIS (MCE 2007), taking account of those stakeholder submissions, was published in October 2007.

A digital STB may also be referred to as a digital television adaptor, decoder or receiver and is used to convert digital free-to-air (FTA) signals and subscription TV (STV) services to a signal compatible with the existing audiovisual display technology. This regulatory proposal is for STBs capable of decoding video transport streams that are MPEG2 and 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

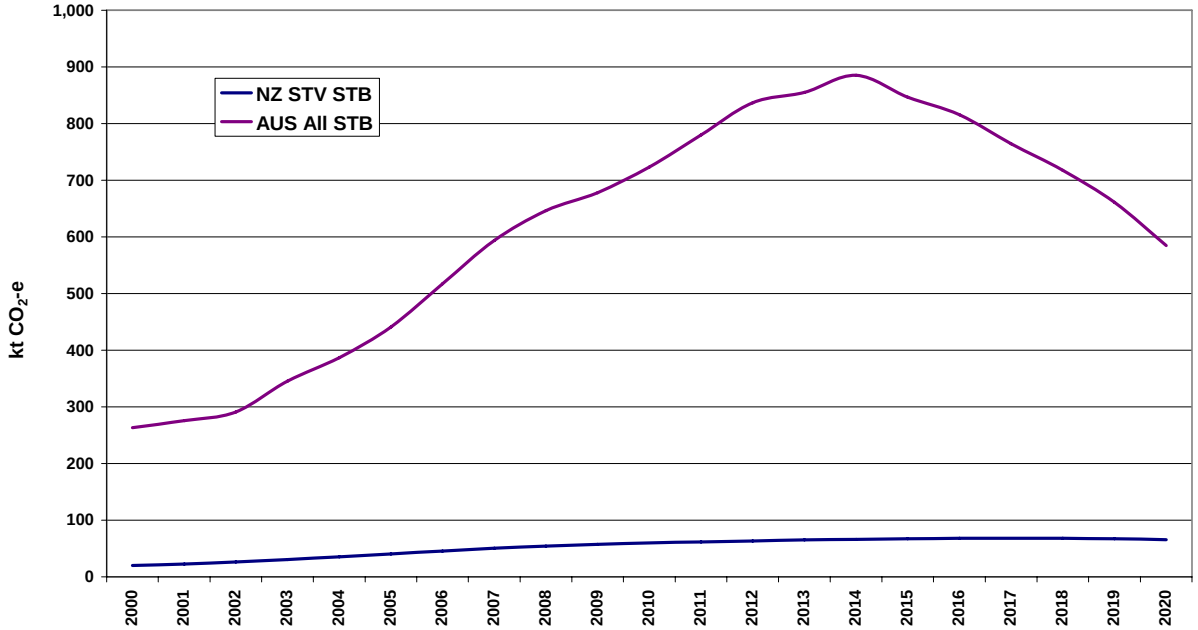
In Australia, digital switchover will be finalised by the end of 2013 and an estimated 15 million TVs will require a STB to receive digital TV, unless a new TV is purchased with an integrated digital receiver. There are an estimated 3.6 million STBs, including Subscription TV STBs, operating in Australian households.

In New Zealand, STBs are mostly provided for subscription TV, and there were an estimated 791,000 STBs in use in 2007. FTA digital TV transmission was launched in New Zealand in May 2007, with analogue TV transmission to be switched off in 2015. As a next step, New Zealand plans to launch high definition FTA digital TV via terrestrial transmission using MPEG4-encoding in 2008. MPEG4 STBs for this service are not covered by this RIS. These STBs will be examined in a subsequent policy response during 2008.

[1] Available from http://www.energyrating.gov.au/library/details200703-cost-benefit-analysis-stb.html

The annual direct and indirect electricity consumption of all STBs for the year 2006 has been estimated to be 500 GWh/yr in Australia. The net energy resulting from the use of STBs is projected to grow to over 900 GWh in Australia by the year 2014. For New Zealand, the corresponding consumption is estimated at 76 GWh/yr and 110 GWh/yr, respectively. Currently the overall electricity used by STBs accounts for nearly 1% of total household electricity usage in Australia. The share of STB energy in overall household energy is expected to rise to 1.5% by 2010. Similarly the share of STBs in overall electricity-related greenhouse gas (GHG) emissions is expected to grow from 0.28% in 2006 to 0.44% in 2014. The following figure provides the estimated annual BAU GHG emissions by STBs in Australia and 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 suppliers to give any serious consideration to energy efficiency.

Retailed STBs for FTA reception 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 three 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 energy use and greenhouse gas emissions below what they are otherwise projected to be (i.e. the "business-as-usual" or BAU 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 December 2008. The regulation 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 in the RIS, two annual sales growth scenarios have been modelled:

- a base sales scenario that provides a total of 5.7 million FTA STBs in 2014; 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 4.5 million STBs in use by 2014.

Australia

The following table summarises the analyses for Australia for the period to 2020. The data presented is based upon valuations at marginal electricity tariffs and net present value (NPV) 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)	1,561 GWh	1,145 GWh
GHG Emission Reduction (cumulative)	1.46 Mt CO_2-e	1.07 Mt CO_2-e
Total Benefit	$42M	$31M
Total Investment	$3.4M	$3.1M
Benefit-Cost Ratio	12.1	10.0

Even at a higher discount rate of 10%, for the base and low sales scenario, benefit-cost ratios are positive at 11.2 and 9.3 respectively. If the incremental costs of improved STBs to meet the MEPS are increased to 3 times the values assumed in the RIS analysis, the benefit are still approximately 6 times the costs.

New Zealand

The following table summarises the analyses for New Zealand for the period to 2020. The data presented is based upon valuation at the marginal electricity tariff and NPV calculations at a discount rate of 10%.

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

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	163 GWh	144 GWh
GHG Emission Reduction (cumulative)	98 kt CO_2-e	86 kt CO_2-e
Total Benefit	$4.0M	$3.5M
Total Investment	$0.6M	$0.6M
Benefit-Cost Ratio	6.6	6.3

All values are expressed in NZ dollars, converted at 1.1 NZD to 1 AUD.

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.

Alternative Options

The other options considered for achieving the objective were:

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

The Australian Government has announced that a domestic emissions trading system (ETS) will be implemented no later than 2012. In New Zealand an emissions trading scheme is planned from 2008, with various sectors phased in over the years to 2013. This could eventually lead to the full cost of GHG emissions impacts being reflected in energy prices, but it is unknown what the impact of an ETS alone, and the energy price rises that might flow from it in the future, will have on the energy efficiency of STBs.

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

It is recommended that the Ministerial Council on Energy agrees:

1. To implement mandatory energy performance standards for STBs in regulation.

2. That STBs covered by this RIS include those that are capable of decoding video transport streams, are MPEG2, and 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 14.

5. That the amendments take effect not earlier than 1 December 2008[2].

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 December 2008.

[2] New Zealand have informed E3 that they will be enacting their regulations from 1 April 2009 due to local considerations. This short period between Australia and New Zealand's effective dates is not considered an issue in terms of the TTMRA.

1 Scope

1.1 General

This Decision Regulatory Impact Statement (RIS) has been prepared to demonstrate the benefits of regulating mandatory energy performance standards for this type of energy-using equipment. A RIS is required whenever new or more stringent mandatory measures are proposed by government. Under the guidelines agreed by all Australian jurisdictions and New Zealand, product regulation is undertaken only where the benefits outweigh the costs to the community; and the cost of improving appliance efficiency is outweighed by the energy and greenhouse gas emissions savings made over the lifetime of the product.

This Decision RIS has been prepared to justify regulation of digital Set-Top Boxes, and responds to stakeholder submissions and meetings pertaining to the Equipment Energy Efficiency (E3) Committee Cost-Benefit Analysis (CBA) titled *Equipment Energy Efficiency Committee Cost-Benefit Analysis: Minimum Energy Performance Standards and Alternative Strategies for Set-top Boxes* and the Consultation RIS (MCE 2007). The submissions and responses are set out in Section 7.

1.2 Australian and New Zealand Policy Responses to Global Warming

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

Australia's Response to Climate Change

Australia's greenhouse abatement and climate change policies have evolved consistently for more than 15 years, since the release of the National Greenhouse Response Strategy in 1997. The paper received overall bi-partisan support, including for national energy efficiency measures. Appendix 2 records some of the more important stages in that development.

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

"Beyond information-based policies, energy efficiency policies could target areas where market barriers are likely to be more fundamental and enduring. This is likely to be in areas where consumers make infrequent decisions and where it is difficult to judge the energy and emissions implications. There is a good case for continuing the development of well-designed and consistent regulated minimum energy standards for buildings and households appliances. Purchase of energy-efficient products can have a large impact on aggregate emissions over time, and reduce the impact on household budgets of any rise in carbon prices". (DPMC 2007 pp135)

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

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

Most recently On 11 March 2008, Australia's ratification of the Kyoto Protocol was officially recognised by the United Nations Framework Convention on Climate Change (UNCCC). Under Kyoto, Australia is obliged to limit its greenhouse gas emissions in 2008-2012 to 108 percent of 1990 emission levels. The Australian Government has also released a report demonstrating how Australia intends to measure the reductions in emissions required under Kyoto titled Australia's Initial Report under the Kyoto Protocol.

New Zealand's Response to Climate Change

New Zealand climate change policies have a similar history of long-term support by government. New Zealand ratified the Kyoto Protocol in 2002, and has committed to reducing its greenhouse gas emissions back to 1990 levels, on average, over the period 2008 to 2012 (or to take responsibility for any emissions above this level if it cannot meet this target).

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

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

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

The MCE Moves beyond "No Regrets" Energy Efficiency Measures

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

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

IEA Sees Improving Energy Efficiency as Top Priority

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

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

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

Equipment Energy Efficiency Program

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

increasing energy efficiency standards, which address market failure relating to life-time energy cost information for appliances and equipment.

The proposed regulation is an element of the Equipment Energy Efficiency Program (E3), formerly known as National Appliance and Equipment Energy Efficiency Program (NAEEEP). E3 embraces a wide range of measures aimed at increasing the energy efficiency of products used in the residential, commercial and manufacturing sectors in Australia and New Zealand. E3 is an initiative of the MCE comprising ministers responsible for energy from all jurisdictions, and is an element of both Australia's National Framework for Energy Efficiency (NFEE) and New Zealand's National Energy Efficiency and Conservation Strategy. It is organised as follows:

- Implementation of the program is the direct responsibility of the Equipment Energy Efficiency Committee (referred to as the "E3 Committee"), which comprises officials from Australian federal, state and territory government agencies and representatives from New Zealand. These officials are responsible for implementing product energy efficiency initiatives in the various jurisdictions.

- The E3 Committee reports through the Energy Efficiency Working Group (E2WG) to the MCE and is ultimately responsible to the MCE.

- The MCE has charged E2WG to manage the overall policy and budget of the national program.

- The Australian and New Zealand members of the E3 Committee work to develop mutually acceptable labelling requirements and MEPS. New requirements are incorporated in Australian and New Zealand Standards and developed within the consultative machinery of Standards Australia.

- The program relies on State and Territory legislation for legal effect in Australia, enforcing relevant Australian Standards for the specific product type. National legislation performs this task in New Zealand.

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

To be included in the program, appliances and equipment must satisfy certain criteria relating to the feasibility and cost effectiveness of intervention. These include potential for energy and greenhouse gas emissions savings, environmental impact of the fuel type, opportunity to influence purchase, the existence of market barriers, access to testing facilities, and considerations of administrative complexity. Policy measures are subject to a cost-benefit analysis and consideration of whether the measures are generally acceptable to the community.

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

1.3 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 analogue RF, composite video, s-vhs , component video or DVI/HDMI. Digital STBs have been used by the STV service provider AUSTAR since 1995. Digital switchover in Australia will be finalised by the end of 2013 before which analogue 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 2014 is estimated to be almost 900 GWh/yr with current business-as-usual (BAU) conditions. This level of energy consumption is more than 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 and New Zealand governments' efficiency goals.

1.4 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; and
- 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; and
- Set-Top Boxes.

In accordance with the Standby Strategy, proposed efficiency targets were identified for each appliance and the Australian 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.

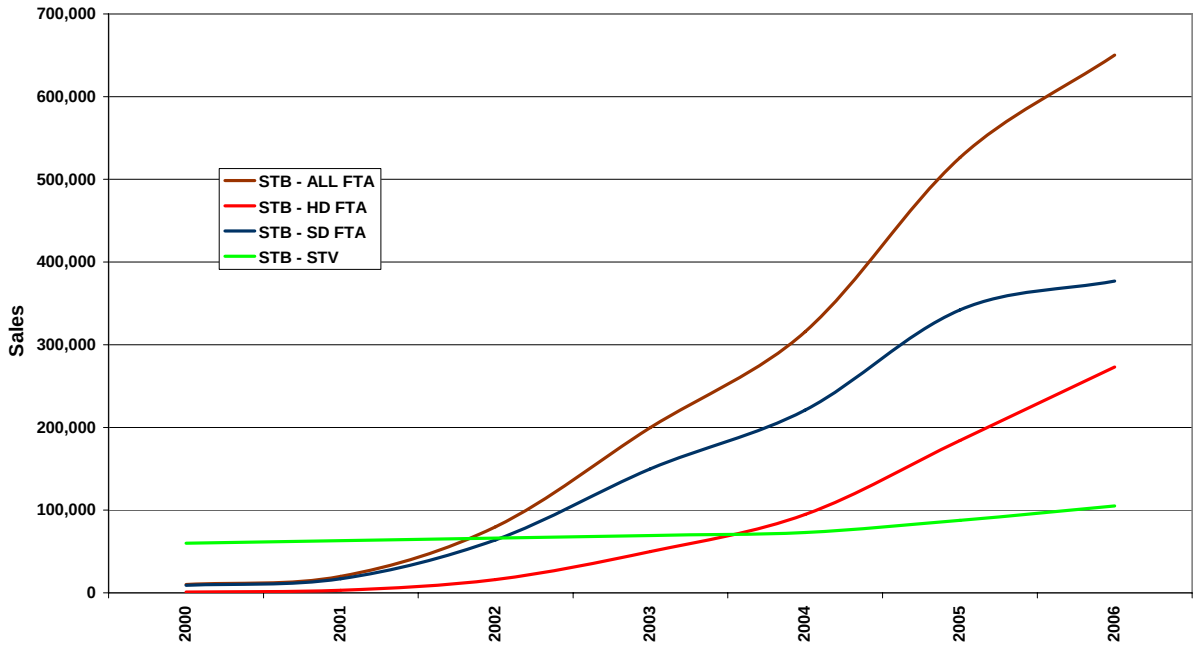
1.5 STB Market

STBs are sold to provide two functions, these being to convert Free to Air Digital TV signals into a format suitable for analogue 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 650,000 by the end of 2006 (GfK 2007). The total penetration of Free to Air Digital TV in households is 28% of Australian homes in early 2007, including both TVs with integrated digital receivers and STBs (DBA2007). Digital switch off in Australia will be finalised by 2013, 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 five 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 analogue TV after analogue services are phased out.

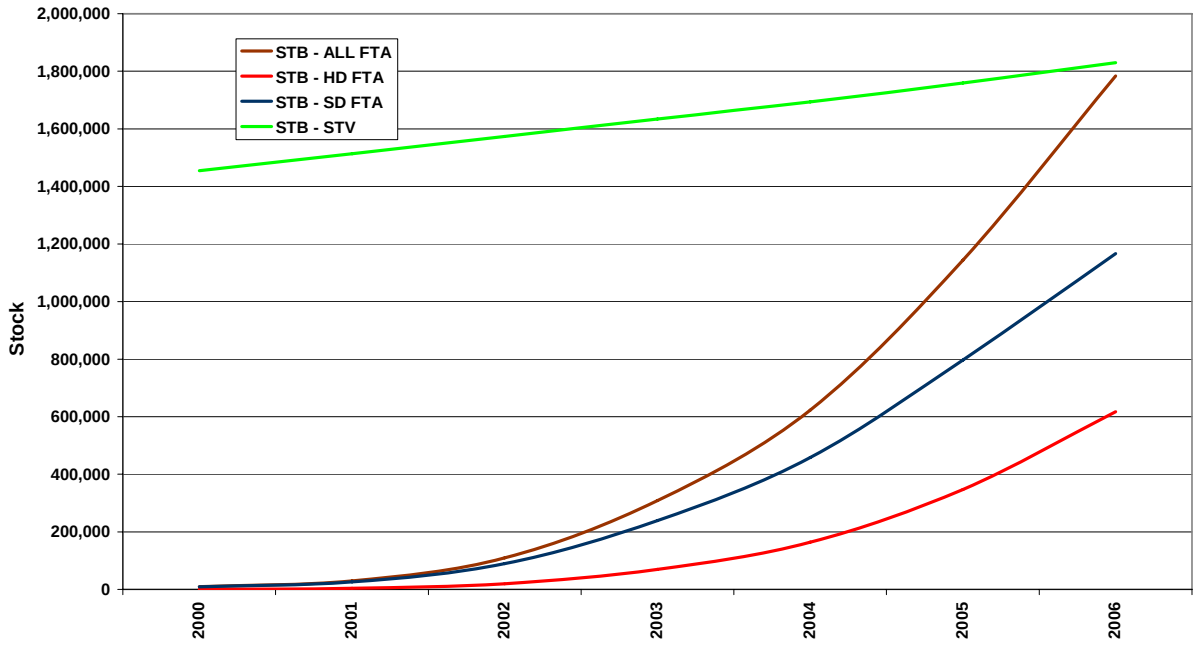
The total number of Pay TV subscribers is 1,841,000 as of June 2006 (AFC 2006). Over 1.27 million are with FOXTEL/Optus and approximately 470,000 with AUSTAR. While AUSTAR have in place a digital platform, FOXTEL have substantially converted their system to digital, with a change over to their digital 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. In addition to FOXTEL and AUSTAR, TransACT supplies 15,000 customers in Canberra with their own subscription service.

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.

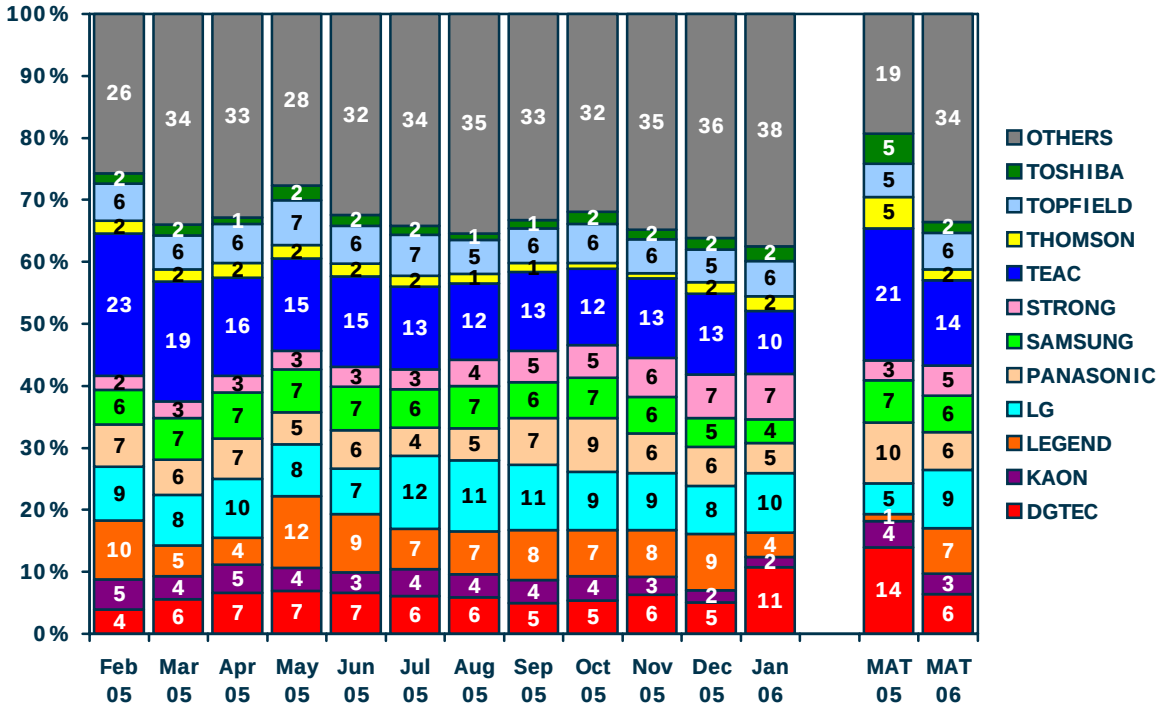
Figure 2: Total Installed Stock of STB – Australia



1.6 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 791,000 set top boxes in New Zealand households

of which about 716,000 are from Sky. The latest Sky STBs are Pace models which claim to meet the proposed MEPS.

Digital FTA TV was launched in New Zealand in May 2007 by the FreeView Group, a consortium of TVNZ, CanWest, Radio New Zealand, Maori Television Service and the New Zealand Racing Board (TAB). FreeView has developed a shared digital platform and is promoting the benefits to viewers of switching from analogue to digital. Analogue TV transmission is to be switched off in 2015.

The FTA digital TV transmission began in May 2007 with satellite transmission for MPEG2 STBs. Freeview plan to launch terrestrial transmission with an MPEG4-encoded service in 2008. The Australian FTA and current STV market are currently using MPEG2-encoding. The scope of this RIS only covers MPEG2 STBs and therefore the New Zealand FTA MPEG4 STBs are not included. MPEG4 STBs will be examined in a subsequent policy response during 2008.

2 The Problem

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

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

The Kyoto Protocol to the UNFCCC was agreed in December 1997, and came into force in 2005. Australia ratified the Kyoto Protocol on 3 December 2007. and has committed to reduce its greenhouse gas emissions by 60% of 2000 levels by 2050.

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

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

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 2014 the energy consumed by STBs will be over 900 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 (CESA 2004 & section 7). 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.

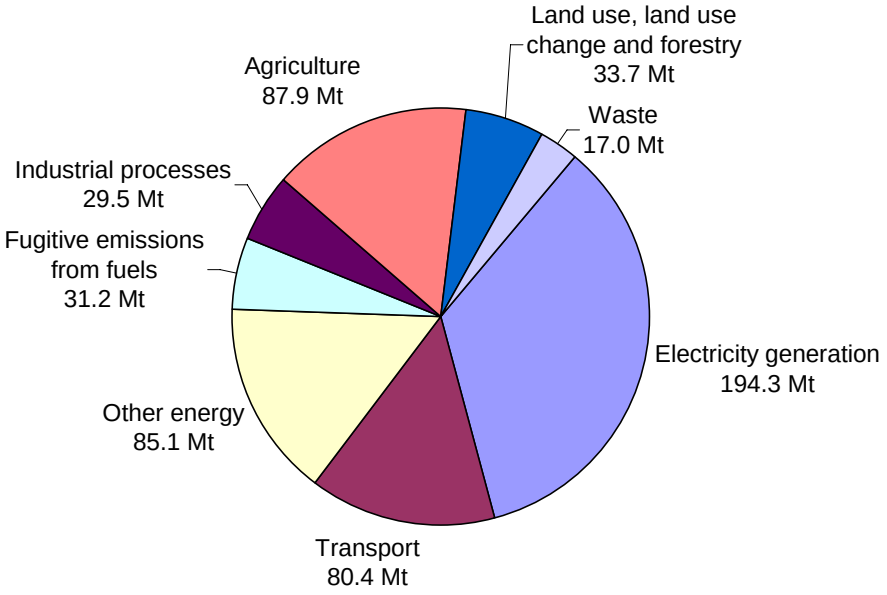
In Australia, the digital switchover will be finalised by the end of 2013 and an estimated 15 million TVs will require a STB to receive digital TV, unless the new TV is purchased with an integrated digital receiver. A study of the potential policy options for STBs (EnergyConsult 2004) recommended regulating the maximum in-use and standby power consumption of digital Set-Top Boxes (STB) from 2006.

In New Zealand, STBs are mostly provided for subscription TV, and there were an estimated 791,000 STBs in use in 2007. FTA digital TV transmission was launched in New Zealand in May 2007, with analogue TV transmission to be switched off in 2015. As a next step, New Zealand plans to launch high definition FTA digital TV via terrestrial transmission using MPEG4-encoding in 2008. MPEG4 STBs for this service are not covered by this RIS. These STBs will be examined in a subsequent policy response during 2008.

2.1 Energy and Greenhouse Gas Emissions

Figure 4 shows estimated Australian greenhouse gas emissions by sector for 2005. The estimated total greenhouse gas emissions for 2005 are 559.1 million tonnes of CO_2-e (NGGI 2007). 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 2005 (Source: NGGI 2007)



The largest contribution to stationary energy emissions comes from the generation of electricity (69.5%). Electricity generation accounted for 194.3 Mt CO_2-e or 34.7% of national emissions in 2005. Electricity generation emissions increased by 0.7 Mt CO_2-e (0.4%) from 2004 to 2005, and by 64.8 Mt CO_2-e (50.1%) from 1990 to 2005.

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

In New Zealand, thermal electricity generation accounted for 24.5% of CO_2 emissions from the energy sector in 2005. In 2005, emissions from this source increased significantly by 35.2% compared with 2004 due to increased consumption of coal (MED NZ 2006). In total, thermal electricity generation produced almost 8 Mt C02-e in 2005. Total greenhouse gas emissions from the energy sector is projected to grow by about 30% between 2005 and 2030 (MED NZ 2006b)

2.2 Contribution of 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 3.6 million STBs, including Subscription TV STBs, operating in Australian households. This number is expected to reach a plateau of around 7.8 million by the year 2015 or earlier depending on how rapidly the analogue system is switched off. After 2015 it is expected the stock of STBs will decline due to the increasing penetration of television set with integrated digital tuners and personal video recording devices with integrated digital tuners. Other factors may influence the sales and penetration of STBs, 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 in Australia for the year 2006 has been estimated to be 500 GWh/yr. The net energy resulting from the use of STBs is projected to grow to over 900 GWh in Australia by the year 2014. The corresponding figures for New Zealand are 76 GWh/yr and 110 GWh/yr. 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 6 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[3]. Figure 7 provides the estimated GHG emissions by type of STB in Australia.

[3] Note that NZ FTA HD STBs impacts are excluded from this analysis as they are MPEG4 STBs

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	72	3	62	28	4	56	40	**267**	**33**
2001	75	3	65	29	5	59	42	**279**	**38**
2002	80	3	70	31	5	63	45	**297**	**44**
2003	89	4	77	35	5	69	50	**328**	**51**
2004	100	4	86	39	6	78	56	**369**	**59**
2005	116	5	101	46	7	91	65	**431**	**67**
2006	137	6	118	53	8	107	76	**506**	**77**
2007	155	7	134	61	10	121	87	**573**	**87**
2008	170	7	147	67	11	133	95	**631**	**95**
2009	184	8	159	72	11	144	103	**682**	**103**
2010	198	9	172	78	12	155	111	**735**	**110**
2011	216	9	187	85	13	169	121	**801**	**116**
2012	231	10	200	90	14	180	129	**854**	**121**
2013	241	10	208	94	15	188	135	**892**	**125**
2014	244	11	211	96	15	191	137	**904**	**129**
2015	242	11	210	95	15	189	136	**897**	**132**
2016	236	10	205	93	15	185	132	**875**	**133**
2017	227	10	196	89	14	177	127	**841**	**133**
2018	214	9	186	84	13	167	120	**794**	**132**
2019	199	9	172	78	12	156	111	**738**	**130**
2020	179	8	155	70	11	140	100	**662**	**125**

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

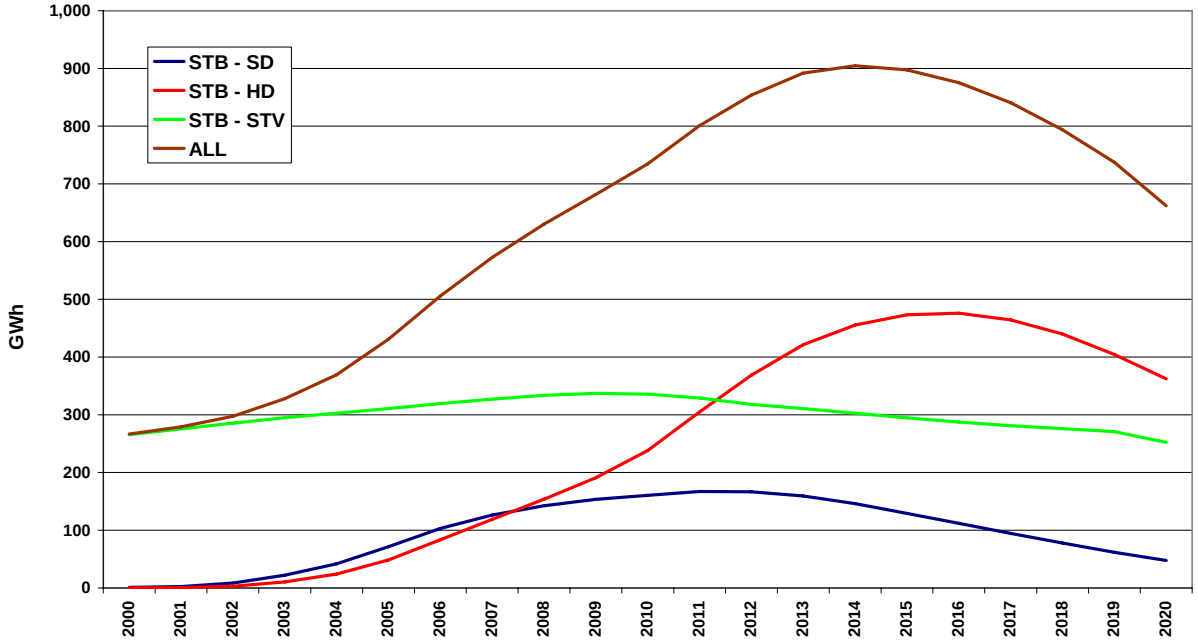
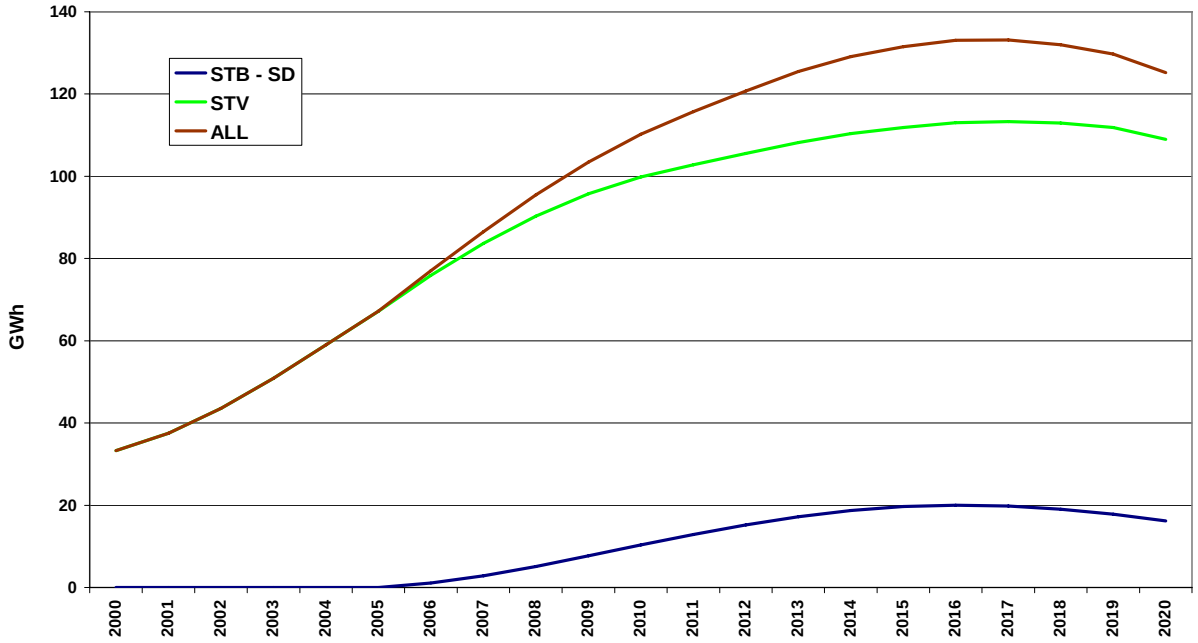


Figure 6: Net annual BAU energy consumption by STB Categories – New Zealand



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 analogue TV transmission) that matures around 2014-17, when the

analogue 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

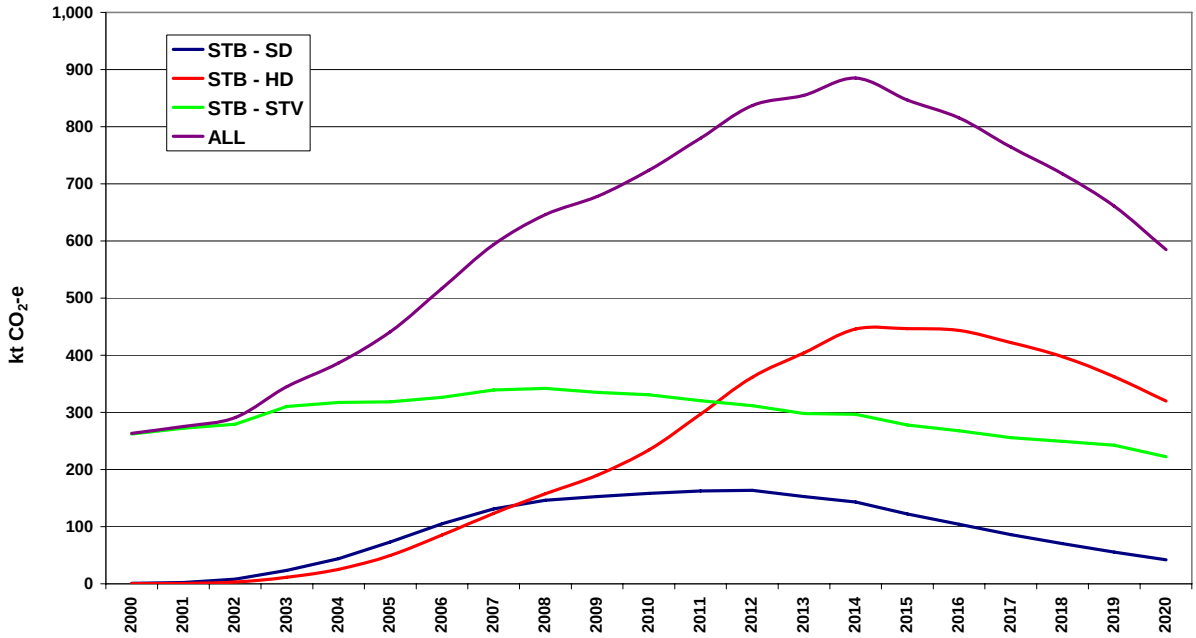
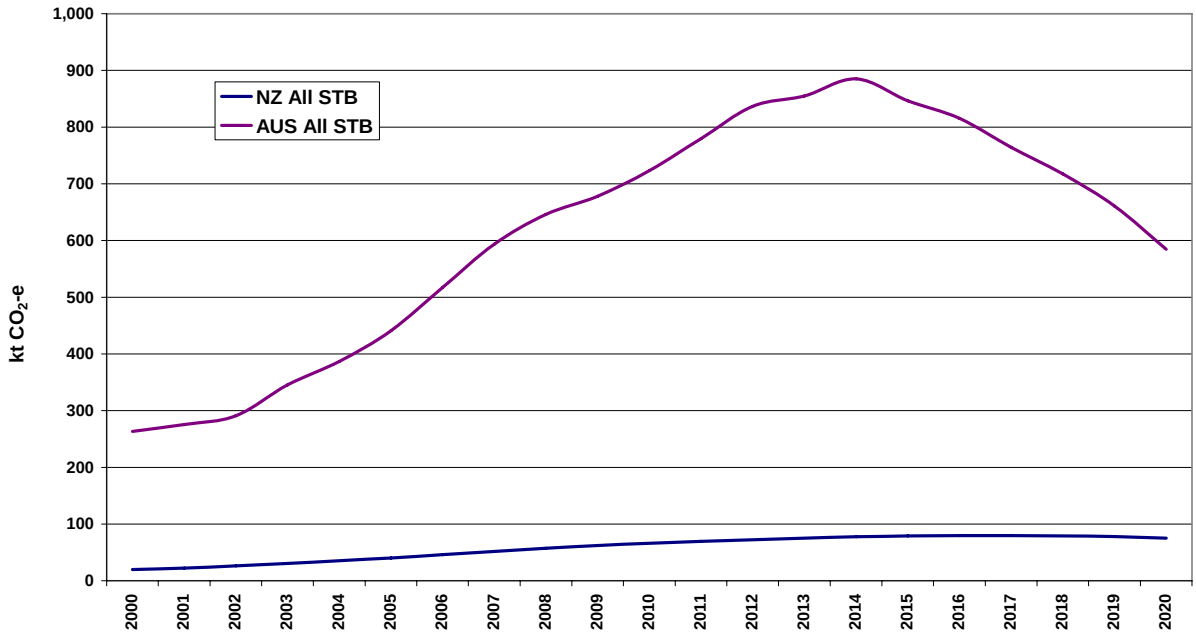


Figure 8: Annual BAU GHG emissions by STBs – Australia & New Zealand



Currently the overall electricity used by STBs accounts for over 1% of total household electricity usage in Australia. The share of STB energy in overall household energy is expected to rise to 1.5% by 2010. Similarly the share of STBs in overall electricity-related GHG emissions is expected to grow from 0.28% in 2006 to 0.44% in 2014.

In New Zealand the overall electricity used by STBs accounts for nearly 0.6% of total household electricity usage in 2005 (EECA 2007b). Therefore, the share of total electricity related GHG emissions in New Zealand from STB products is approx 0.2% in 2005.

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.

The encoding/decoding of the digital TV signal for standard definition in Australia and New Zealand is currently by MPEG2. Australia currently also uses MPEG2 for high definition services. In New Zealand, MPEG4 has been chosen for FTA high definition services and potentially for STV services. The scope of the STB technologies examined in this RIS covers MPEG2 STBs. Therefore, only the standard definition MPEG2 STBs used for STV and FTA TV is considered in the New Zealand component of this RIS. In the future MPEG4 may become available in Australia in both STV and FTA transmission, and these developments will be monitored by the Australian and New Zealand governments. It is planned to examine the policy options for MPEG4 STBs over 2008 and a separate RIS may be published to address these STBs.

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 RIS options. Also excluded from the scope of this RIS 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 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 2006/07, 30 different models were measured. The average load when in use/active standby was 12W with a minimum of 5.4W and a maximum of 20.0W. In passive standby mode of 28 units, the load was measured ranged from 2.1W to 19.9W. The average passive standby load was 9.8W. Ten set top boxes had an off mode. All of these consumed zero watts in this mode. Table 3 summarises the latest results.

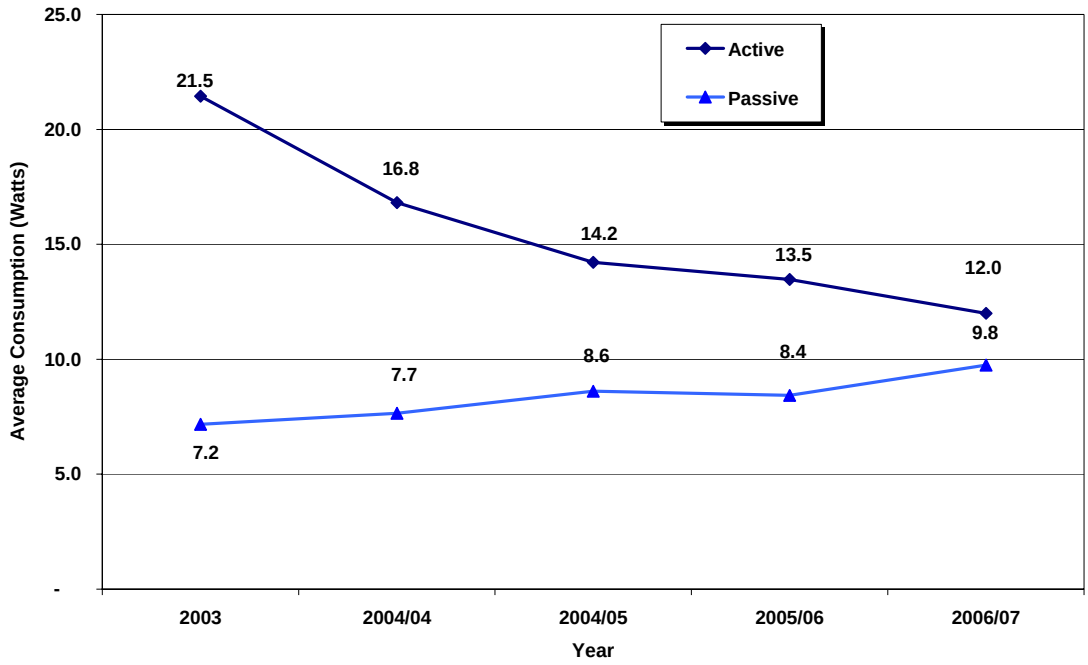
Table 3: Digital Set-Top Box Measurements: Survey 2006/07

Mode	Number of Measurements	Average Power (W)	Power Max (W)	Power Min (W)
In Use/Active	29	12.0	20.0	5.4
Passive	28	9.8	19.9	2.1
Off	10	0.0	0.0	0.0
Total Number of Units	**30**			

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 five 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 consider price and features more important criteria than energy efficiency when purchasing home entertainment equipment and appliances, and it is unlikely that life cycle analysis is undertaken for small appliances of this type.

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. The recent study to support the European Commission proposal for a Directive on establishing a framework for setting Eco-design requirements (e.g. energy efficiency) for all energy using products (EuP), notes that purchase price, features and technical qualities are the most important factors influencing the consumer decision (EC 2007a, Task 3).

Retailed STBs for FTA reception 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 three 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.

In addition, where the energy cost savings are relatively small, the transaction costs of obtaining comparative information on differences in standby make taking this into account during the product purchase not viable (Siderius 2006). This is supported by the European Commission Communication on Standby Losses in Consumer Electronics (EC 1999) where they state:

> *Another important consideration in designing policies is that the annual energy consumption in stand-by mode of any individual consumer electronic equipment might not be a considerable amount to draw the attention of any "rational" buyer to energy efficiency. There are many features and quality issues that might have a higher priority in the final purchase decision. [page 4]*

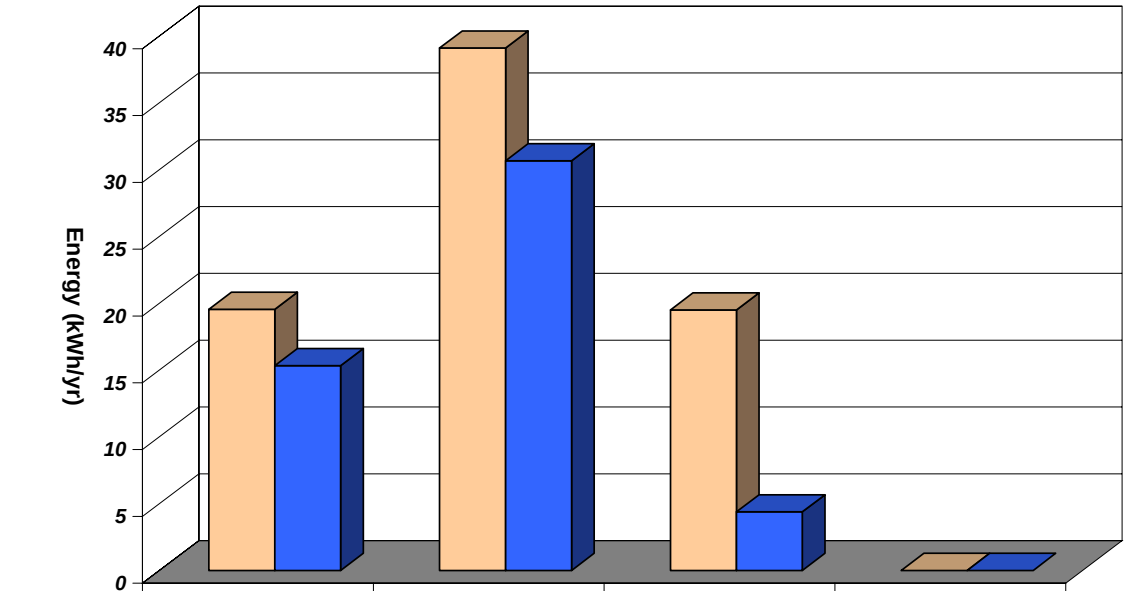
The Communication goes further and notes that standby energy consumption life cycle costs are small and that action should be directed to the manufacturers:

> *As already indicated consumer awareness for standby consumption is very low and the stand-by consumption might account for a limited amount of the total life cycle cost. Several other purchase criteria have a higher priority on consumer's choice (product quality, features, brand and price); therefore action directed towards manufacturers will in principle be more effective. To this end establishing maximum power consumption in stand-by mode (and other modes) will certainly have a positive impact on the average consumption [page 6]*

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



	ON	Active Stby	Passive Stby	Off
Avg Unit	20	39	20	0
MEPS Unit	15	31	4	0

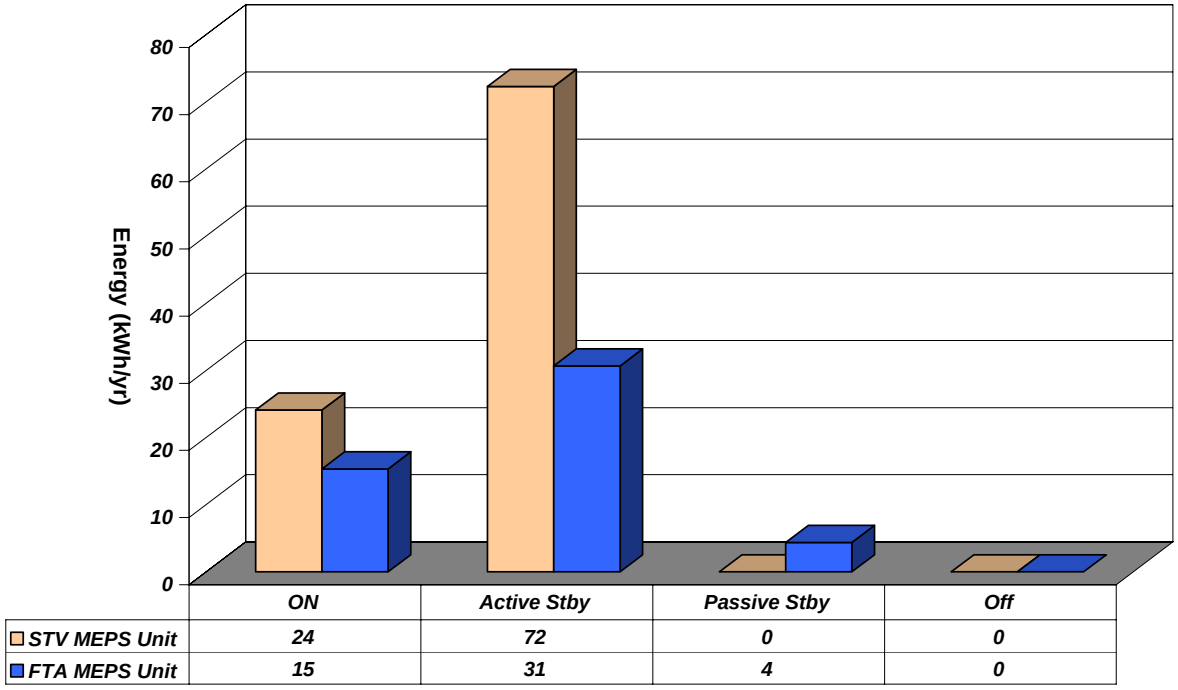
These figures and the evidence from overseas markets shows the market deficiencies in the current STB market, where STB passive standby power consumption decreased from 2002 to 2004 but increased in 2005 (the last year of results) despite a voluntary agreement between industry and the European Commission (Siderius 2006, fig 1). The figure from this paper shows passive standby power at about 6.5 W in 2001 and lowers to around 3W in 2004, then increases to over 5W in 2005. The Code requires passive standby power to not exceed 2 W.

The market segment for STB supplied by STV service providers is somewhat different as the service providers purchase and distribute large volumes of STBs, and therefore have much greater control over the design and manufacturing of the STB. STV service providers are also in the position to obtain and understand power consumption data for

the STBs. The STV service providers have no direct financial incentive to require the energy consumption of STBs to be lower but due to their public exposure, and in some cases commitment to environmental sustainability, such companies may be motivated to reduce the energy consumption of their STBs.

To illustrate the difference in power consumption characteristics of the FTA and STV MEPS units, Figure 11 shows that a STV MEPS compliant STB is estimated to consume almost twice the energy of a FTA SD MEPS compliant STB. This is primarily due to the different modes of use of the STV STB, where the device is never able to be used in passive standby mode compared to the FTA STB.

Figure 11: Annual Energy Consumption per STB: FTA MEPS vs. STV MEPS-compliant



	ON	Active Stby	Passive Stby	Off
STV MEPS Unit	24	72	0	0
FTA MEPS Unit	15	31	4	0

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 energy use and 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 STBs in Australia is currently estimated to be approximately 500 GWh per annum, equivalent to annual greenhouse emissions of 517 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 900 GWh by the year 2014. 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 6 and Appendix 11 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 and New Zealand

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	20.0	15.0	15.0	12.0	11.0
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. Given this number of suppliers, it is considered that this market is unsuitable for introducing voluntary standards and there is a very low likelihood of getting the majority of STB suppliers to agree to abide by the voluntary efficiency standards if they were introduced.

There is a counter-argument that as there are only a small number of suppliers of STBs for STV usage, voluntary standards might be applicable for the STV STBs market segment. However the STV STB market does not operate as an independent market. FTA and STV suppliers are actively competing against one another and targeting the same television consumers, and therefore are operating in the same market. The STB is an implementation technology tied to the total television service market. Consequently given that FTV and STV operate in the same market, if follows that any regulatory intervention of STBs must treat the STB as one market, while recognising the technology differences in the market segments. So the fact that there are a small number of STV SBA suppliers cannot be used to argue for the introduction of voluntary standards in one part of the STB market, while using other regulatory methods for the remainder of the market.

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 4: 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, which is very high. 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).

A review of the success of the EU CoC shows that Voluntary Standards are not likely to have an effect on the energy efficiency of simple STBs (Harrison et el 2006). The paper reports that:

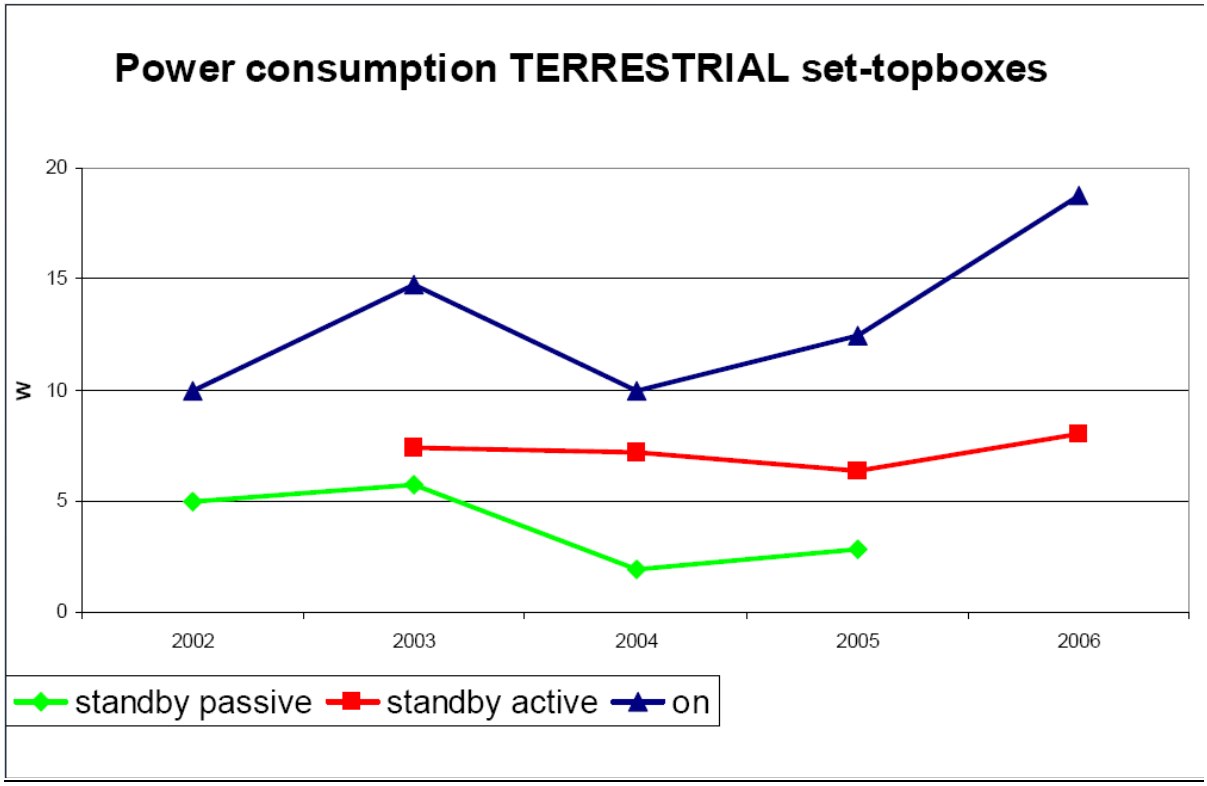
> *The impact of cost competition on these products has already driven energy efficient design to an all-time low. Standby passive power requirement has moved from less than 1W in 2003 from two major manufacturers to a point where no manufacturer is currently meeting the CoC criterion of 2W. Conformance testing shows that there is a step increase in the average standby power of these products to an average level of over 6W*

And a recent summary report for the EU CoC for 2006 (EC 2007b) on the compliance of the voluntary standard shows this graphically in Figure 12. The summary report concludes:

- *Few simple converter boxes reported in 2006.*
- *For terrestrial and satellite STBs difference in power consumption between standby-active and on is increasing.*

It also notes that only 21 (or 57% of the) models registered by the CoC participants comply with the voluntary standard. The European Commissions states that these negotiated agreements can be a useful policy instrument to promote energy efficiency, if commitments are made by manufacturers accounting for most of the appliances sold on the Community market (80% at least) (EC 1999). The European approach to voluntary agreements, such as the CoC, appears to have some effect on the improvement of efficiency of certain STBs (Siderius 2006). However, as noted above, for the type of STB considered by this RIS, the effect of this voluntary agreement is considered negligible.

Figure 12: EU CoC STB Power Trends from 2002 to 2006



In addition, the US ENERGY STAR specifications covering STBs have been under revision during 2004 to 2006. The scope of the ENERGY STAR specifications were released in January 2007 and only cover digital to analogue (DTA) STBs (see Appendix 4). This means that FTA STBs are now covered by the voluntary Energy Star program but not STV STBs, hence the specifications would only cover part of the Australian STB market. Consequently neither of the major international programs can at present 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.

Although in certain circumstances, voluntary agreements can be effective, as found by the World Energy Council in it's *Energy Efficiency: A Worldwide Review Indicators, Policies, Evaluation* (WEC 2004) The report found

> *"In certain conditions, voluntary agreements can be an effective alternative to minimum energy efficiency standards. Since they have the support of manufacturers, they can be implemented more rapidly than regulations. Nevertheless, their effectiveness is still dependent on the possibility of imposing precise requirements corresponding to genuine additional efforts from industry. To achieve this, the free flow of information should be ensured. Above all, the regulations must remain credible if negotiating power is to stay in the hands of the public authorities." P47*

The World Energy Council went on to conclude that results of past voluntary agreements are in many cases uncertain and that they are *"…more suited as complementary to other existing regulations, rather than being the prime policy instrument to address energy efficiency and climate change"*(WEC 2004, p67)

A detailed analysis of the cost and benefits of voluntary efficiency standards has not been undertaken due to the lack of information from industry on the costs and likely impacts of such a program and because such a voluntary program is considered unlikely to be effective. International voluntary efficiency standard programs do not appear to have been highly successful in reducing the energy consumption in STBs and the large numbers of STB suppliers in the Australian market effectively preclude the use of a voluntary program to reduce consumption.

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 web site, 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 retail 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 retail 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.

Certification programs are also unlikely to be useful for the STV STB segment of the STB market, as STV service providers will already be aware of the power consumption characteristics of the STB they purchase. Certification is unlikely to be an effective way of influencing their purchase decisions.

Participation by suppliers in voluntary certification programs is often a marketing strategy for product suppliers rather than 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 depends 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 used for some consumer products in Australia and New Zealand in the sense that it applies a negative characteristic to the labelled product, rather than providing information on the energy performance level of the product. As a dis-endorsement label provides such different information than the existing energy star labelling scheme, introducing the dis-endorsement label scheme is likely to confuse the consumer and reduce the effectiveness of both schemes. The resulting impact of the dis-endorsement label scheme is therefore likely to be minimal.

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

4.5 Levies and Emissions Trading

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

Equipment Levy

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

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

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

Electricity Levy

At present, the electricity prices faced by consumers reflect – however imperfectly - the cost of the capital invested in the electricity generation and transmission systems, operating and maintenance costs and taxes. They may also reflect the costs of controlling pollutants such as oxides of nitrogen and sulphur (NO_x and SO_x), for which emissions standards are currently in force in some areas. They do not reflect the value of greenhouse gas emissions, or rather they implicitly assign a value of zero to such emissions. In other words, greenhouse costs are not internalised in the electricity price. However, through the Federal Government MRET program and New South Wales' NGAC programs, some cost of greenhouse gas emissions are imposed.

At present, electricity prices are sufficiently low that few consumers consider the cost of the electricity required by appliances when the consumer is making decisions regarding the purchase of the appliance. This is especially true for the purchase of appliances such as STBs. One policy option would be to introduce a levy on the price of electricity to reflect the cost of greenhouse gas emissions from the production and combustion of the fuels used to generate it. This would raise the consumers' consideration of the energy efficiency of appliances and might encourage the uptake of more efficient STBs.

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

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

Carbon Emissions Trading Scheme

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

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

The nature of the Australian ETS and the impact on the costs and benefits of the proposed policy approach for STBs cannot be determined until the Government has decided operational details of the ETS and until modelling of future electricity prices is available.

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

> *"Emissions trading is not a panacea. A comprehensive response will involve complementary measures that address market failures not corrected by the emissions trading scheme. ... There will also be a continuing role for policies that improve information, awareness and adoption of energy-efficient vehicles, appliances and buildings." (p 12)*
>
> *"Beyond information-based policies, energy efficiency policies could target areas where market barriers are likely to be more fundamental and enduring. This is likely to be in areas where consumers make infrequent decisions and where it is difficult to judge the energy and emissions implications. There is a good case for continuing the development of well-designed and consistent regulated minimum energy standards for buildings and household appliances. Purchases of energy-efficient products can have a large impact on aggregate emissions over time, and reduce the impact on household budgets of any rise in carbon prices." (p 135);*

Also, the New Zealand Government is working towards establishing its own domestic emissions trading scheme over the next few years. The energy sector will be included in the scheme from 2010. More information is available in *The Framework for a New Zealand Emissions Trading Scheme* document at http://www.climatechange.govt.nz/

Conclusions

The two levy options proposed are not currently government policy and would require extensive consultation at the highest levels of government. Hence these options are not

worthy of consideration until such time as government policy changes to favour levy schemes.

The introduction of an emissions trading scheme is Australian Government policy, but it is unclear if an ETS alone would impact on the energy efficiency of STBs. The energy price rises that might flow from the introduction of an ETS are unlikely to quickly lead to consumers being concerned about the energy efficiency of appliances such as STBs, and consumers would still lack information on the energy usage of the STBs even if they were more concerned. Hence it is concluded that an ETS 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. A recent paper at the European ECEEE Summer Study notes that even with information on standby power usage, the impact of this is likely to be too small to be of significance in the decision-making process in most cases (Harrington et el 2007, p 5). Other studies support this assessment in relation to consumer electronics in the USA (PGE 2004, p 14).

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. So the experience of the ENERGY STAR program is unlikely to be highly relevant to the introduction of a mandatory labelling scheme.

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 was 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

Feature	Additional power consumption (Active Standby Mode)	Additional power consumption (On Mode STB FTA only)
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.

Comments on the CBA for STBs (E3 Committee 2007) raised different issues in the case of STBs for the STV consumers. Here it was argued that there was not a market failure with regard to STBs energy consumption and, as there were only two STV STB suppliers, the use of a voluntary program was appropriate. However, the STV SBA "market" is in fact a market segment of the overall STB market, though with different technical requirements, hence any analysis of the market and of the applicability of voluntary programs must be made on the overall STB market. Taken as a whole, voluntary options are not appropriate, as previously indicated.

In conclusion, the most effective way to reduce GHG emissions for STB is MEPS. This is the option that is subsequently assessed in the RIS 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 RIS 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. Appendix 12: Annual Cost Inputs for RIS Model, shows the annual cost inputs for the RIS analysis.

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 RIS starting at $2.20 in 2007 and reducing to zero by 2015. Price increases due to the MEPS are considered to decrease to zero by 2015 as more functions are included in silicon chips for STBs, and these components become more common in MEPS compliant devices (see page 43). 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). Comments on the likely incremental costs of meeting the proposed MEPS were sought in the CBA (E3 Committee 2007), and no submissions were received contradicting the modelled price increases. Table 10 presents the estimated incremental price increase due to the MEPS requirements by year for the Base scenario modelled in the RIS.

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, GATT and TTMRA issues are discussed in detail in Appendix 8.

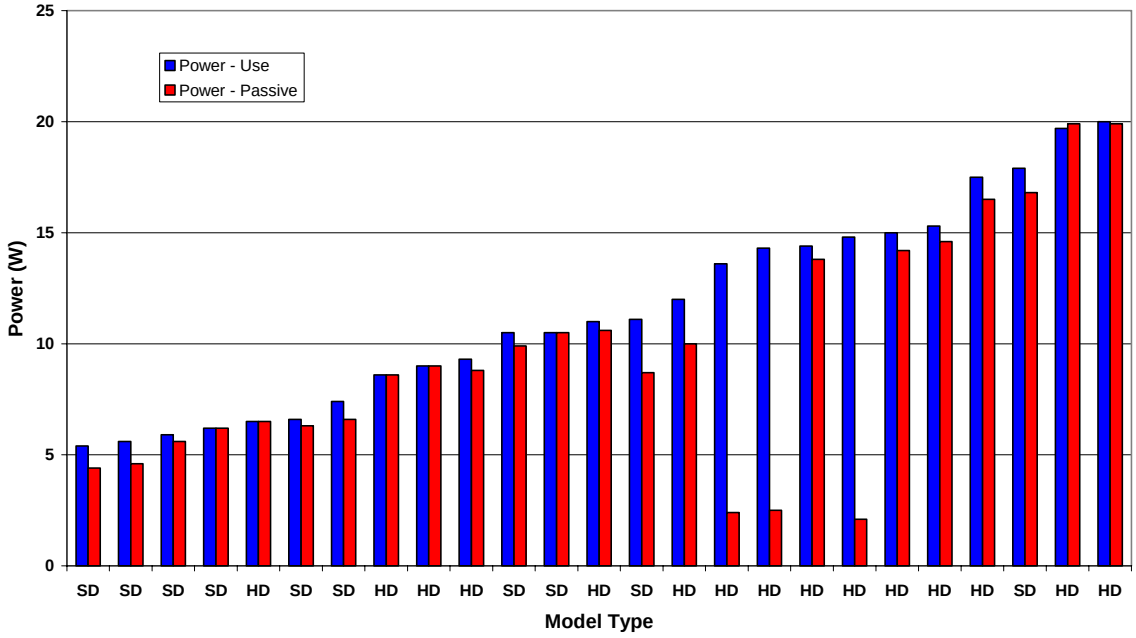
Competition

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.

In the most recent survey of FTA STBs in retail stores (EES/EC 2002-2007), 3 HD STBs would meet or come close to meeting the proposed MEPS out of 15 models surveyed. No SD STBs met the passive standby requirements of the proposed MEPS. Figure 13 shows the results of the survey with the models sorted in order of lowest to highest in-use power consumption. Although no SD STB models meet the passive power consumption requirements, 50% of these models (5 out of 10) would meet the in-use/active standby power requirements. It is noteworthy that some models meet the in-use/active standby, while others meet the passive standby requirements. This suggests that STBs can be modified to meet the proposed MEPS requirements as they are no technical reasons for those that meet the in-use power requirements to not also have a low passive standby power use. It is suggested that further surveys should continue to monitor the STBs every 6 months and report on the percentage of models that comply. The results of this latest survey indicate that STBs are becoming available which meet the proposed MEPS and delaying the implementation date to December 2008 will ensure that more STBs are available to meet the proposed MEPS.

In New Zealand, the FreeView Group have tested two MPEG2 STB models (Hills and Zinwell) and had already taken action to ensure they will meet the MEPS. They have voluntarily labelled these STBs with the Freeview label.

Figure 13: Power Consumption of FTA STBs from 2006-07 Survey



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).

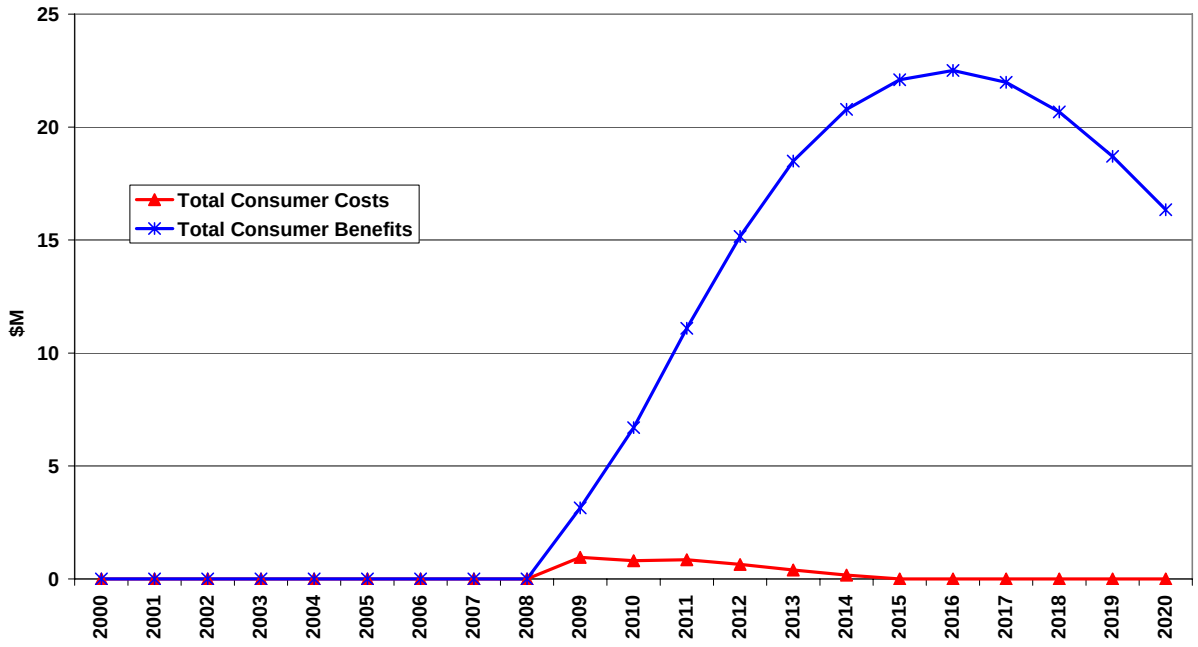
5.4 Consumer Costs and Benefits

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 RIS model are shown in Figure 14. The undiscounted benefits peak at $22.5M in 2016, while the costs are estimated at $1M in 2009.

Figure 14: Consumer Cost-Benefit of MEPS (Aus)



The benefits start to decrease after 2016 as the predicted BAU efficiency improvements for STBs come closer to the MEPS requirements. The consumer benefits continue to accumulate 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 5.7 million FTA STBs in 2014. 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 $70 - $200 and HD STB from $200 - $450. 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 2.5% and 0.4%.

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 3).

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	35	$4.45	$26.07

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 and active standby 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 6, Table 33. 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	35	$4.45	$26.07
SD	High	17	$2.14	$12.56
HD	High	33	$4.23	$24.76
STV	High	35	$4.45	$26.07

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.

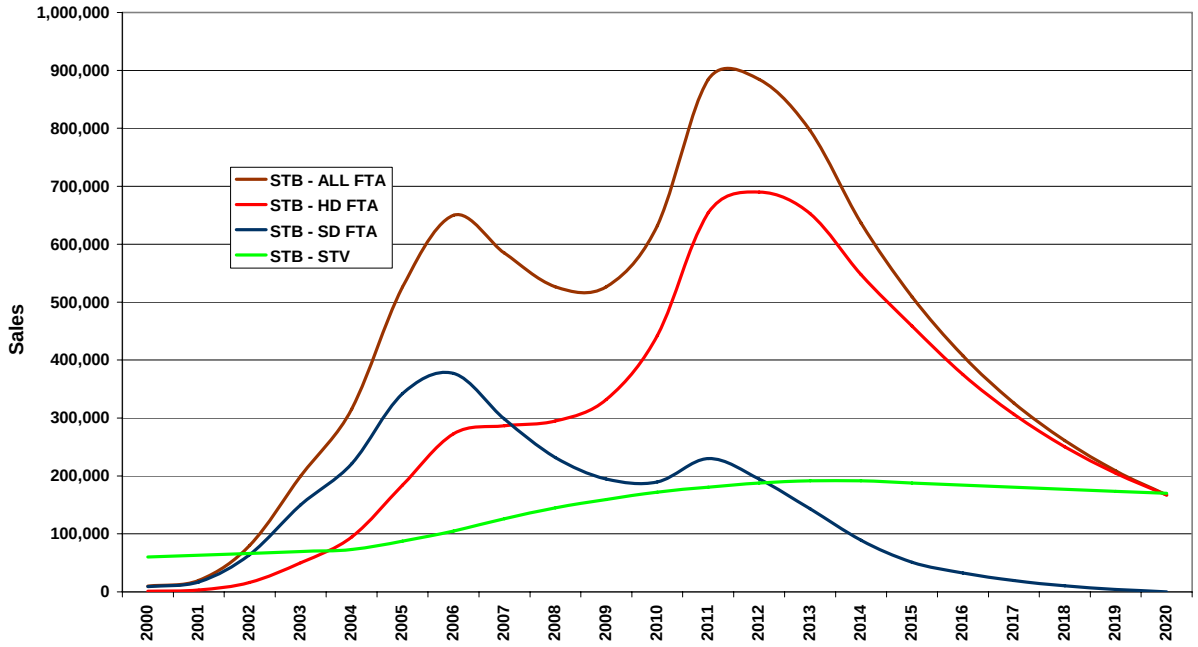
5.5 Impact on Energy Use and Greenhouse Gas Emissions

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 RIS; a Base Sales scenario with STB sales dipping until 2009 trending higher until 2012 and then sharply declining, and a Low Sales scenario with lower sales until 2009 and a small increase in the lead up to the digital switchover by the end of 2013. This section provides the results of this analysis for Australia. Figure 15 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 RIS take into account the split of sales of effectively competing technologies (STBs and IDTVs). Recent trends show that the sales of IDTV are increasing rapidly; 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 RIS models declining sales of STBs until the approach of the analogue TV switch off. The low sales scenario is used to determine the sensitivity of the cost-benefit impacts of sales changes.

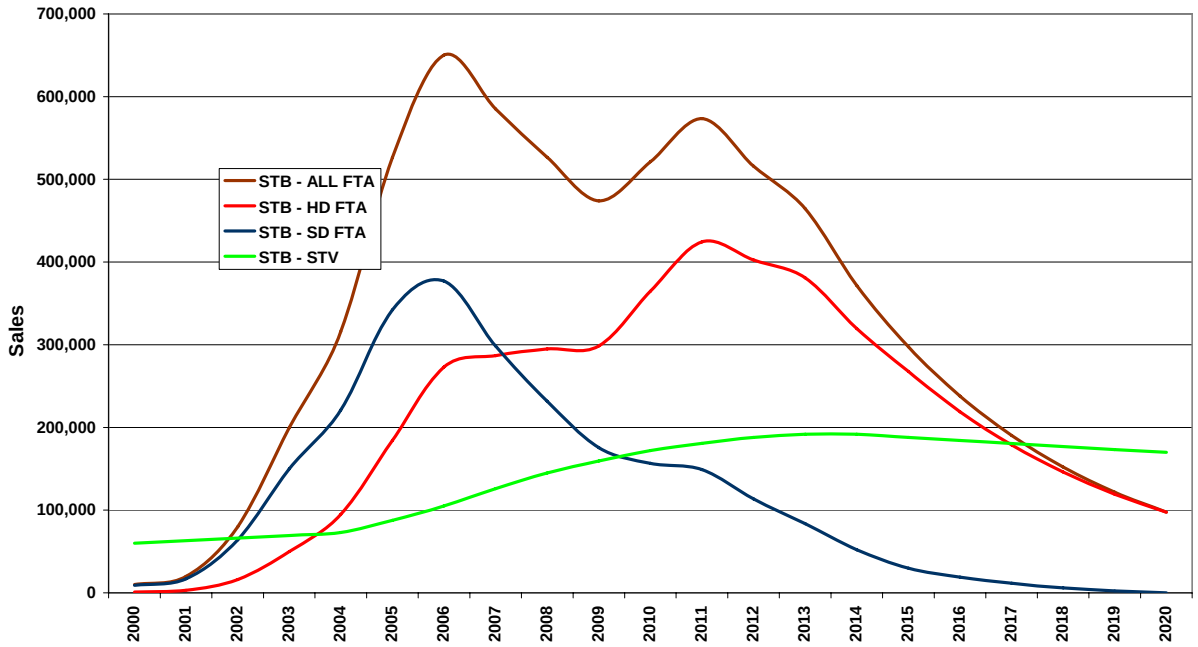
Figure 15: Forecast Sales of STBs - Base Sales Scenario Australia



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 16. The sales of STBs under this scenario are forecast to decline from over 650,000 pa in 2006 to just over 550,000 pa in 2011. The low sales forecast is based on a stock of approximately 4.5 million FTA STBs in the period 2012 to 2015. This scenario assumes that most households would convert one analogue 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 analogue TVs in use, so this low sales forecast scenario is utilised for sensitivity analysis of the RIS impact projections.

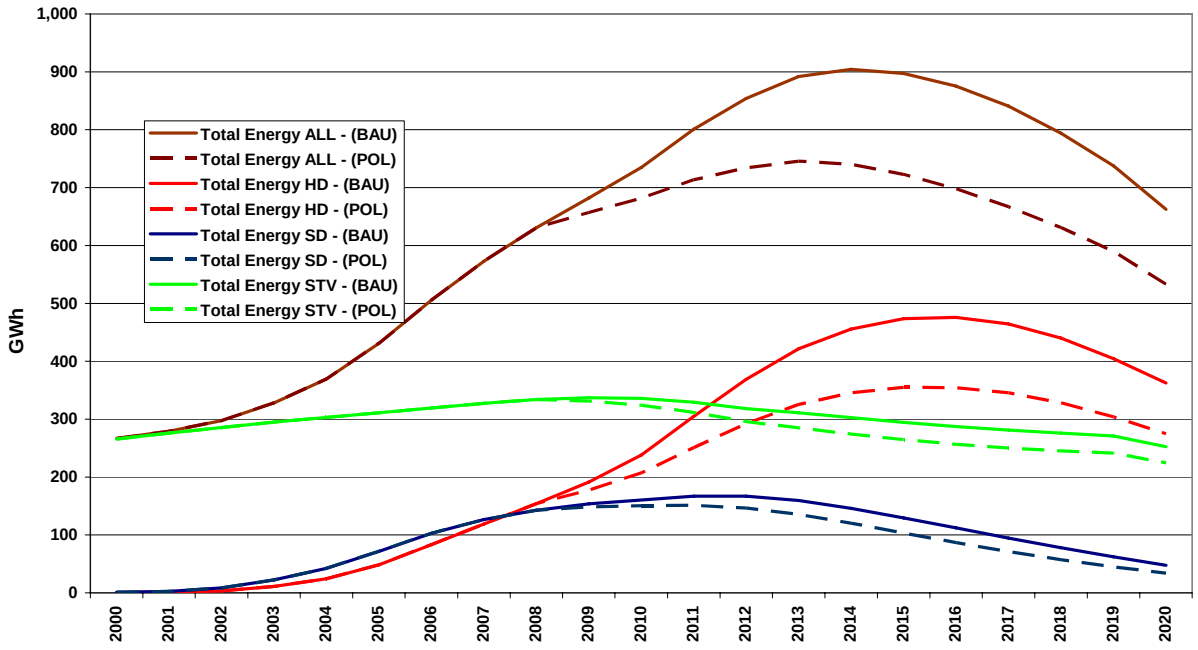
Figure 16: Forecast Sales of STBs - Low Sales Scenario Australia



Energy and Greenhouse Impacts

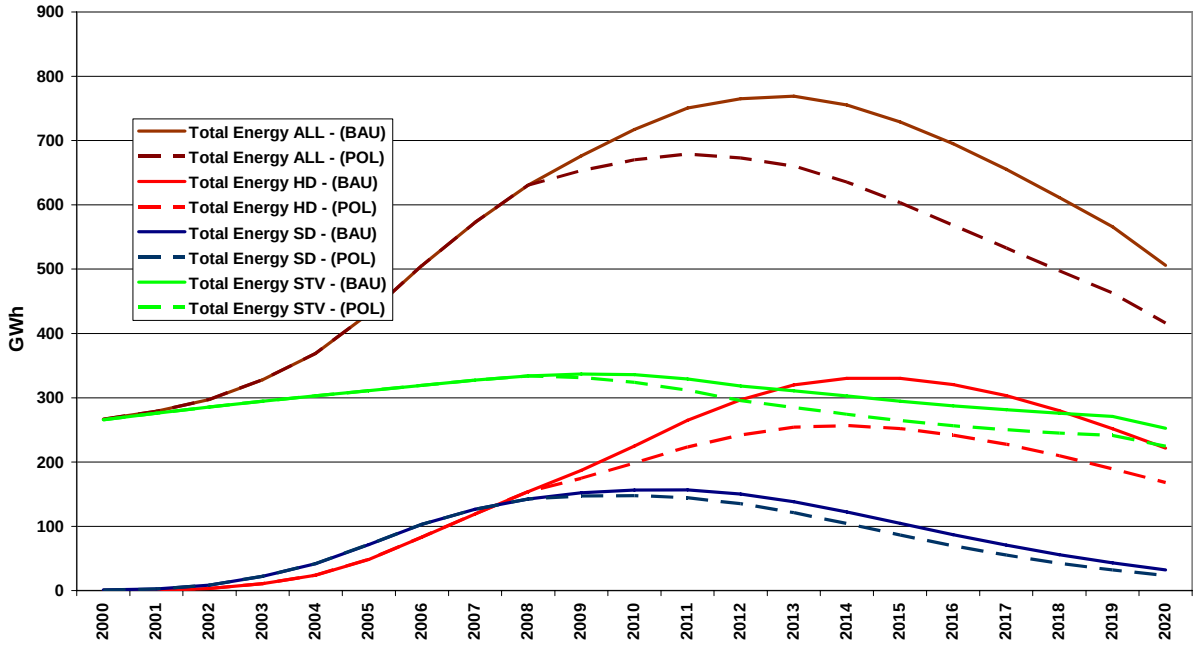
The MEPS impact is based on an implementation date of December 2008 for this RIS impact assessment, hence the impacts are shown to begin in 2009. For the Base Sales scenario, the net energy impact of the proposed MEPS for each category of STB is shown in Figure 17, where the estimated impact of MEPS is shown as the policy (POL) line compared to business as usual (BAU). Annual net energy savings are estimated at 170 GWh per year by 2016 for all STBs as a result of the MEPS with high definition STBs representing approximately 68% of the total net energy savings.

Figure 17: Net Annual Energy - BAU and MEPS: Australia Base Sales Scenario



The MEPS impact for the Low Sales scenario is shown in Figure 18, with total net energy savings of 120 GWh per year by 2016.

Figure 18: 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 19, with a 165 kt CO_2-e/yr emission reduction for the Base Sales scenario in 2016.

Figure 19: GHG Emissions - BAU and MEPS: Australia Base Sales Scenario

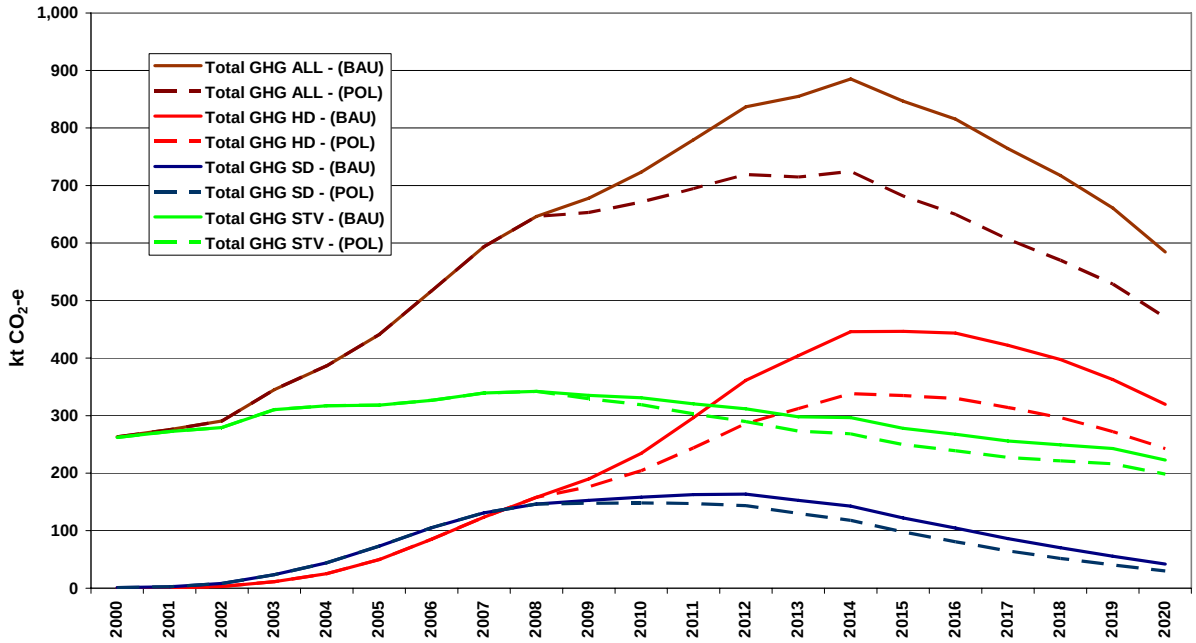
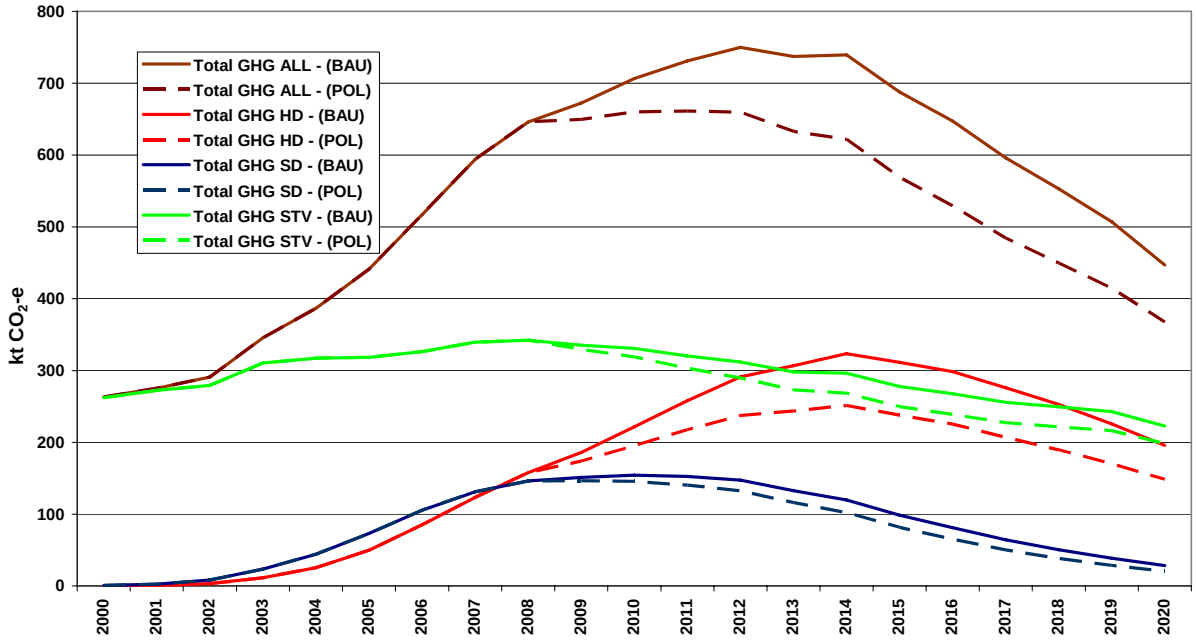


Figure 20 shows the resulting GHG emission reduction for the Low Sales scenario. It is estimated that greenhouse emissions would be approximately 50 kt CO_2-e lower if the MEPS is implemented compared to BAU under this scenario.

Figure 20: GHG Emissions - BAU and MEPS: Australia Low Sales Scenario



5.6 National and State Costs and Benefits - Australia

This section provides estimates of the national, state and territory costs and benefits for Australia.

National and State Analysis

Table 13 shows the net present value (NPV) and benefit-cost ratios (BCR) for Australia for a range of discount rates. The national perspective includes:

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

It is worth noting that only the directly related avoided cost of generating and supplying electricity has been used to calculate the benefits. Several components of the actual cost of electricity, that are not avoidable simply by reducing energy consumption, have not been used in the benefits. Such costs may include cost of metering, general maintenance cost etc. The nature and magnitude of avoidable electricity costs has been estimated in a previous RIS for clothes washers & dishwashers (Syneca 2006). This study estimated the national avoidable cost of electricity at 8 cents/kWh, comprising 7 cents/kWh in avoided cost of generation and 1 cent/kWh in avoided network costs, relative to the marginal tariff of electricity for a normal load (with normal peak to off peak consumption ratio) for residential customers of 12.7 cents/kWh. This avoidable cost is approximately 65% of the marginal tariff.

In this RIS, instead of using a single national avoided cost of electricity for Australia, it is considered more reasonable to estimate the avoidable cost of electricity on the basis of different values of marginal tariffs for each state and territory separately. In this way, the avoided costs will more accurately reflect the costs of supplying electricity by state. We have therefore calculated the avoidable cost of electricity as 65% of the marginal tariff in each state. The estimated value of avoidable cost of electricity are shown in Table 32 in Appendix 5

Table 13 shows the net present value (NPV) 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.

Table 13: Financial Analysis – Australia Base Sales Growth for a Range of Discount Rates

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$8,645,314	$4,610,593	$3,436,319	$2,592,256
Total Benefits	$133,422,370	$60,457,384	$41,571,900	$28,965,318
Net Benefits	$124,777,055	$55,846,791	$38,135,580	$26,373,062
Benefit-Cost Ratio	15.4	13.1	12.1	11.2

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 for a Range of Discount Rates

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$7,805,289	$4,152,304	$3,093,656	$2,334,088
Total Benefits	$97,854,334	$44,721,482	$30,886,838	$21,616,179
Net Benefits	$90,049,044	$40,569,179	$27,793,182	$19,282,091
Benefit-Cost Ratio	12.5	10.8	10.0	9.3

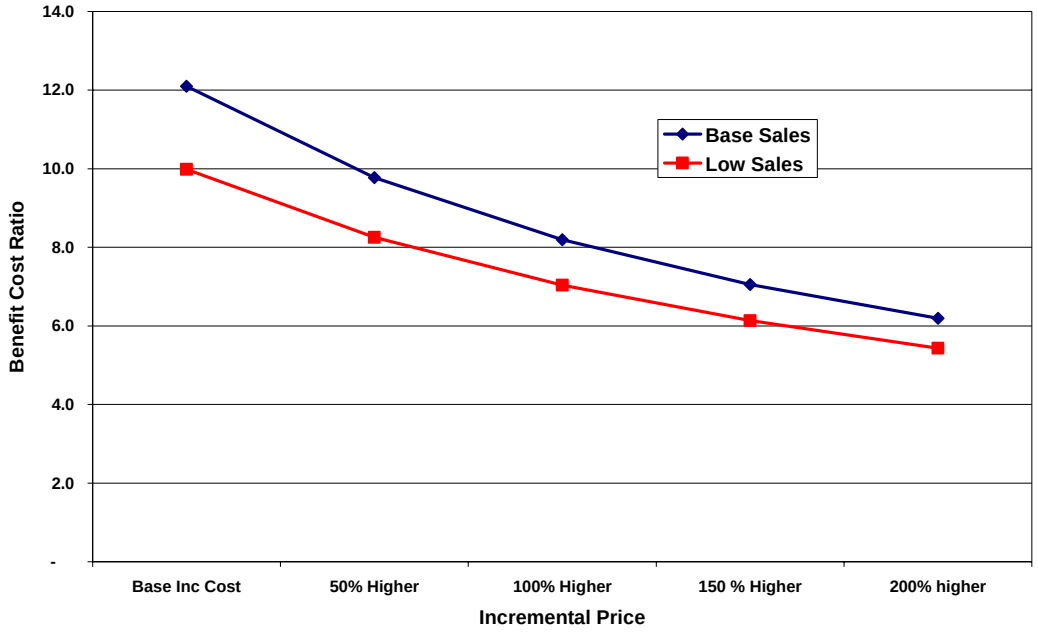
To illustrate the relative contribution of the main cost components in the cost-benefit analysis, Table 15 shows the net present value (NPV) of the three main cost components.

Table 15: Costs Inputs of Financial Analysis – Australia Base Sales Growth for a Range of Discount Rates

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Government Costs	$2,265,000	$1,158,713	$851,891	$636,788
Business Compliance Costs	$2,559,429	$1,297,160	$946,915	$701,767
Incremental Product Costs	$3,820,886	$2,154,721	$1,637,514	$1,253,701
Total Costs	$8,645,314	$4,610,593	$3,436,319	$2,592,256

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 21 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 21: Benefit-Cost Ratio as a Function of Incremental Price Increase



The benefit-cost ratios for all the Australian states are shown in Table 16 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 16: 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	13.4	11.4	10.5	9.7
NT	21.2	18.0	16.6	15.4
QLD	15.9	13.5	12.5	11.5
SA	15.3	13.0	12.0	11.1
TAS	12.3	10.4	9.6	8.9
VIC	16.1	13.7	12.6	11.7
WA	17.4	14.8	13.6	12.6

The benefit-cost ratios for all the Australian states are shown in Table 17 under the Low Sales scenario. Again, in all states the BCR is well above 1.

Table 17: 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	10.9	9.4	8.7	8.1
NT	17.2	14.8	13.7	12.7
QLD	12.9	11.1	10.3	9.5
SA	12.4	10.7	9.9	9.2
TAS	10.0	8.6	7.9	7.4
VIC	13.1	11.2	10.4	9.7
WA	14.1	12.1	11.2	10.4

Figure 22 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 the period 2006 to 2008 which reflect the government costs associated with the establishment of the MEPS program and systems before the implementation date of December 2008; however these are difficult to view in the figure due to their size (less than $300,000 for all states).

Figure 22: Annual Net Benefit $M: Base Sales Growth Scenario

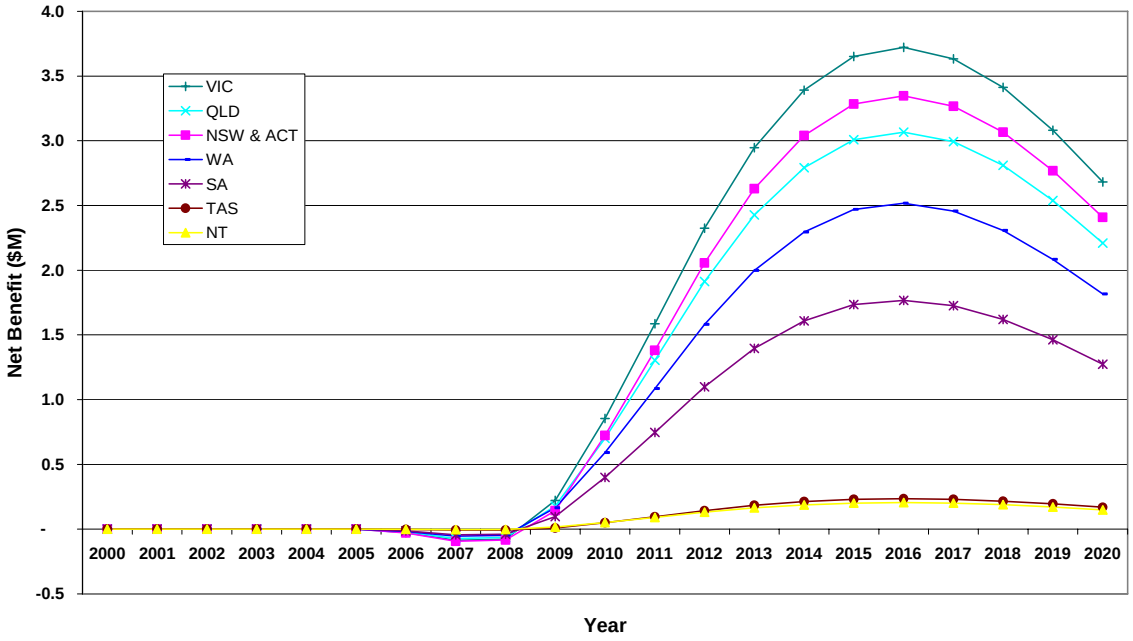
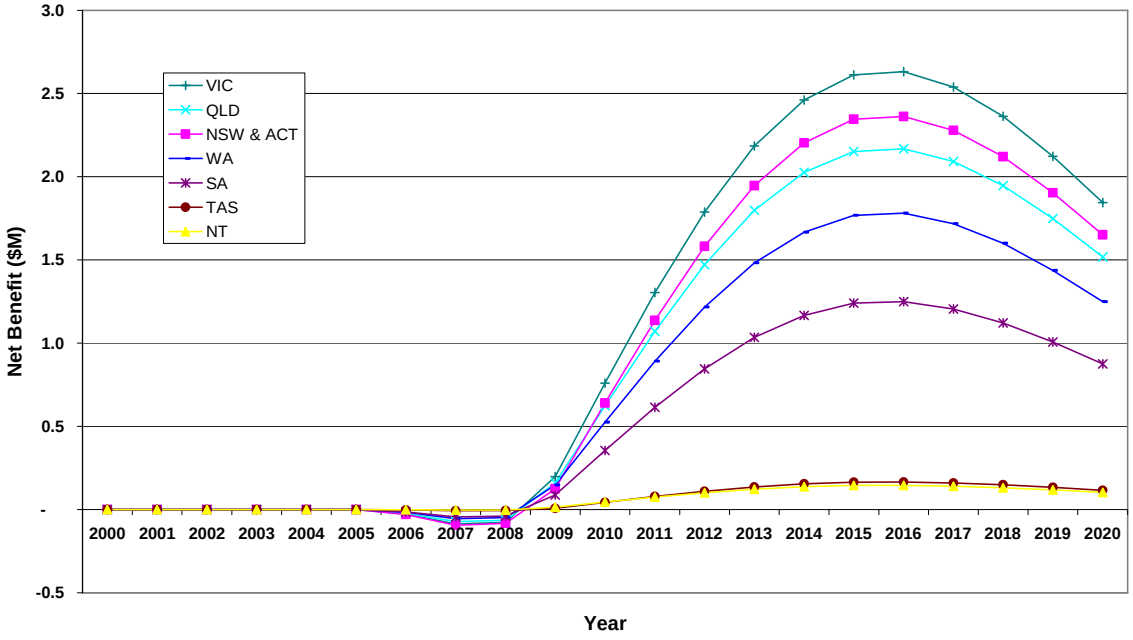


Figure 23 shows the forecast net benefit by State over the period 2000 to 2020 at a discount rate of 7.5% for the Low Sales scenario.

Figure 23: 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 18.

Table 18 Summary Data for Alternative BAU Sales Australia – 7.5% Discount Rate

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	1,561 GWh	1,145 GWh
GHG Emission Reduction (cumulative)	1.46 Mt CO_2-e	1.07 Mt CO_2-e
Total Benefit	$42M	$31M
Total Investment	$3.4M	$3.1M
Benefit-Cost Ratio	12.1	10.0

6 New Zealand Impacts

This section details the RIS assessment where data is specific to New Zealand. The STB stock modelling framework is explained in Appendix 3: Stock and Sales. As noted earlier, the scope of the RIS includes only MPEG2 STBs, which are currently used for SD FTA and STV services in New Zealand. The HD FTA STBs will be MPEG4 and further analysis and assessment of these STBs will be undertaken in 2008.

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 was launched in New Zealand in May 2007.

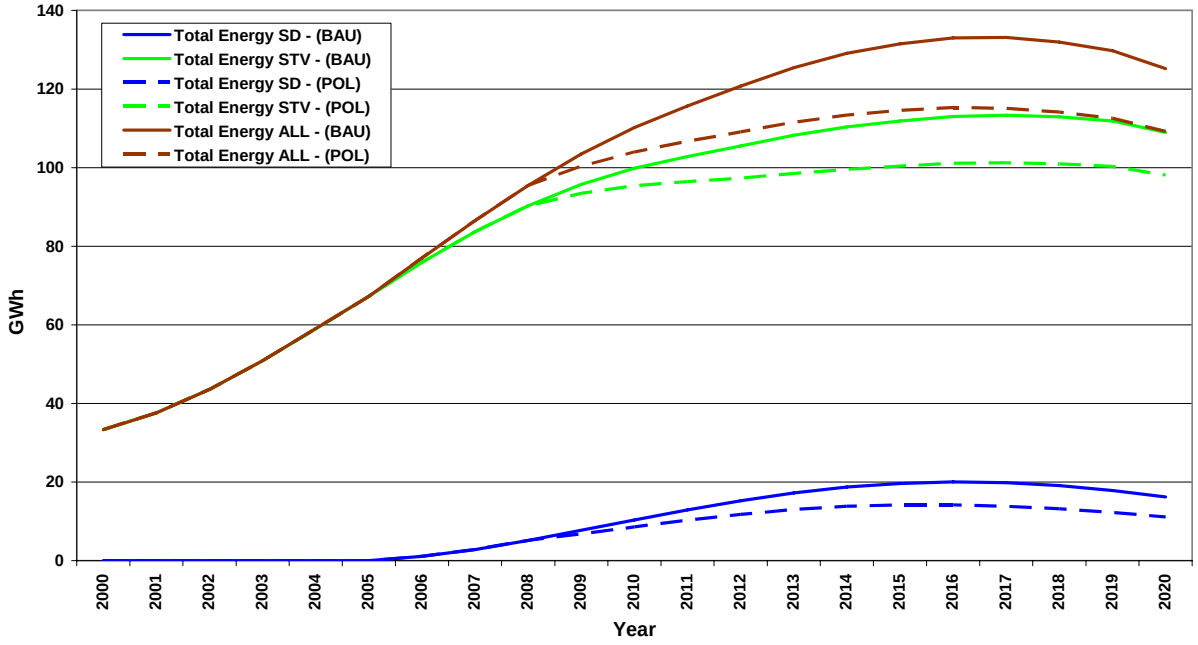
Most of the assumptions that apply to Australia also apply to New Zealand as the STBs likely to be sold in NZ are similar to Australia, with the following differences:

- Modelling is based on the NZ Digital TV Plans announced in 2006 (Analogue 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

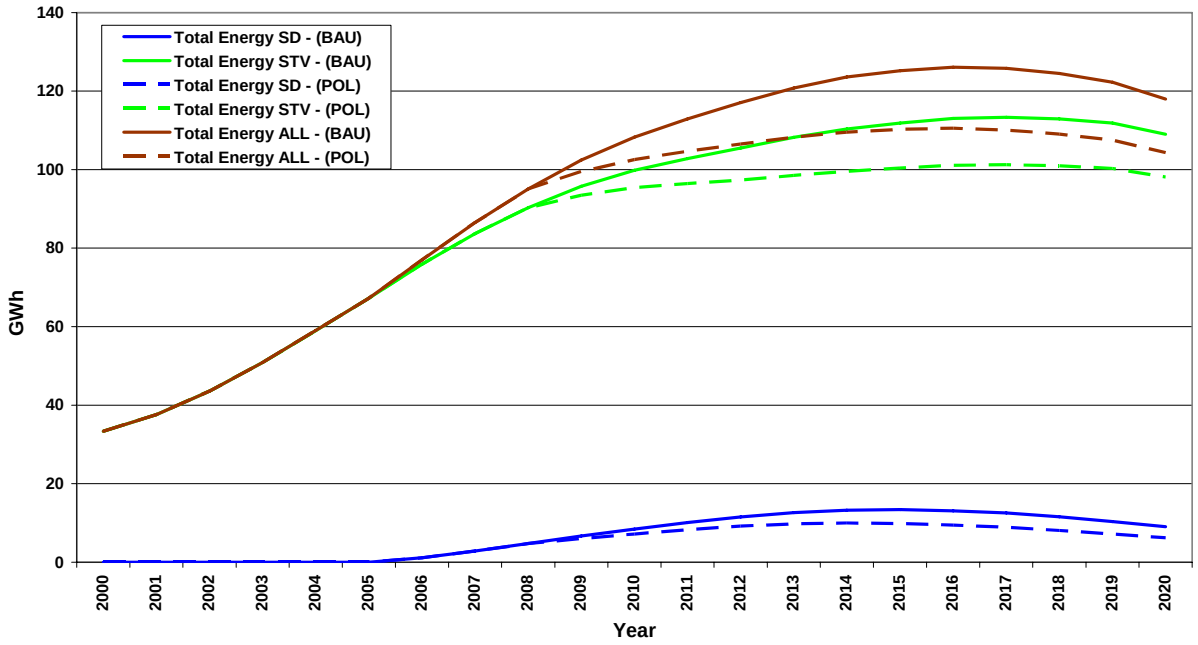
The MEPS impact is based on an implementation date of December 2008 for this RIS impact assessment. For the Base Sales scenario, the net energy impact of the proposed MEPS for STV STB is shown in Figure 24, where the estimated impact of MEPS is shown as the policy (POL) line compared to business as usual (BAU). Annual net energy savings are estimated at 20 GWh per year by 2017.

Figure 24: Net Annual Energy - BAU and MEPS: NZ Base Sales Scenario



The MEPS impact for the Low Sales scenario is shown in Figure 25, with total net energy savings of 18 GWh per year by 2017.

Figure 25: 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 26, with a 10 kt CO_2-e pa emission reduction for the Base Sales scenario in 2017.

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

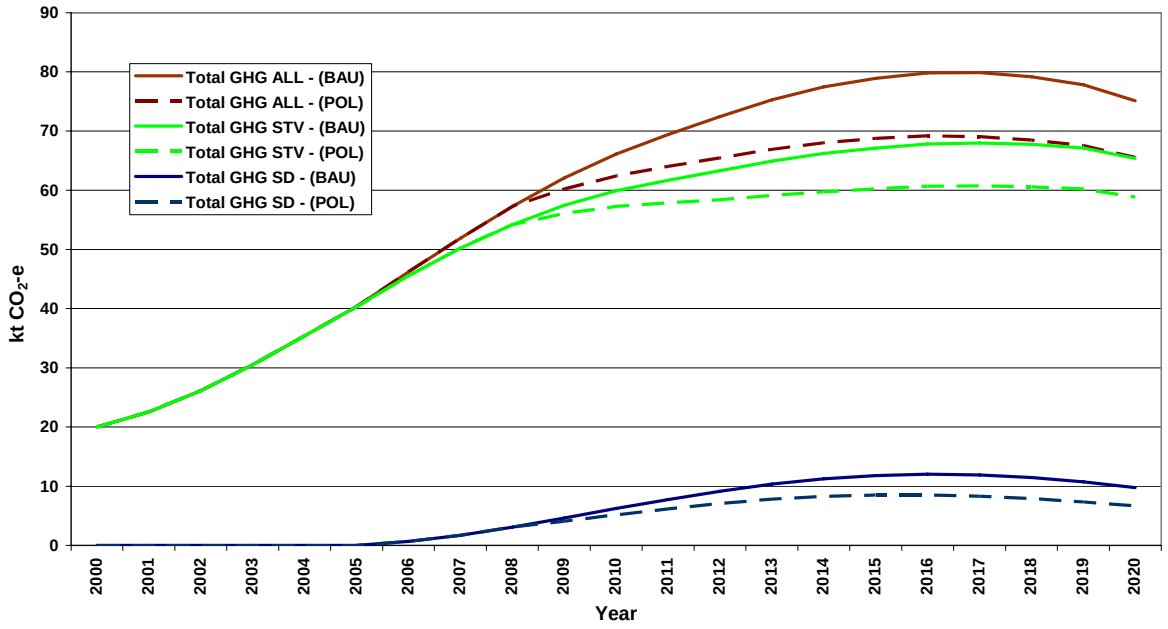
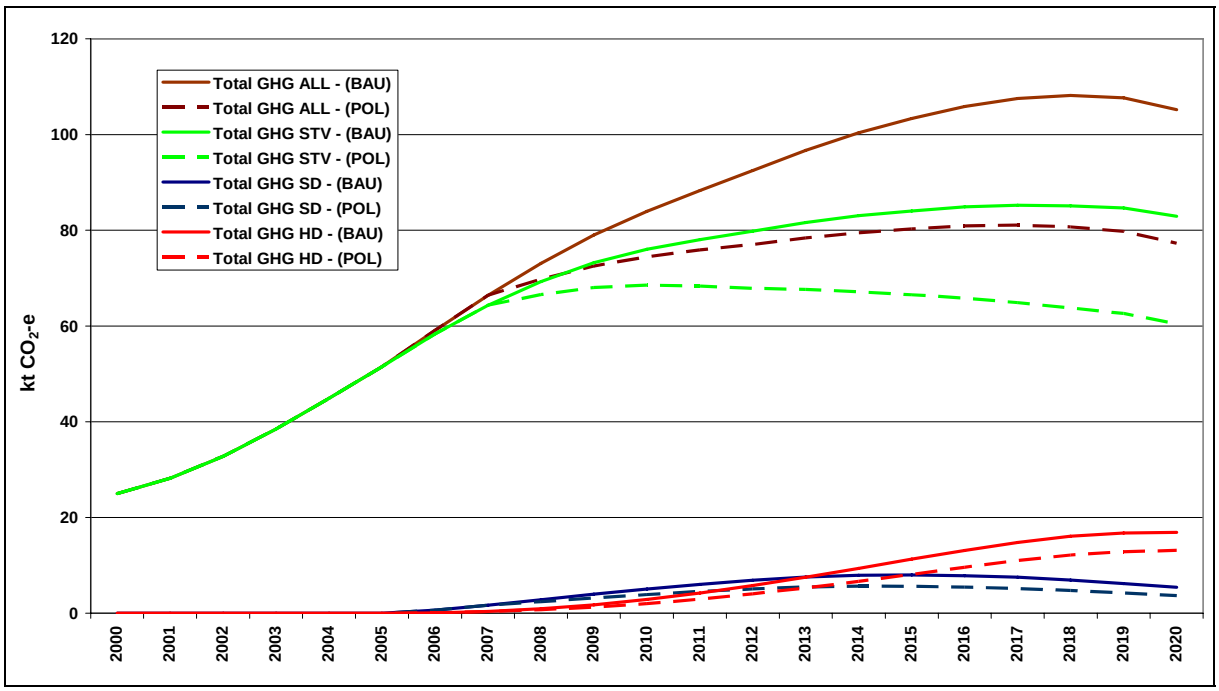


Figure 27 shows the resulting GHG emission reduction for the Low Sales scenario. It is estimated that greenhouse emissions would be approximately 1 kt CO_2-e lower if the MEPS is implemented compared to BAU under this scenario.

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



6.2 Costs and Benefits

Table 19 shows the net present value (NPV) and benefit-cost ratios (BCR) 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 1.1 NZD to 1 AUD.

Table 19: Financial Analysis – NZ Base Sales Scenario for a Range of Discount Rates

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$2,284,842	$1,131,032	$816,561	$598,743
Total Benefits	$18,490,717	$8,331,756	$5,716,826	$3,976,393
Net Benefits	$16,205,874	$7,200,725	$4,900,265	$3,377,651
Benefit-Cost Ratio	8.1	7.4	7.0	6.6

Table 20 presents the NPV benefits and costs of the proposed MEPS for the Low Sales scenario.

Table 20: Financial Analysis – NZ Low Sales Scenario for a Range of Discount Rates

	NPV Nil (0%)	NPV Low (5%)	NPV Med (7.5%)	NPV High (10%)
Total Costs	$2,132,821	$1,060,263	$766,503	$562,565
Total Benefits	$16,301,059	$7,369,173	$5,064,475	$3,528,199
Net Benefits	$14,168,238	$6,308,910	$4,297,971	$2,965,635
Benefit-Cost Ratio	7.6	7.0	6.6	6.3

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

Summary Data for BAU Base Sales Scenario

The impact of changes to the forecast sales of STBs is shown for the two scenarios in Table 21

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

Scenario	Base Sales	Low Sales
Energy Saved (cumulative)	163 GWh	144 GWh
GHG Emission Reduction (cumulative)	98 kt CO_2-e	86 kt CO_2-e
Total Benefit	$4.0M	$3.5M
Total Investment	$0.6M	$0.6M
Benefit-Cost Ratio	6.6	6.3

7 Consultations and Comments

7.1 Summary: Prior to Consultation RIS

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. 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 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.

- ***Industry Meeting –*** Set-Top Boxes: May 2007. Consultation between the New Zealand STB industry and EECA was held at a meeting in Auckland on 8 May 2007.

These key policy/technical documents were also made available on the public web site, 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 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.

Cost-Benefit Analysis for STBs: April 2007

In April 2007, the Equipment Energy Efficiency Committee (E3 Committee) released a Cost-Benefit Analysis (CBA) for STBs (E3 Committee 2007) seeking comments. Stakeholders were asked to comment on the proposed MEPS and the data and assumptions relating to the cost-benefit analysis. Table 22 presents the short summary of the nine submissions received and the responses to these comments.

Table 22: Short Summary of Comments and Responses to E3 Committee CBA for STBs

Organisation	Comment Received	Response Summary
Free TV	Support of MEPS but only if STV is covered by the same requirements as FTA STBS	No change required. MEPS levels match international best practice regulation with modifications for Australia technical requirements
FOXTEL	Accept the introduction of MEPS for new STBs effective not earlier that 1 October 2008 and understand that Austar will accept this position and therefore will be the position adopted by ASTRA. However firmly believe that a mandatory regime for regulating STV STBs is unnecessary.	No change required. MEPS is considered necessary due to the broader definition of the market than just the STV market alone and increasing competition in the STV market, e.g. by Internet service providers.
AEEMA	Delay the implementation of the MEPS to April 2009.	Implementation date now proposed to be October 2008
CESA	Delay the implementation of the MEPS to April 2009, with final RIS sign off by Nov 2007	Implementation date now proposed to be October 2008
DBA	Proposes that STB sales are not correct for 2006 and 2007, and projections will need to be revised	New data will be incorporated in the revised modelling for the consultation RIS
EECA	MPEG4 will be available in NZ in 2008, and the current MEPS deals with MPEG2 STBs. Request a 6 month delay to NZ MEPS and develop MPEG4 MEPS levels	Separate policy response for MPEG4 STBs in NZ and Australia during 2008, for likely implementation in 2010
Sky Network Television Ltd (NZ)	Endorse MEPS, but have technical issues with the draft AS/NZS standard	Sky/EECA to liaise with Standards Australia committee to address technical concerns
TransACT	Clarify when a product is required to meet MEPS	MEPS will apply to those STBs purchased and delivered to the STV provider after the implementation date
PJ Rosenberger	MEPS should apply to both operational and standby mode. STBs should have an on/off switch.	The MEPS does apply to both modes. To receive Over the Air System Software Updates STBs need to be in a passive standby mode or higher.

7.2 Summary of Comments: Consultation RIS

In October 2007, the MCE released a Consultation RIS: MEPS and Alternative Strategies for Set-Top Boxes for STBs seeking comments. Stakeholders were asked to comment on the proposed MEPS and the data and assumptions relating to the cost-benefit analysis. Table 23 presents the short summary of the five submissions received and the responses to these comments.

Table 23: Summary of Comments and Responses to Consultative RIS for STBs

Organisation	Comment Received	Response Summary
Free TV	State their support of MEPS as per submission on CBA, only if STV is covered by the same requirements as FTA STBS	No change to RIS required. No additional evidence to support submission. The MEPS levels match international best practice regulation with modifications for Australia technical requirements
ASTRA	Support for government initiative. ASTRA provide information on STV energy consumption levels, treatment of costs/benefits for the STV industry, MEPS administrative issues and editorial comments	No change to RIS required. STV STB power levels are consistent with RIS analysis, cost benefits treated as per Guide, and MEPS administrative issues to be addressed separate to RIS.
Freeview Limited (NZ)	Support for MEPS and want to create a new category for Satellite FTA STBs.	Referred to standards committee. EECA has agreed to implement the joint standard when MPEG2 Satelite efficiency levels for FTA STBs are increased in stringency.
CESA	Delay the implementation of the MEPS to April 2009	MEPS implementation date was delayed in the RIS to October 2008
AEEMA	Delay the implementation of the MEPS	MEPS implementation date was delayed in the RIS to October 2008

A detailed summary of the specific submissions and the responses are contained in Appendix 7: STB RIS Comments and Responses.

7.3 Responses to Comments

The comments from the stakeholders were considered and no change to the RIS is required. In general, the submissions from stakeholders supported the MEPS initiative. The submissions also provided additional information to support the BAU power consumption and editorial or administrative clarifications.

One submission requested that the MEPS requirements for STV STBs be the same as for FTA STBs, however no further evidence was provided to support the request, which was dealt with in the earlier CBA. Another submission requested that the implementation date for the MEPS be delayed. This was also a concern in the CBA consultation and the E3 program deferred the implementation date to October 2008.

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 by overseas experience.

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

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

Addressing Market Failures

By requiring the removal of low efficiency 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 2008, the program could be implemented in 2008.

8.2 Recommendations

It is recommended that the Ministerial Council on Energy agrees:

1. To implement mandatory energy performance standards for STBs in regulation.

2. That STBs covered by this RIS include those that are capable of decoding video transport streams, are MPEG2, and 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 14.

5. That the amendments take effect not earlier than 1 December 2008[4].

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 December 2008.

[4] New Zealand have informed E3 that they will be enacting their regulations from 1 April 2009 due to local considerations. This short period between Australia and New Zealand's effective dates is not considered an issue in terms of the TTMRA.

9 Implementation and Review

General administrative arrangements

Australia has a national scheme for mandatory energy labelling and performance standards that relies on State and Territory legislation to give it legal effect. The jurisdictions have also agreed to a set of administrative guidelines. While not legally binding, they aim to promote a uniform approach, consistent outcomes and to minimise compliance costs. The E3 program released the latest guidelines in May 2005 (NAEEEC 2005). The key administrative arrangements are:

1. The technical details of the MEPS and labelling requirements are contained in Australia or Australian and New Zealand Standards that are incorporated by reference into the State and Territory legislation. These standards do not vary between States and Territories and are subject to unanimous approval by State and Territory regulatory bodies.

2. Changes to the technical detail in Standards are subject to transition periods that are negotiated between industry and government. State and Territory regulatory agencies and stakeholders have agreed that this type of transition arrangement minimises the cost of compliance and the confusion surrounding both the old and the new standards.

3. To minimise trade barriers, State and Territory regulatory agencies support a policy of adopting international standards wherever appropriate. E3 and Standards Australia actively support the development of international standards.

4. Where a product is not regulated for energy efficiency prior to the implementation of MEPS for the first time, products that were manufactured in Australia or imported before the MEPS implementation date may be sold without the need for any registration. 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.

5. Grandfathering arrangements are adopted such that stocks of non-complying products that were imported or manufactured in Australia prior to the effective date of legislation affecting them can be sold for an indefinite period (i.e. products made in Australia or imported prior to the relevant MEPS date may be sold at any time into the future).

6. All States and Territories accept the registration of an appliance undertaken in another State or Territory. Where a regulatory agency has refused to register a model for energy efficiency labelling or MEPS, it will immediately inform all other States and Territories of the circumstances surrounding the refusal.

7. State and Territory regulatory agencies have set target time periods within which they aim to process applications.

8. Proposed changes in administrative and operating practice are subject to consultation between states.

Product-specific compliance and enforcement activities

The E3 program organises its compliance and enforcement activities as follows:

1. A check testing program is administered by the Department of Environment, Water, Heritage and the Arts

2. Checktesting is conducted in NATA accredited laboratories.

3. Equipment is selected for check testing on the basis of risk factors rather than randomly. The risk factors are as follows:
   - history of success and failure in check tests;
   - age of models, with newer models given greater attention, reflecting the prospect of longer life in the market;
   - high volume sales;
   - claims of high efficiency;
   - complaints.

4. In the event of failure to comply, there are several sanctions that may be utilised.
   - There is a 'shaming' option involving publication of failed brands or models in reports by agencies and/or the relevant Ministers.
   - Deregistration by the state and territory authorities, subject to show cause procedures. Subsequent sale of deregistered appliances would be a criminal offence. Re-registration of models that are subject to MEPS is subject to new registration tests.
   - Legal action by the ACCC.

5. Standard statistical criteria are applied to deal with normal variation in the performance of equipment selected for check testing. A sample of only one is selected initially, with a further sample of 3 selected if the first fails.

6. Laboratories that produce misleading tests results may also be denied further registration business.

7. Applicants that use laboratories for registration testing, whose products subsequently fail Checktesting, may be asked to ensure that future testing conducted in relation to their products is undertaken by a NATA accredited laboratory or a laboratory accredited by a body with a mutual recognition agreement with NATA.

General monitoring and benchmarking of impacts and effectiveness

In the past the E3 program has periodically commissioned an omnibus evaluation of its impacts. The last of these was published in April 2005 (NAEEEC 2005b), titled W*hen you keep measuring it, you know even more about it: Projected impacts 2050-2020.* The general aims of such an exercise are to document expected impacts, estimate costs and benefits, and compare outcomes with earlier projections. It commits E3 to examination of the appliance register and store survey data, and comparative review of trends in appliance efficiency. . The program has since advised industry that the 2003 exercise was the last of the omnibus reviews and will be replaced by ad-hoc reviews. The first of these evaluated the impacts of MEPS and labelling of refrigerators and freezers (EnergyConsult 2006).

Over the past seven years, E3 has produced an annual "Achievements" report, the most recent reporting the 2006 position. These reports provide summary information such as achievements in the year, current and projected economic benefits, current and projected greenhouse gas reductions, compliance/enforcement issues, procedures and outcomes and Standards information. . The bi-annual standby store survey provides the E3 program with trend data and information on the energy consumption of products that are being sold in the market. This survey specifically targets set-top boxes and other consumer electronics, and will be used to monitor the general effectiveness of the MEPS over time

E3 holds an annual consultation forum and invites stakeholders to raise concerns about its operation and impacts. In addition, E3 also holds industry/stakeholder fora and conferences to discuss future directions for currently regulated products and products being considered for regulation.

Less frequently, E3 reviews program fundamentals. The most recent exercise of this kind was a major research-based review and scoping of future directions for a wide range of appliance efficiency labels in Australia and NZ (Winton 2003).

The program also takes occasional opportunities to benchmark its activities with programs in other countries.

Regulatory review

Review functions are not centralised: each State and Territory has its own arrangements for review. The 'subordinate legislation' acts in several states provide for the automatic revoking of regulations after 10 years. These states are Victoria, SA, Queensland and Tasmania. NSW requires that all regulations contain sunset clauses. The remaining jurisdictions have no general requirement but may include sunset clauses on a case-by-case basis.

All jurisdictions have some Parliamentary machinery for the systematic review of regulations, such as a 'Legislation Review Committee'. Arrangements for agency or inter-agency review are more variable. Only Victoria has a specific body charged with

regulatory oversight, which is the Victorian Competition and Efficiency Commission. This work is undertaken by an inter-departmental committee in the NT. Otherwise, however, the review process uses a parliamentary secretariat to raise issues and solicit public comment.

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

Information Specific to Set Top Box Requirements

STB 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.

As with the E3 adopted principles there should be a MEPS 'stability period', and a cost-benefit analysis would be undertaken before any revisions are proposed. The earliest possible timing of any change to the MEPS regulations discussed in this RIS would therefore depend on date of their implementation. If implemented in December 2008, the earliest possible revision would be October 2011.

In respect of revisions, 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. The study would typically be undertaken 18 - 24 months before a revision was proposed. The study would review and compare local and international trends in efficiency levels, international programs and harmonisation initiatives, possibly proposing more stringent MEPS, if sufficient evidence indicated such change was achievable and beneficial. Equally, the study could indicate that continuation of MEPS, with registration, may not be the most cost effective outcome for the community at large and hence recommend alternative options, including the removal of mandatory measures.

Therefore considering the E3 Committee principles and the State sunset requirements:

- the earliest a review would be undertaken would be 2010 (if changes were to be considered for implementation in October 2011).
- the latest a review to be undertaken would be in 2017, one year before the State sunset provisions.

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Appendix 1: References

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Appendix 2: Australian Energy Efficiency Policy Background

The Australian Government's initial response to concerns about the environmental, economic and social impacts of global warming was set out in the Prime Minister's statement of 20 November 1997, *Safeguarding the Future: Australia's Response to Climate Change*. The Prime Minister noted that the Government was seeking *"…realistic, cost-effective reductions in key sectors where emissions are high or growing strongly, while also fairly spreading the burden of action across the economy."* He also stated that the Government is "…*prepared to ask industry to do more than they would otherwise be prepared to do, that is, go beyond a 'no regrets'*[5]*, minimum cost approach where this is sensible in order to achieve effective and meaningful outcomes."* This "no regrets" test was a key part of the guidelines adopted by the Council of Australian Governments (COAG) in 1997 that any initiative proposed by the MCE, including standards and labelling measures under the Equipment Energy Efficiency Program, must meet.

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

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

Since that time, CoAG has remained the primary forum for progressing Australian, state and territory government collaboration on climate change issues requiring inter-jurisdictional attention. Significant progress has been made under the CoAG climate change agenda since CoAG's agreement in June 2005 to establish a new Senior Officials

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

Group to consider ways to further improve investment certainty for business, encourage renewable energy and enhance cooperation in areas such as technology development, energy efficiency and adaptation. This work culminated in the January 2006 CoAG climate change action plan. In addition, climate change issues requiring national coordination have been managed through a number of inter-governmental ministerial councils including the Ministerial Council on Energy.

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

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

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

Emissions trading will complement existing Government actions to reduce greenhouse gases. These include:

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

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

Appendix 3: 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 650,000 by the end of 2006 (GfK 2007). The total penetration of Free to Air Digital TV in households is 28% of Australian homes in early 2007, including both TVs with integrated digital receivers and STBs(DBA2007). Digital switchoff in Australia will occur by 2013, 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 analogue TV after analogue 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. In addition to FOXTEL and AUSTAR, TransACT supplies 15,000 customers in Canberra with their own subscription service.

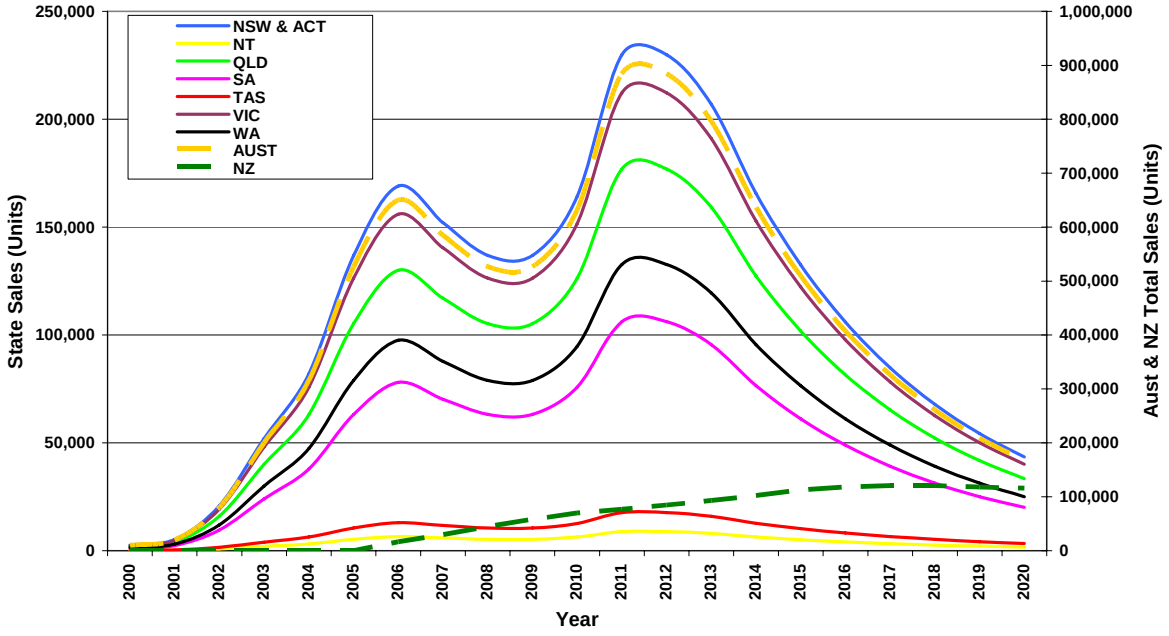
Based on such estimates the present annual sales of FTA STBs and trends for 2000-2020 have been estimated as shown in Table 24 while Figure 28 graphically illustrates the sales trends.

Table 24: Total annual sales of FTA digital STBs 2000-2020, by States, Australia as a whole

YEAR	NSW & ACT	NT	QLD	SA	TAS	VIC	WA	AUST	NZ[1]
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	169,000	6,500	130,000	78,000	13,000	156,000	97,500	**650,000**	**16,610**
2007	152,100	5,850	117,000	70,200	11,700	140,400	87,750	**585,000**	**29,898**
2008	136,890	5,265	105,300	63,180	10,530	126,360	78,975	**526,500**	**44,847**
2009	136,890	5,265	105,300	63,180	10,530	126,360	78,975	**526,500**	**58,301**
2010	164,268	6,318	126,360	75,816	12,636	151,632	94,770	**631,800**	**69,961**
2011	229,975	8,845	176,904	106,142	17,690	212,285	132,678	**884,520**	**76,957**
2012	229,975	8,845	176,904	106,142	17,690	212,285	132,678	**884,520**	**84,653**
2013	206,978	7,961	159,214	95,528	15,921	191,056	119,410	**796,068**	**93,119**
2014	165,582	6,369	127,371	76,423	12,737	152,845	95,528	**636,854**	**102,430**
2015	132,466	5,095	101,897	61,138	10,190	122,276	76,423	**509,484**	**112,673**
2016	105,973	4,076	81,517	48,910	8,152	97,821	61,138	**407,587**	**118,307**
2017	84,778	3,261	65,214	39,128	6,521	78,257	48,910	**326,069**	**120,673**
2018	67,822	2,609	52,171	31,303	5,217	62,605	39,128	**260,856**	**120,673**
2019	54,258	2,087	41,737	25,042	4,174	50,084	31,303	**208,684**	**118,260**
2020	43,406	1,669	33,390	20,034	3,339	40,067	25,042	**166,948**	**115,895**

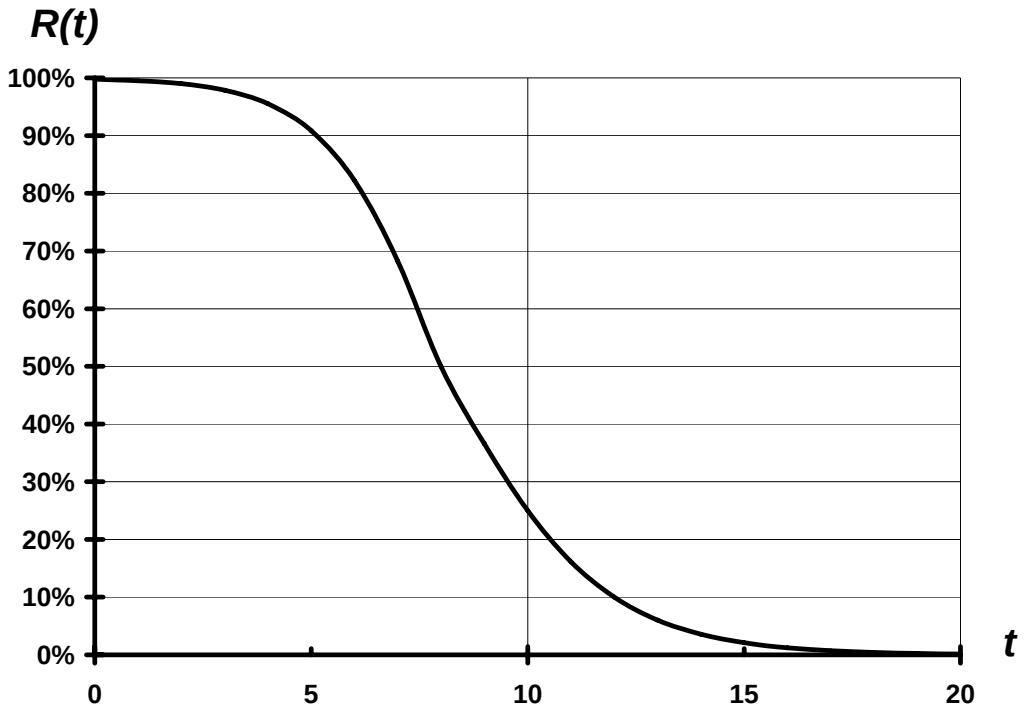
1. Includes both SD and HD STBs

Figure 28: Annual sales of FTA STBs by State, Australia and NZ



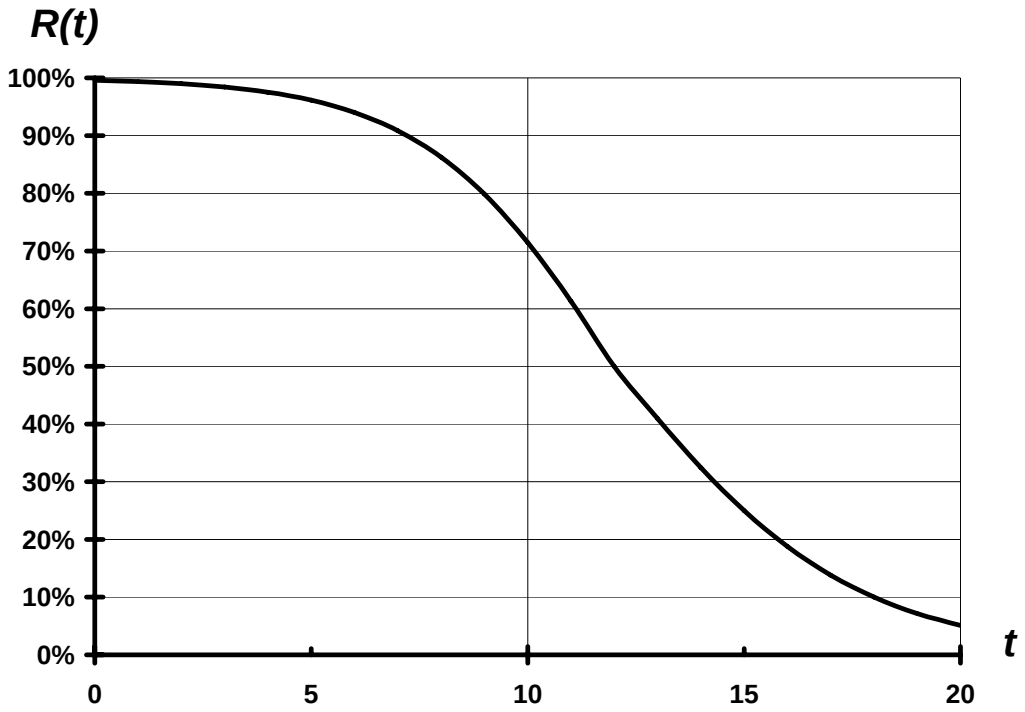
With rapid increase in sales, the stock of digital STBs also continues to grow. The stock is a function of life/age of the device and annual sales. In case of majority of electronic devices, that do not have a mechanical component, the physical life is often greater than 10 years. However, on the other 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 29 provides a graphical view of the percentage of STBs (Rt) in useful service over the life in years from purchase (t).

Figure 29: 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 30

Figure 30: Survival Function of STV STB for Australia and New Zealand

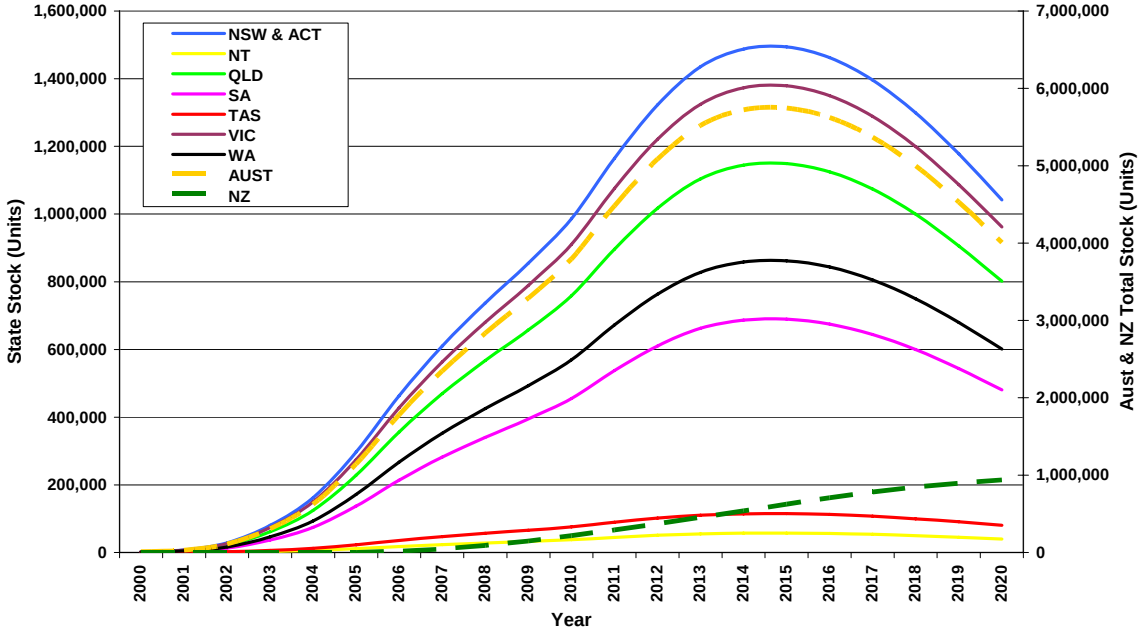


Our estimates of STB stock for the period between 2000 and 2020 by states, Australia as a whole and New Zealand are provided in Table 25 while Figure 31 shows the corresponding trend.

Table 25: Stock of FTA STBs 2000-2020, by States, Australia as a whole

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	463,747	17,836	356,729	214,037	35,673	428,074	267,546	**1,783,643**	**16,730**
2007	610,441	23,479	469,570	281,742	46,957	563,484	352,178	**2,347,851**	**46,518**
2008	736,867	28,341	566,821	340,092	56,682	680,185	425,115	**2,834,103**	**91,098**
2009	854,675	32,872	657,442	394,465	65,744	788,931	493,082	**3,287,212**	**148,805**
2010	986,309	37,935	758,699	455,219	75,870	910,439	569,024	**3,793,496**	**217,493**
2011	1,165,250	44,817	896,346	537,808	89,635	1,075,615	672,259	**4,481,730**	**291,802**
2012	1,322,725	50,874	1,017,481	610,489	101,748	1,220,977	763,111	**5,087,405**	**371,149**
2013	1,434,981	55,192	1,103,831	662,299	110,383	1,324,598	827,873	**5,519,156**	**454,271**
2014	1,487,694	57,219	1,144,380	686,628	114,438	1,373,256	858,285	**5,721,898**	**539,469**
2015	1,494,020	57,462	1,149,246	689,548	114,925	1,379,095	861,935	**5,746,230**	**626,126**
2016	1,461,968	56,230	1,124,591	674,755	112,459	1,349,509	843,443	**5,622,955**	**708,407**
2017	1,396,073	53,695	1,073,903	644,342	107,390	1,288,683	805,427	**5,369,513**	**782,616**
2018	1,299,449	49,979	999,576	599,746	99,958	1,199,492	749,682	**4,997,882**	**846,558**
2019	1,177,724	45,297	905,942	543,565	90,594	1,087,130	679,456	**4,529,708**	**898,337**
2020	1,042,034	40,078	801,565	480,939	80,156	961,878	601,173	**4,007,823**	**938,398**

Figure 31: Trend - Stock of FTA Digital STBs



Subscription TV – Australia and New Zealand

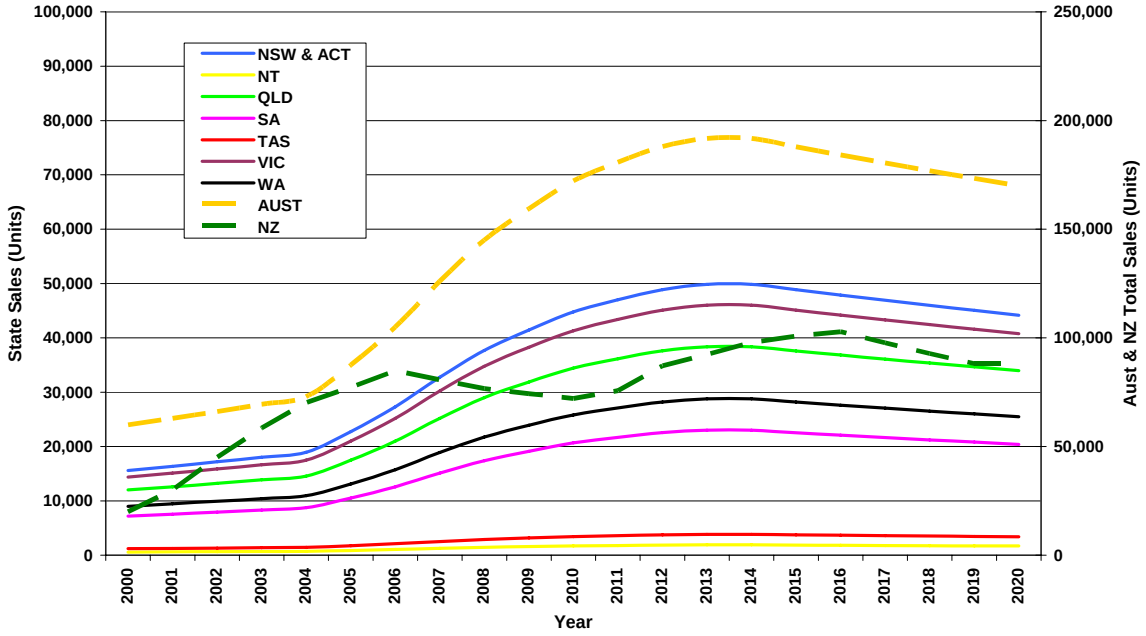
The total number of Australian Subscription TV subscribers is 1,841,000 as of June 2006 (AFC 2006). Over 1.27 million are with FOXTEL/Optus and approximately 470,000 with AUSTAR. While AUSTAR have in place a digital platform, FOXTEL have substantially converted their system to digital, with a change 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 26 contains annual number of new subscribers of Pay TV while Figure 32 illustrates the corresponding trend.

Table 26: 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 32: Annual number of new STBs for Subscription TV

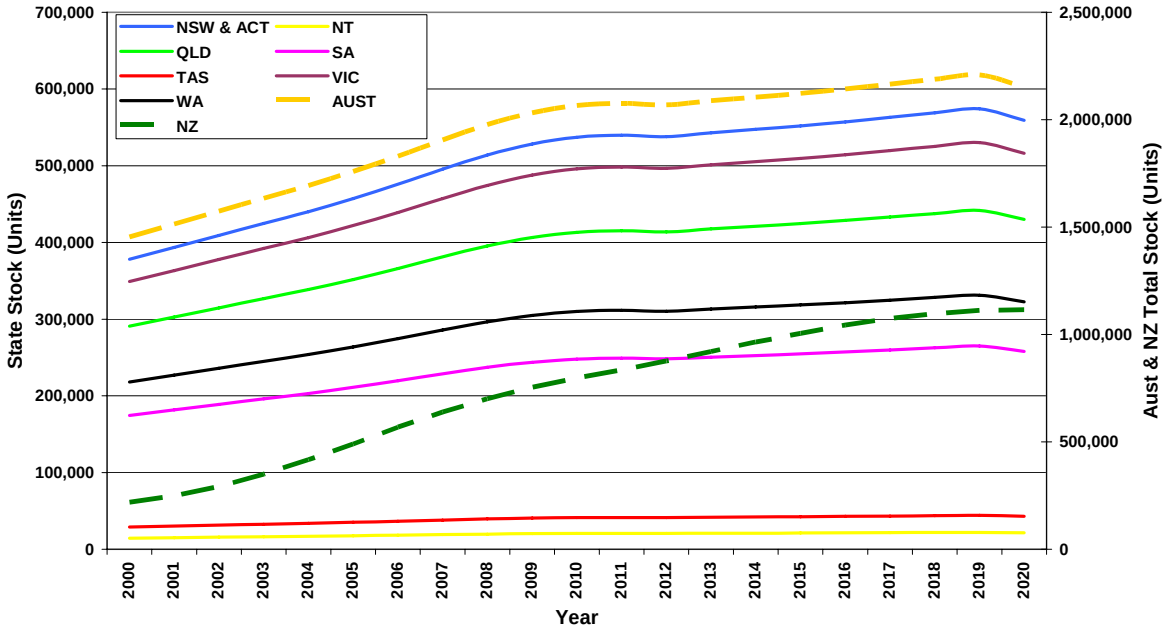


In case of STV STBs, generally one subscription supports one STB, although some consumers may hold more than 1 STB to service to their 2nd or 3rd TVs. Nonetheless, generally 1 STB to one subscription provides a reasonably accurate account of the stock of STV STBs. Consequently the stock of STV STBs becomes 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 27. Figure 33 shows the corresponding trend.

Table 27: 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**

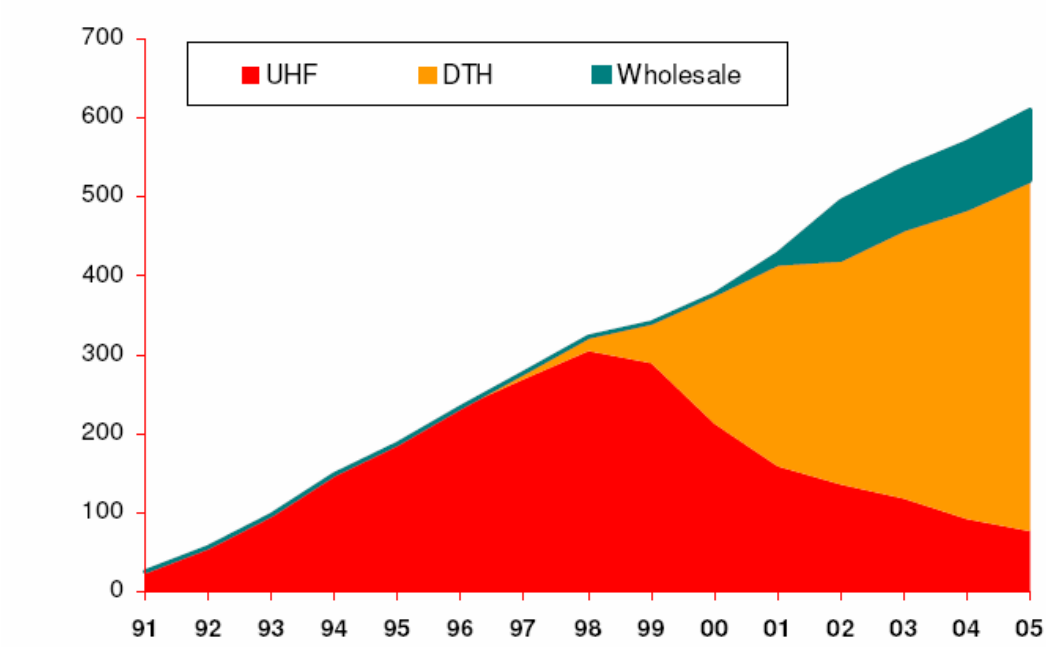
Figure 33: Trend - Stock of STV STBs



Ownership and Market Trends by STB Categories

The penetration of FTA STBs TV is likely to continue up to the analogue TV transmission switch-off by 2013. There is also predicted to be a 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 34 shows the predicted STV services for New Zealand where digital FTA TV is introduced.

Figure 34: STV Service: Subscribers Forecast in NZ



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

For FTA STBs in Australia, the sales of standard definition STBs (SD STBs) were initially much higher than high definition STBs (HD STB) due to substantial price difference and lack of availability of high definition display devices. However, SD STBs are expected to phase out gradually as 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 from 2008. 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 35 and Figure 36 show respectively the trends of STBs sales by three categories of STBs for Australia and New Zealand.

Figure 35: Annual sales of STBs by Categories – Australia

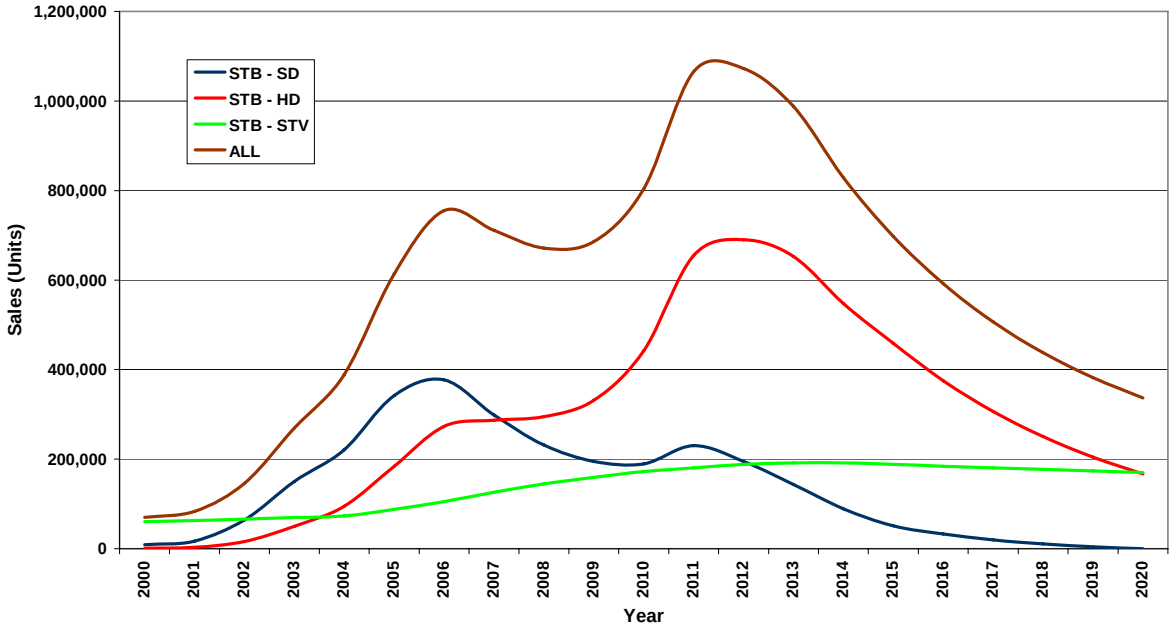
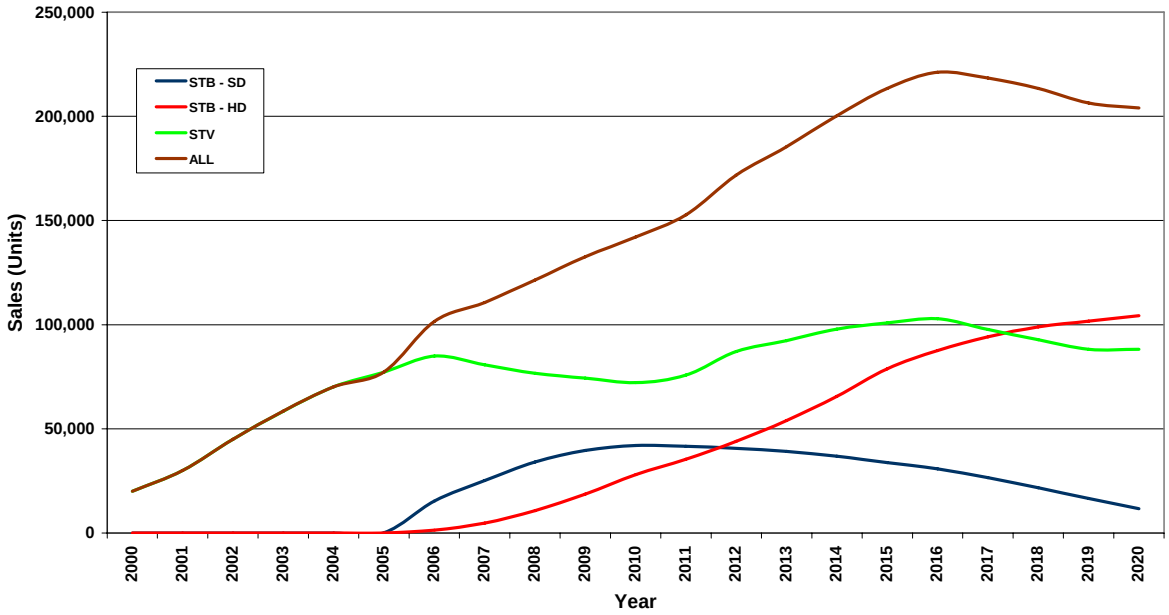


Figure 36: Annual sales of STBs by Categories – New Zealand



Following the sales trend as above, the stock of 3 types of STBs are shown in Figure 37 and Figure 38 by categories for Australia and New Zealand respectively.

Figure 37: Trend - Stock of STBs by Categories – Australia

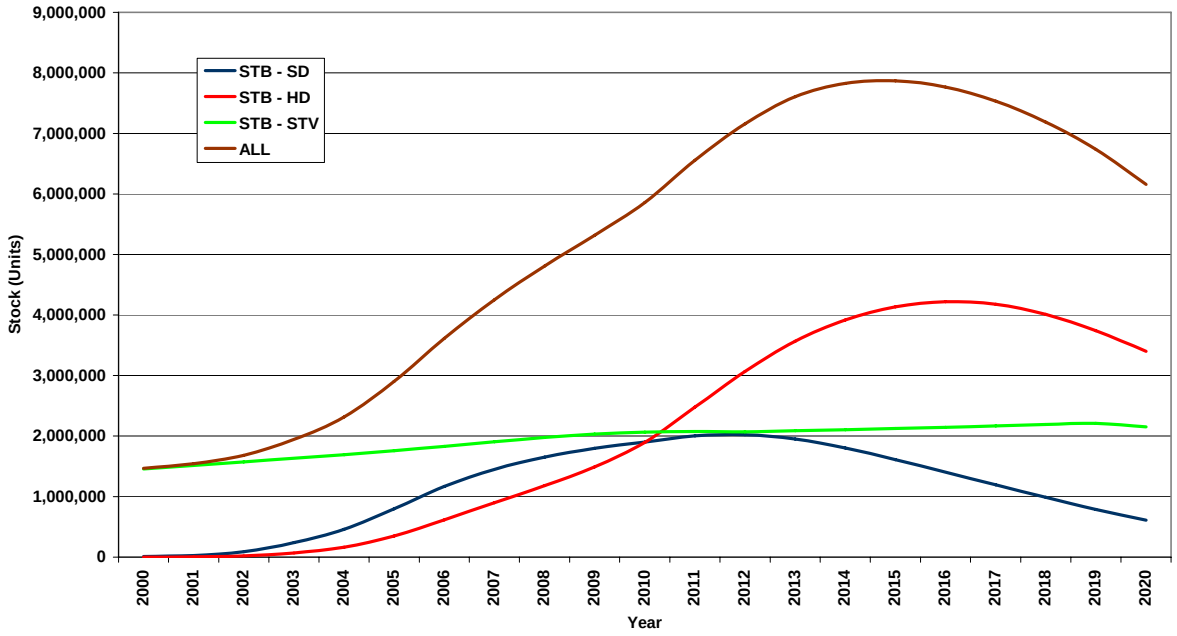
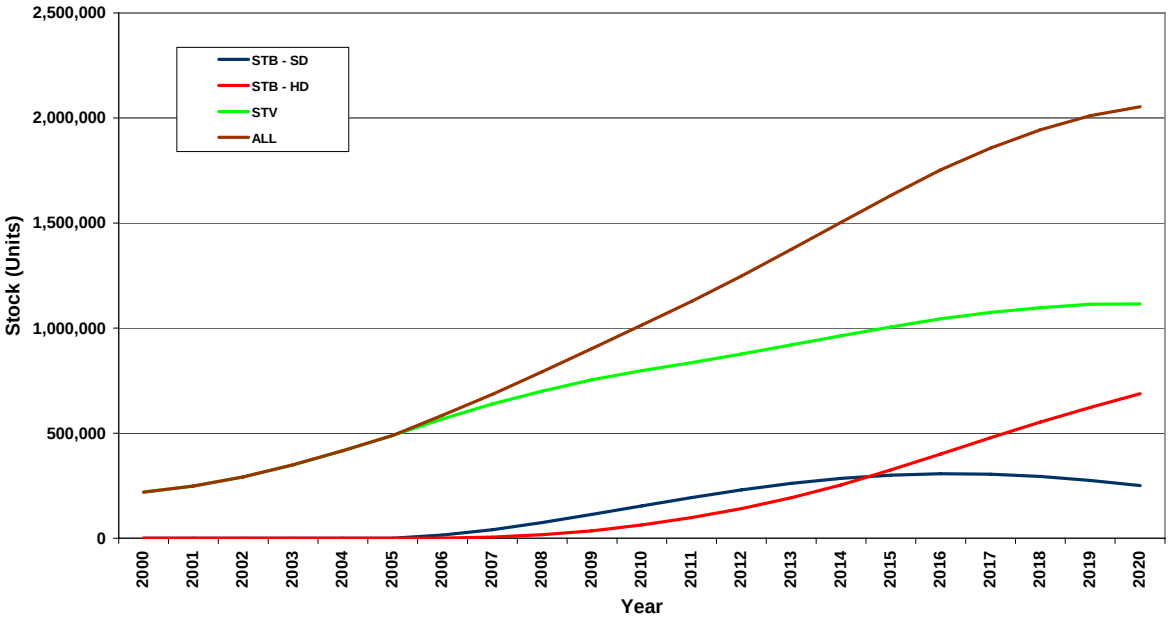


Figure 38: Trend - Stock of STBs by Categories – New Zealand



Appendix 4: 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 US 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 has just been revised for STBs. The development of the ENERGY STAR criteria is usually undertaken in consultation with industry. In 2002, the ENERGY STAR criteria 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 newest ENERGY STAR criteria for Digital to Analogue (DTA) converter STBs were published in January 2007. These specifications match the CEC MEPS requirements shown in Table 28 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. The ENERGY STAR 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 28 from 1 January 2008:

Table 28: 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 analogue TVs and VCRs. All the target levels are summarised in Table 30.

Table 29: 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

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 29. However, the Code does stipulate that the total maximum power consumption targets in active standby mode should not exceed 15W.

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 analogue 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 analogue (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 29. 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 analogue 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 30. 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 30: 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 analogue	Until 31/12/2005	≤2W
	Active standby Digital to analogue 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 5: Energy Prices and Factors

Table 31: 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**	

Sources: Australian tariffs from EPS RIS 2006.

Table 32: Avoided Marginal Costs of Electricity

State	c/kWh Avoided Costs of Electricity
NSW	7.2
Victoria	10.1
Queensland	7.5
SA	9.6
WA	9.6
Tasmania	8.1
NT	10.0
ACT	7.2
Australia (weighted)	**8.3**

Based on 65% of Marginal Tariff (Syneca 2006)

Appendix 6: Calculation Methodology

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

This methodology and the assumptions made are the basis of the Costs, Benefits and Impacts of the RIS. 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 3: 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 11: 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 33 for 3 scenarios.

Table 33: 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 34.

Table 34: 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 9.

Cost-Benefits

The NPV benefits are calculated for each State using the domestic tariffs as shown in Appendix 5: 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 21.

Appendix 7: STB RIS Comments and Responses

The following Appendix presents a summary of the comments received on the *Consultation RIS: MEPS and Alternative Strategies for Set-Top Boxes*, published in October 2007. Comments were requested by 9 November 2007. A response is shown following each of the comments.

Free TV Australia Ltd

Overall: Free TV Australia are seeking some changes to the proposed draft standard to ensure parity between free-to-air and subscription TV STBs. They are seeking a standard which does not distinguish between free-to-air and subscription TV STBs. Other issues are elaborated and/or acknowledged.

Response: The submission from Free TV Australia does not provide any more evidence to support their request for equal MEPS levels for FTA and STV STBs. The performance requirements specified in the draft Australian and New Zealand Standard AS/NZS 62087.2 (MEPS requirements for digital television STBs) are based on technical requirements of the FTA and STV STBs developed by the standards committee. The policy decision to include certain modes of operation is based on the treatment of STBs in international MEPS schemes.

Response Summary: No change to the MEPS requirements is considered.

Australian Subscription Television and Radio Association (ASTRA)

Overall: ASTRA supports this important government initiative and the underlying premise that STBs should be designed to minimise energy consumption. The subscription television ('STV') industry is committed to working towards this goal. However, it is important that any imposed standards should be appropriate to the Australian experience.

Specific Comments and Responses:

1. Figure 11 appearing on Page 24 of the RIS offers a diagram comparing annual energy consumption of STBs comparing FTA MEPS with STV MEPS. This table presents STV STBs as consuming far more energy than FTA STBs and is inaccurate. Assumptions have been made in Table 4 and Appendix 11 primarily among which is that STV STBs' power consumption in 'Active Stand-by' is 15 Watts. The 15 Watt figure is very high: 50% higher than that which is reflective of AUSTAR's STBs and 100% higher than that which is reflective of FOXTEL's STBs.

   Response: The data used in the RIS was based on supplier information and figures provided by industry. The 15 Watt figure is representative of the power consumption considering the further information provided by one STV supplier

in its submission to the CBA in June 2007. The power consumption used in the BAU was estimated at higher levels than those noted in the submission as the BAU power consumption included the stock of older STBs (with higher power consumption) and the power consumption of the LNB for STB satellite receivers to calculate the "total average" power consumption of 15W. Therefore figure 11 is a direct comparison to the annual energy consumption of FTA STBs and STV STBs and does not need to be modified.

2. Important information contextualizing the RIS in relation to the draft MEPS standard is missing. In order to explain why there is 'No allowance' for LNB in Table 6, a footnote should be added to Table 7, in the same way as there is in the draft standard, stating that the power consumed by LNB is excluded from the STB power consumption.

   Response: The standard will take precedence over the RIS when the final standard is published as it specifies the MEPS requirements, therefore no change is required. The Standards committee will be notified and can make editorial changes as necessary.

3. The starting point for the cost-benefit assessment in Section 5.4 is modeled on the assumption that the cost of meeting MEPS can be met by passing these costs onto subscribers through increased subscription charges. Although a reference is made to the alternative of operators absorbing costs, the actual modelling should not have been done using an erroneous assumption..

   Response: The approach to allocating costs and benefits is described in NAEEEP 2005, *Guide to Preparing Regulatory Impact Statements for the National Appliance and Equipment Energy Efficiency Program (NAEEEP)*. This document provides a consistent approach to the allocation of costs and benefits for RIS Cost Benefit Analysis (CBA). The costs are allocated to the consumer for consistency and in accordance with the Guide. This approach also allows for a consistent treatment of costs-benefits for both the FTA and STV markets.

4. There is concern regarding re-testing and re-registration of boxes upon downloaded software upgrades that affect the power consumption of STBs.

   Response: The administrative requirements concerning the re-testing and re-registration of boxes are still under development and will be independent of the MEPS regulations. Consultation with the stakeholders will continue however in-principle, the re-testing and re-registration of STBs that meet the requirements of the MEPS will not be required. There is a concern from the compliance perspective that STBs may meet the requirements when sold, however subsequent STB software downloads by suppliers could cause a STB to not perform as tested and registered.

5. No mention is made in the RIS of STBs that have an external power supply ('EPS'). The issue of the treatment of STBs with EPS' has been raised by ASTRA to the AGO on a number of occasions. Given that the EPS Standard does not cover STBs, STBs with EPSs should be addressed in the RIS and in the MEPS by stating that the scope of the MEPS includes STBs with an external power supply. To remove any possible confusion it should also be addressed in the method of measurement part of the standard (AS/NZS 62087.1).

   Response: STBs with a EPS, they are still included in the scope of the MEPS and the AS/NZS 62087.2. The power consumption of the STB is measured as when connected to the mains (*Page 1 of AS/NZS 62087.1*). Further modifications of the standard to ensure that STBs with EPS are measured correctly will be undertaken with the Standards Committee.

Response Summary: No change to the MEPS requirements is considered.

Freeview Limited (NZ)

Overall: Freeview support for all measures that reduce unnecessary power. They would like to see an additional category in the AS/NZS 62087.2 to cover FTA Satellite STBs. Freeview have requested increased efficiency levels for MPEG2 Satellite FTA STBs. They are willing to propose new levels to the Standards committee. EECA have agreed to implement the joint standard into regulation when the more stringent levels for these STBs are included.

Response: consideration will be given by the Standards Committee for AS/NZS 62087.

Response Summary: No change to the MEPS requirements is considered.

CESA

Overall: The implementation date is requested to be no earlier than 1 April 2009.

Response: As noted in the RIS, in consideration of the need to provide notice to industry, the implementation date was changed to October 2008.

AEEMA

Overall: AEEMA stated that industry requires longer timelines to plan for any increases in energy efficiency.

Response: As noted in the RIS, in consideration of the need to provide notice to industry, the implementation date was changed to October 2008.

Appendix 8: Trade, GATT and TTMRA Issues

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 RIS are currently imported, MEPS would not favour local supplies against imports.

It is a particular concern of the GTBT that where technical regulations are required and relevant international standards exist or their completion is imminent, members should use them, or the relevant parts of them, as a basis for their technical regulations. The energy test procedure 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. New Zealand's position is that they may not be able to complete the necessary steps to call regulation into effect until April 2009 following the completion of their November general election process. Under this circumstance no policy disjunct exists and Australian jurisdictions would not seek a TTMRA exemption for this reason.

Appendix 9: Greenhouse Gas Emission Factors

Table 35: 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 10: 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 11: 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	20.00	19.00	18.00	17.00	16.00	15.00	15.00	15.00	15.00	15.00	15.00	14.40	13.80	13.20	12.60	12.00	11.80	11.60	11.40	11.20	11.00
STB - STV (Active Stby) - BAU	20.00	19.00	18.00	17.00	16.00	15.00	15.00	15.00	15.00	15.00	15.00	14.40	13.80	13.20	12.60	12.00	11.80	11.60	11.40	11.20	11.00
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	0.0	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 12: Annual Cost Inputs for RIS Model

STB Category	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Costs to Government															
Establishment (Once Off)	60,000	70,000	0	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance/Yr	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Administration of Program	0	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	30,000	35,000	40,000	45,000	50,000
Random Check/Testing/	0	0	20,000	20,000	25,000	25,000	25,000	25,000	25,000	25,000	24,000	23,000	22,000	21,000	20,000
Consumer Information/Education/	0	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	24,000	23,000	22,000	21,000	20,000
Misc (RIS, Market Research)r	5,000	10,000	15,000	20,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Subtotal Government	115,000	180,000	135,000	140,000	150,000	150,000	150,000	150,000	150,000	150,000	153,000	156,000	159,000	162,000	165,000
Costs to Industry															
Total Cost of Testing	0	146,000	152,000	158,000	164,000	162,000	160,000	158,000	156,000	154,000	150,000	146,000	142,000	138,000	134,000
Total Cost of Registration	0	36,709	35,611	34,309	32,800	32,400	32,000	31,600	31,200	30,800	30,000	29,200	28,400	27,600	26,800
Subtotal Business	0	182,709	187,611	192,309	196,800	194,400	192,000	189,600	187,200	184,800	180,000	175,200	170,400	165,600	160,800
Costs to Consumers															
Costs of Incremental Price Increase	0	0	0	960,288	803,974	852,242	643,520	395,137	165,726	0	0	0	0	0	0
Total	115,000	362,709	322,611	1,292,597	1,150,774	1,196,642	985,520	734,737	502,926	334,800	333,000	331,200	329,400	327,600	325,800

Appendix 13: Annual Benefit and Cost Data

Table 36: 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	266.6	279.1	297.5	327.9	369.1	430.8	505.6	572.8	630.6	681.7	734.5	800.9	853.8	891.8	904.3	897.3	875.4	840.5	793.9	737.5	662.2
With-program energy use	GWh/yr	266.6	279.1	297.5	327.9	369.1	430.8	505.6	572.8	630.6	656.9	681.7	713.3	734.1	745.8	740.1	722.8	697.6	666.9	630.7	589.8	533.1
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.8	52.9	87.6	119.7	146.1	164.2	174.5	177.8	173.6	163.2	147.7	129.1
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.14	6.70	11.09	15.16	18.50	20.79	22.10	22.51	21.98	20.67	18.71	16.35
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.7	52.1	85.3	117.4	140.0	160.7	164.6	165.6	157.8	147.5	132.4	114.0
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.80	0.85	0.64	0.40	0.17	0.00	0.00	0.00	0.00	0.00	0.00
NSW&ACT																						
BAU Energy use	GWh/yr	72.0	75.4	80.4	88.6	99.7	116.4	136.6	154.7	170.3	184.2	198.4	216.3	230.6	240.9	244.3	242.4	236.5	227.1	214.5	199.2	178.9
With-program energy use	GWh/yr	72.0	75.4	80.4	88.6	99.7	116.4	136.6	154.7	170.3	177.5	184.1	192.7	198.3	201.5	199.9	195.3	188.5	180.2	170.4	159.3	144.0
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	14.3	23.7	32.3	39.5	44.3	47.1	48.0	46.9	44.1	39.9	34.9
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	1.31	2.16	2.96	3.61	4.05	4.31	4.39	4.29	4.03	3.65	3.19
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	13.9	22.8	31.2	37.3	42.6	43.3	43.7	41.4	39.2	35.2	30.2
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.21	0.22	0.17	0.10	0.04	0.00	0.00	0.00	0.00	0.00	0.00
NT																						
BAU Energy use	GWh/yr	3.1	3.3	3.5	3.9	4.3	5.1	5.9	6.7	7.4	8.0	8.6	9.4	10.0	10.5	10.6	10.5	10.3	9.9	9.3	8.7	7.8
With-program energy use	GWh/yr	3.1	3.3	3.5	3.9	4.3	5.1	5.9	6.7	7.4	7.7	8.0	8.4	8.6	8.8	8.7	8.5	8.2	7.8	7.4	6.9	6.3
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	1.0	1.4	1.7	1.9	2.0	2.1	2.0	1.9	1.7	1.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10	0.16	0.22	0.26	0.30	0.32	0.32	0.31	0.30	0.27	0.23
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.8	1.0	1.3	1.4	1.5	1.6	1.5	1.4	1.3	1.1
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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	62.3	65.2	69.5	76.6	86.3	100.7	118.2	133.9	147.4	159.3	171.7	187.2	199.5	208.4	211.3	209.7	204.6	196.4	185.5	172.4	154.7
With-program energy use	GWh/yr	62.3	65.2	69.5	76.6	86.3	100.7	118.2	133.9	147.4	153.5	159.3	166.7	171.6	174.3	173.0	168.9	163.0	155.9	147.4	137.8	124.6
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	12.4	20.5	28.0	34.1	38.4	40.8	41.5	40.6	38.1	34.5	30.2
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	1.43	2.38	3.25	3.96	4.45	4.73	4.82	4.71	4.42	4.01	3.50
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.6	19.0	26.1	30.8	35.6	37.2	37.4	36.3	33.3	29.8	26.2
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.16	0.17	0.13	0.08	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	28.2	29.5	31.4	34.7	39.0	45.5	53.4	60.5	66.6	72.0	77.6	84.6	90.2	94.3	95.6	94.8	92.5	88.8	83.9	77.9	70.0
With-program energy use	GWh/yr	28.2	29.5	31.4	34.7	39.0	45.5	53.4	60.5	66.6	69.4	72.0	75.4	77.6	78.8	78.2	76.4	73.7	70.5	66.6	62.3	56.3
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	5.6	9.3	12.7	15.4	17.4	18.4	18.8	18.3	17.3	15.6	13.6
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.84	1.39	1.89	2.31	2.60	2.76	2.81	2.74	2.58	2.34	2.04
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	6.1	10.2	14.2	16.6	19.0	18.7	18.7	18.1	16.9	15.6	13.0
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.10	0.10	0.08	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00
TAS																						
BAU Energy use	GWh/yr	4.5	4.7	5.0	5.5	6.2	7.2	8.5	9.6	10.5	11.4	12.3	13.4	14.3	14.9	15.1	15.0	14.6	14.1	13.3	12.3	11.1
With-program energy use	GWh/yr	4.5	4.7	5.0	5.5	6.2	7.2	8.5	9.6	10.5	11.0	11.4	11.9	12.3	12.5	12.4	12.1	11.7	11.2	10.6	9.9	8.9
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.9	1.5	2.0	2.4	2.7	2.9	3.0	2.9	2.7	2.5	2.2
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.18	0.25	0.31	0.34	0.36	0.37	0.36	0.34	0.31	0.27
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.9	1.5	2.0	2.5	2.8	3.0	2.9	2.8	2.6	2.4	2.1
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	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	56.2	58.9	62.7	69.2	77.8	90.9	106.6	120.8	133.0	143.8	154.9	168.9	180.1	188.1	190.7	189.2	184.6	177.3	167.4	155.5	139.7
With-program energy use	GWh/yr	56.2	58.9	62.7	69.2	77.8	90.9	106.6	120.8	133.0	138.6	143.8	150.4	154.8	157.3	156.1	152.4	147.1	140.7	133.0	124.4	112.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	11.2	18.5	25.3	30.8	34.6	36.8	37.5	36.6	34.4	31.2	27.2
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.74	2.88	3.94	4.81	5.40	5.74	5.85	5.71	5.37	4.86	4.25
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	12.0	20.1	27.9	33.4	38.5	38.6	38.4	36.3	34.3	30.1	25.5
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.19	0.20	0.15	0.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00
WA																						
BAU Energy use	GWh/yr	40.3	42.2	44.9	49.6	55.8	65.1	76.4	86.5	95.3	103.0	111.0	121.0	129.0	134.8	136.6	135.6	132.3	127.0	120.0	111.4	100.1
With-program energy use	GWh/yr	40.3	42.2	44.9	49.6	55.8	65.1	76.4	86.5	95.3	99.3	103.0	107.8	110.9	112.7	111.8	109.2	105.4	100.8	95.3	89.1	80.5
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	8.0	13.2	18.1	22.1	24.8	26.4	26.9	26.2	24.7	22.3	19.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.17	1.95	2.66	3.24	3.65	3.88	3.95	3.86	3.63	3.28	2.87
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	7.1	11.0	14.9	18.2	20.8	22.3	23.0	21.4	19.8	18.0	15.8
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.12	0.13	0.10	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00
NZ																						
BAU Energy use	GWh/yr	33.3	37.6	43.6	50.9	59.0	67.2	77.0	86.5	95.4	103.5	110.2	115.7	120.8	125.5	129.1	131.5	133.0	133.1	132.0	129.7	125.2
With-program energy use	GWh/yr	33.3	37.6	43.6	50.9	59.0	67.2	77.0	86.5	95.4	100.3	104.0	106.7	109.1	111.5	113.4	114.6	115.3	115.1	114.1	112.6	109.2
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	6.2	9.0	11.6	13.9	15.7	16.9	17.7	18.0	17.8	17.1	16.0
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.08	1.57	2.03	2.43	2.74	2.95	3.09	3.14	3.11	2.99	2.78
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	3.7	5.4	7.0	8.4	9.4	10.2	10.6	10.8	10.7	10.3	9.6
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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 37: 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	266.6	279.1	297.5	327.9	369.1	430.8	505.6	572.8	630.6	676.2	717.3	750.7	765.1	769.1	755.3	729.2	695.0	655.3	611.6	565.7	506.1
With-program energy use	GWh/yr	266.6	279.1	297.5	327.9	369.1	430.8	505.6	572.8	630.6	653.3	670.1	679.1	672.9	660.2	635.2	603.3	568.2	532.9	497.4	462.8	416.2
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.9	47.2	71.6	92.2	108.9	120.1	125.9	126.8	122.5	114.2	102.9	89.9
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90	5.97	9.06	11.68	13.79	15.21	15.94	16.05	15.51	14.46	13.03	11.38
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.8	46.5	69.7	90.4	104.4	117.6	118.8	118.1	111.3	103.2	92.3	79.3
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.69	0.60	0.42	0.26	0.11	0.00	0.00	0.00	0.00	0.00	0.00
NSW&ACT																						
BAU Energy use	GWh/yr	72.0	75.4	80.4	88.6	99.7	116.4	136.6	154.7	170.3	182.7	193.8	202.8	206.7	207.8	204.0	197.0	187.7	177.0	165.2	152.8	136.7
With-program energy use	GWh/yr	72.0	75.4	80.4	88.6	99.7	116.4	136.6	154.7	170.3	176.5	181.0	183.5	181.8	178.3	171.6	163.0	153.5	143.9	134.4	125.0	112.4
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	12.7	19.3	24.9	29.4	32.4	34.0	34.2	33.1	30.9	27.8	24.3
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	1.16	1.77	2.28	2.69	2.97	3.11	3.13	3.02	2.82	2.54	2.22
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	12.4	18.6	24.0	27.8	31.2	31.3	31.2	29.2	27.4	24.5	21.0
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.18	0.16	0.11	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00
NT																						
BAU Energy use	GWh/yr	3.1	3.3	3.5	3.9	4.3	5.1	5.9	6.7	7.4	7.9	8.4	8.8	9.0	9.0	8.9	8.6	8.2	7.7	7.2	6.6	5.9
With-program energy use	GWh/yr	3.1	3.3	3.5	3.9	4.3	5.1	5.9	6.7	7.4	7.7	7.9	8.0	7.9	7.8	7.5	7.1	6.7	6.3	5.8	5.4	4.9
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.8	1.1	1.3	1.4	1.5	1.5	1.4	1.3	1.2	1.1
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.13	0.17	0.20	0.22	0.23	0.23	0.22	0.21	0.19	0.16
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.7	0.8	0.9	1.0	1.1	1.1	1.1	1.0	0.9	0.8
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
QLD																						
BAU Energy use	GWh/yr	62.3	65.2	69.5	76.6	86.3	100.7	118.2	133.9	147.4	158.0	167.6	175.4	178.8	179.7	176.5	170.4	162.4	153.2	142.9	132.2	118.3
With-program energy use	GWh/yr	62.3	65.2	69.5	76.6	86.3	100.7	118.2	133.9	147.4	152.7	156.6	158.7	157.3	154.3	148.5	141.0	132.8	124.5	116.2	108.1	97.3
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.0	16.7	21.5	25.4	28.1	29.4	29.6	28.6	26.7	24.1	21.0
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.28	1.94	2.50	2.95	3.26	3.41	3.44	3.32	3.10	2.79	2.44
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	10.3	15.5	20.1	22.9	26.1	26.8	26.7	25.6	23.3	20.8	18.2
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.14	0.12	0.08	0.05	0.02	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	28.2	29.5	31.4	34.7	39.0	45.5	53.4	60.5	66.6	71.5	75.8	79.3	80.9	81.3	79.8	77.1	73.5	69.3	64.6	59.8	53.5
With-program energy use	GWh/yr	28.2	29.5	31.4	34.7	39.0	45.5	53.4	60.5	66.6	69.0	70.8	71.8	71.1	69.8	67.1	63.8	60.1	56.3	52.6	48.9	44.0
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	5.0	7.6	9.7	11.5	12.7	13.3	13.4	12.9	12.1	10.9	9.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.75	1.13	1.46	1.72	1.90	1.99	2.00	1.94	1.81	1.63	1.42
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	5.4	8.3	10.9	12.4	13.9	13.5	13.3	12.8	11.8	10.9	9.1
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.08	0.07	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
TAS																						
BAU Energy use	GWh/yr	4.5	4.7	5.0	5.5	6.2	7.2	8.5	9.6	10.5	11.3	12.0	12.6	12.8	12.9	12.6	12.2	11.6	11.0	10.2	9.5	8.5
With-program energy use	GWh/yr	4.5	4.7	5.0	5.5	6.2	7.2	8.5	9.6	10.5	10.9	11.2	11.4	11.3	11.0	10.6	10.1	9.5	8.9	8.3	7.7	7.0
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.2	1.5	1.8	2.0	2.1	2.1	2.0	1.9	1.7	1.5
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.15	0.19	0.23	0.25	0.26	0.27	0.26	0.24	0.22	0.19
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.2	1.5	1.9	2.0	2.2	2.1	2.0	1.8	1.7	1.5
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VIC																						
BAU Energy use	GWh/yr	56.2	58.9	62.7	69.2	77.8	90.9	106.6	120.8	133.0	142.6	151.3	158.3	161.4	162.2	159.3	153.8	146.6	138.2	129.0	119.3	106.7
With-program energy use	GWh/yr	56.2	58.9	62.7	69.2	77.8	90.9	106.6	120.8	133.0	137.8	141.3	143.2	141.9	139.2	134.0	127.2	119.8	112.4	104.9	97.6	87.8
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	9.9	15.1	19.4	23.0	25.3	26.6	26.7	25.8	24.1	21.7	19.0
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.55	2.36	3.03	3.58	3.95	4.14	4.17	4.03	3.76	3.39	2.96
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	10.7	16.4	21.5	24.9	28.2	27.8	27.4	25.6	24.0	21.0	17.7
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.17	0.14	0.10	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.00
WA																						
BAU Energy use	GWh/yr	40.3	42.2	44.9	49.6	55.8	65.1	76.4	86.5	95.3	102.2	108.4	113.4	115.6	116.2	114.1	110.2	105.0	99.0	92.4	85.5	76.5
With-program energy use	GWh/yr	40.3	42.2	44.9	49.6	55.8	65.1	76.4	86.5	95.3	98.7	101.3	102.6	101.7	99.8	96.0	91.2	85.9	80.5	75.2	69.9	62.9
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.1	10.8	13.9	16.5	18.1	19.0	19.2	18.5	17.3	15.6	13.6
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	1.05	1.59	2.05	2.42	2.67	2.80	2.82	2.72	2.54	2.29	2.00
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	6.4	9.0	11.5	13.5	15.2	16.1	16.4	15.1	13.9	12.6	11.0
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.10	0.09	0.06	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.00
NZ																						
BAU Energy use	GWh/yr	33.3	37.6	43.6	50.9	59.0	67.2	77.0	86.5	95.1	102.4	108.3	112.9	117.1	120.8	123.6	125.2	126.1	125.8	124.5	122.3	118.0
With-program energy use	GWh/yr	33.3	37.6	43.6	50.9	59.0	67.2	77.0	86.5	95.1	99.5	102.6	104.7	106.5	108.3	109.6	110.2	110.6	110.1	109.1	107.5	104.3
Energy savings	GWh/yr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	5.7	8.2	10.6	12.5	14.0	15.0	15.5	15.7	15.4	14.7	13.7
Value of energy saved	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.99	1.43	1.84	2.18	2.44	2.61	2.71	2.74	2.69	2.57	2.38
Emissions saved (marginal)	ktCO2-e	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	3.4	4.9	6.3	7.5	8.4	9.0	9.3	9.4	9.3	8.8	8.2
Additional appliance cost	$M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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 14: Draft Standard