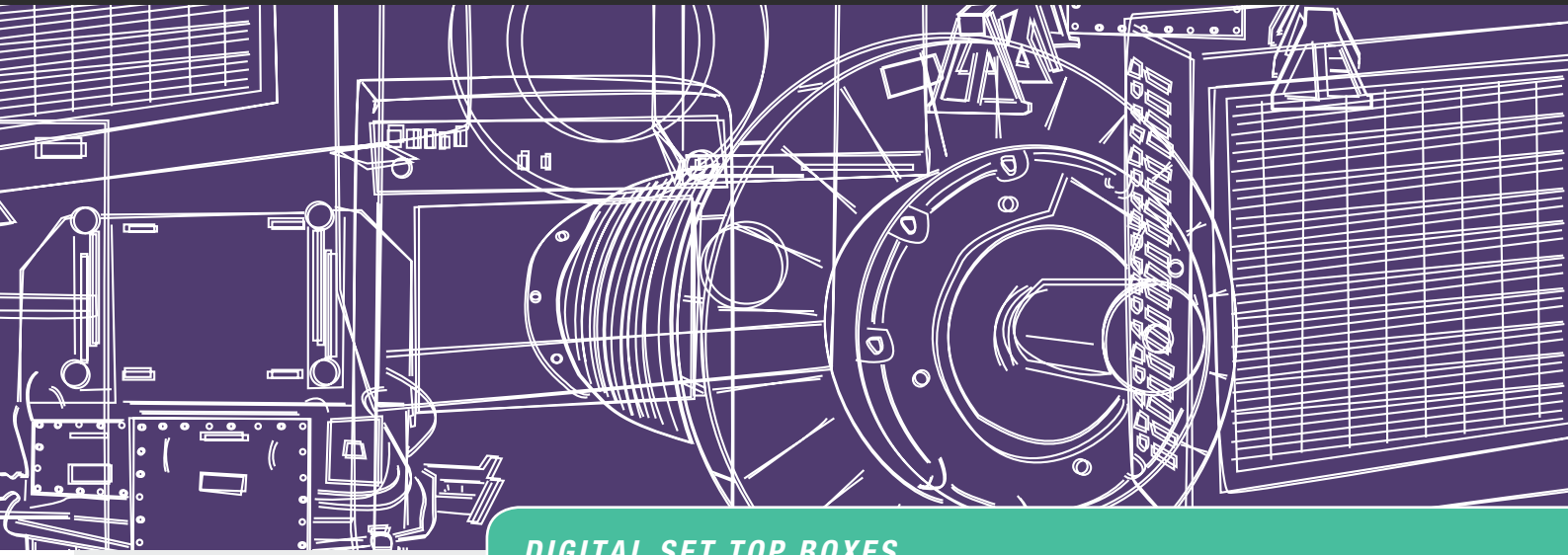


NATIONAL APPLIANCE AND EQUIPMENT ENERGY EFFICIENCY PROGRAM

Minimum Energy Performance Standards




DIGITAL SET TOP BOXES



PREPARED FOR

THE AUSTRALIAN GREENHOUSE OFFICE UNDER
THE NATIONAL APPLIANCE & EQUIPMENT ENERGY
EFFICIENCY PROGRAM



Minimum Energy Performance Standards - Digital Set Top Boxes

Digital Set Top Boxes (STB) first became available in Australia in 2001 to coincide with the launch 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 free-to-air signals and pay TV services to a signal compatible with the existing audiovisual display technology, including composite video, s-vhs or component video. According to the government digital TV implementation timetable, by 2008, most analog TV transmissions will cease and Australian households will require a digital STB or TV with an integrated digital receiver to view free-to-air TV broadcasts. With approximately 14 million TVs in Australian households and the low rate of take up of replacement TVs with integrated digital receivers, several million STBs will be required over the next decade.

Energy consumption from STBs in 2012 is estimated to be over 700 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.

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 consumed even when the device is put into passive standby mode by the remote control and more power is consumed when the device is in use or active standby mode. A plan was published by the Australian government in March 2004 for reducing the standby power STBs, however comments received on this plan suggested that mandatory regulations that examined all modes of use, including on mode, might better meet Australian governments' efficiency goals.

NAEEEC in-store surveys from 2001 to 2003-04 show that free-to-air TV STBs consume over 15W of electricity in active/use mode and 8W in passive standby mode. The store surveys also show a considerable range in both in-use and passive standby energy consumption indicating that there is technological scope for improvements to energy efficiency. STBs fall into three broad groups, simple converter STBs for free-to-air TV, STBs with integrated video recording devices and STBs for Pay TV services. All STBs sold in Australia are imported.

STAKEHOLDER COMMENT

NAEEEC invites comments from any interested person or organisation on the measures proposed in this study. Comments should be directed to energy.rating@greenhouse.gov.au by 31 December 2004. Information sessions for industry participants can be arranged during the comment period if requested.

Electronic copies of profiles and full reports released for public discussion can be obtained from www.energyrating.gov.au

INTERNATIONAL HARMONISATION

In the European Union, California in the USA, Korea and shortly China, Minimum Energy Performance Standards (MEPS) or voluntary agreements are aiming for efficiency improvements of at least 50% of active/in-use power consumption and dramatic reductions in standby power consumption. In addition, the ENERGY STAR program has in place standby power consumption targets of initially 3 Watts and eventually 1 Watt. By modelling units sold in the Australian market (as measured in the NAEEEC store surveys) against both the USA and European targets, it is clear that television units in the Australian market fall far short indicating that energy and greenhouse gas reduction potential is significant.

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. Also 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.

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.

As utilised in Europe and California, the method of determining maximum power input to STBs should take into consideration the functional requirements of different STB features, such as cable/satellite access, internal hard drive, PC interfaces other consumer-desired features. This will ensure that manufacturers are not unduly penalised for providing more features for consumers. The MEPS methodology used in Australia should hence be close to the approach used by the European Commission Code of Conduct for Digital TV Services and the Californian Energy Commission (CEC) Appliance Standards.

Australia proposes to adopt the EC Code of Conduct for Digital TV Services as the basis for

the MEPS program, with consideration given to proposed CEC MEPS levels. The EC and the CEC program specifies the maximum power levels for on mode and standby mode for simple converter STBs, and the standby power levels for Pay TV and more complex STBs.

NAEEEC PLAN

NAEEEC proposes to introduce minimum energy performance standards regulation for STBs. No energy labelling scheme is proposed for STBs.

The key components of these regulations will be as follows:

1. That a MEPS for STBs be implemented to ensure that the worst performing STB products are removed from the Australian market. Any MEPS approach should cover both in-use and maximum standby power levels for simple converter STBs and maximum standby power for Pay TV and other STBs.
2. The suggested MEPS levels are based on the CEC appliance standards to be introduced from 2006 and applicable elements of the EC Code of Conduct.
3. The MEPS be introduced in April 2006 for simple STBs. The potential MEPS for implementation in 2006 are suggested at 8W maximum power for in-use/active mode and a maximum 1 Watt for passive standby power for simple convert STBs. Almost all simple STB models surveyed since 2003 would not meet this MEPS level.
4. The MEPS be introduced in April 2006 for all other STBs, including Pay TV services and integrated recording devices. The potential MEPS for implementation in 2006 are suggested at 15W maximum power for active standby mode and a maximum 1 Watt for passive standby power, if applicable. The currently available Pay TV STBs without integrated recording devices are thought to meet this level.
5. The definitions for standby power are based on the EC Code of Conduct, as shown in Table 2.



The recommended MEPS are shown in Table 1.

TABLE 1: RECOMMENDED MAXIMUM POWER LEVELS (MEPS)

Product Type	Passive Standby – Max Power	Active Standby – Max Power	On mode – Max Power
STB – Simple Converter	1 W	NA	8 W
STB – All Pay TV and Other	1 W (if applicable)	15 W*	NA

* This is a Maximum allowed standby power, allowance up this amount for features

TABLE 2: DEFINITION OF POWER MODES

Mode	Definition
Off	The equipment is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, an external or internal signal.
Passive Standby	The appliance is connected to a power source, fulfils not the main function but can be switched into another mode with the remote control unit or an internal signal.
Active Standby	The appliance is connected to a power source, fulfils not 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 a minimal level of data from an external source.
On mode (in-use)	The appliance is connected to a power source and fulfils a main function, including the provision of signals to supported devices.

Table 3 shows the timetable for implementation of MEPS and labelling. The regulatory (“Part 2”) Standard will be published at least 12 months in advance of the date in which the MEPS come into force, in order to provide industry with sufficient time to make the necessary purchasing decisions.

TABLE 3: TIMETABLE FOR IMPLEMENTATION OF PROPOSED MEPS

October 2004	Government publication of MEPS Proposals for STB
October 2004 - December 2004	Consultation on the MEPS with stakeholders
October 2004 - March 2005	Product Testing including international collaboration
October 2004 - March 2005	Consultation on Draft Standard(s) Part 2 by Standards Australia
April 2005	Publication of Standard by Standards Australia
2005	Regulatory Impact Statement(s) undertaken
April 2006	Introduce MEPS

IMPACT OF MEPS

Based on the MEPS being introduced in 2006, for simple STBs it is estimated to reduce annual energy consumption by 440 GWh/yr by 2012, and 760 GWh/yr by 2020. This is equivalent to reducing annual greenhouse emissions by 390 kt CO₂-e and 650 kt CO₂-e respectively. The total cumulative savings in emissions by these dates are approximately 1.4 Mt CO₂-e and 6 Mt CO₂-e.



NAEEEC MEMBERS

The Commonwealth, New Zealand, and all State and Territory governments are part of NAEEEC. Representatives are senior officials from various government agencies and statutory authorities or persons appointed to represent those bodies.

The *Australian Greenhouse Office (AGO)* is the Australian Government agency responsible for monitoring the National Greenhouse Strategy in cooperation with State and Territory Governments and with the support of local government, industry and the community. The AGO chairs NAEEEC and other members provide support for its activities.

The NSW *Ministry of Energy and Utilities* (incorporated within the Department of Energy, Utilities and Sustainability since 1 January 2004) provides policy advice to the NSW Government and operates a regulatory framework aimed at facilitating environmentally responsible appliance and equipment energy use. The Ministry is represented on the Energy Efficiency and Greenhouse Working Group, through which the appliance and equipment related elements of the National Greenhouse Strategy are being progressed.

The NSW *Sustainable Energy Development Authority* was established in February 1996 with a mission to reduce the level of greenhouse emissions in New South Wales by investing in the commercialisation and use of sustainable energy technologies.

The *Office of the Chief Electrical Inspector* is the Victorian technical regulator responsible for electrical safety and equipment efficiency. Its mission is to ensure the safety of electricity supply and use throughout the State. The corporate vision of the Office is to demonstrate national leadership in electrical safety matters and to improve the superior electrical safety record in Victoria. The Office's strategic focus is to ensure a high level of compliance is sustained by industry with equipment efficiency labelling and associated regulations.

The *Sustainable Energy Authority* was established in 2000 by the Victorian Government to provide a focus for sustainable energy in Victoria. The Authority's objective is to accelerate progress towards a sustainable energy future by bringing together the best available knowledge and expertise to stimulate innovation and provide Victorians with greater choice in how they can take action to significantly improve energy sustainability.

The *Electrical Safety Office*, Department of Industrial Relations, is the Queensland technical regulator responsible for electrical safety and appliance and equipment energy efficiency. The office ensures compliance with electrical safety and efficiency regulations throughout Queensland.

The *Department of Energy* is the lead agency with regard to sustainable development within the

Queensland energy sector and is involved in a range of activities that reflect the importance of a sustainable approach. These activities involve developing and evaluating policies and initiatives through flexible and responsible decision making that allows economic, environmental and social outcomes from the energy sector to be maximised.

The Western Australian electricity regulator *Energy Safety* (a Division of the Department of Consumer and Employment Protection) is responsible for the technical and safety regulation of the electrical industry in WA. This includes the safety of consumers' electrical installations and appliances and the auditing of appliances and equipment to check compliance with energy efficiency and prescribed safety requirements.

The Western Australian *Sustainable Energy Development Office* promotes more efficient energy use and increased use of renewable energy to help reduce greenhouse gas emissions and increase jobs in related industries.

The *Office of the Technical Regulator* seeks to ensure the coordinated development and implementation of policies and regulatory responsibilities for the safe, efficient and responsible provision and use of energy for the benefit of the South Australian community.

The Tasmanian Government's interest is managed by the Department of Infrastructure, Energy and Resources' *Office of Energy, Planning and Conservation (OEPC)*. The OEPC provides policy advice on energy related matters including energy efficiency. Its web site is www.dier.tas.gov.au/energy/index.html.

Electricity Standards and Safety is the technical regulator responsible for electrical safety throughout Tasmania. Regulatory responsibilities include electrical licensing, appliance approval and equipment energy efficiency.

The Australian Capital Territory's interest is managed by the *Energy Policy Unit, Economic Management Branch*, Department of Treasury. The primary function of this Unit is to provide the ACT Government with advice on National and Territory energy related matters including energy efficiency.

The *Department of Infrastructure, Planning and Environment* is responsible for the administration of regulations in the Northern Territory regarding various aspects of safety, performance and licensing for goods and services including electrical appliances.

The *Energy Efficiency and Conservation Authority (EECA)* is the principal body responsible for delivering New Zealand's National Energy Efficiency and Conservation Strategy (NEECS). EECA's function is to encourage, promote and support energy efficiency, energy conservation and the use of renewable energy sources.

Analysis of the Potential Policy Option:

Digital Set Top Boxes

Prepared for

*The Australian Greenhouse Office:
National Appliance & Equipment Energy
Efficiency Program*

October 2004



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

Contents

<i>Introduction</i>	<i>1</i>
Background of Efficiency Regulation	1
<i>Product Characteristics</i>	<i>2</i>
<i>Product Description</i>	<i>2</i>
<i>Power Modes of STBs</i>	<i>2</i>
<i>Power Usage of New Products</i>	<i>3</i>
<i>Australian Market Characteristics</i>	<i>6</i>
Current Ownership and Trends	6
<i>Free to Air TV</i>	<i>6</i>
<i>Pay TV</i>	<i>6</i>
<i>Relevant National Standards</i>	<i>8</i>
<i>Review of International Approaches</i>	<i>9</i>
Energy Star	9
USA - California	9
Europe	10
<i>European Commission</i>	<i>10</i>
<i>GEEA</i>	<i>10</i>
Korea	11
China	11
International Initiatives	11
Summary	12
<i>Recommended MEPS levels</i>	<i>14</i>
<i>Impact of MEPS</i>	<i>17</i>
<i>Greenhouse Emissions</i>	<i>17</i>
<i>Recommendations</i>	<i>19</i>
<i>References</i>	<i>20</i>
Appendix A: European Commission Code of Conduct on Energy Efficiency of Digital TV Service Systems Version 2	

List of Tables

Table 1: Definition of Power Modes	3
Table 2 – A summary of digital set top box results	4
Table 3: Total sales of terrestrial digital STBs & IDTV 2000-2004, estimated sales to end 2004	6
Table 4: Additional power consumption allowable for additional features	10
Table 5: Summary of program requirements for STBs - Internationally	13
Table 6: Definitions of STBs	14
Table 7: Recommended Maximum Power Levels (MEPS)	15
Table 8: Additional Power Consumption Allowable for Additional Features	15
Table 9: Definition of Power Modes	16
Table 10: Timetable for Implementation of Proposed MEPS	16

List of Figures

Figure 1: Power measurements for digital STBs: on/active mode	4
Figure 2: Power measurements for digital STBs: passive mode	5
Figure 3: BAU vs MEPS – GHG emissions for digital STBs	17
Figure 4: Annual effect on energy consumption of MEPS vs. BAU for digital STBs	18

Introduction

Digital Set Top Boxes (STB) first became available in Australia in 2001 to coincide with the launch 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 free-to-air signals and pay TV services to a signal compatible with the existing audiovisual display technology, including analog RF, composite video, s-vhs or component video. According to the government digital TV implementation timetable, by 2008, most analog TV transmissions will cease and Australian households will require a digital STB or TV with an integrated digital receiver to view free-to-air TV broadcasts. With approximately 14 million TVs in Australian households and the low rate of take up of replacement TVs with integrated digital receivers, several million STBs will be required over the next decade.

Energy consumption from STBs in 2012 is estimated to be over 700 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.

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 consumed even when the device is put into passive standby mode by the remote control and more power is consumed when the device is in use or active standby mode. A plan was published by the Australian government in March 2004 for reducing the standby power STBs, however comments received on this plan suggested that mandatory regulations that examined all modes of use, including on mode, might better meet the Australian governments’ efficiency goals.

Background of Efficiency Regulation

The National Appliance and Equipment Energy Efficiency Program (NAEEEP) is part of the National Greenhouse Strategy that targets the energy efficiency of consumer appliances and, industrial and commercial equipment. The main tools of the Program are mandatory energy efficiency labelling and minimum energy performance standards, and voluntary measures including endorsement labelling, training and support to promote the best available products. Mandatory minimum energy efficiency performance standards (MEPS) are needed to overcome the market failure regarding whole-of-life costs and to meet the objectives of both increasing energy efficiency and reducing greenhouse gas emissions.

National product regulation can only be justified where the benefits outweigh the costs to the community; and the cost of improving appliance efficiency is outweighed by the energy savings made over the lifetime of the product.

Product Characteristics

Product Description

Digital STBs first became available in Australia in 2001 to coincide with the launch of digital television. A digital STB may also 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. 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 Digital Receivers (SD-DR) and High Definition Digital Receivers (HD-DR). The difference between these products is that an HD-DR connected to an HD display device will enable you to view High Definition and Standard Definition pictures.

Set top boxes can be used for receiving terrestrial broadcast TV or 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 Australian pay TV service providers are Foxtel and Austar. All new pay TV services in Australia are now digital, since the recent conversion of the Foxtel network. Austar have been providing digital satellite pay TV for a number of years. 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.

It should be noted that this report does not cover integrated digital televisions (IDTV) including those with an integrated receiver and decoder (IRD). These products will be addressed separately in the proposals for TVs.

Power Modes of STBs

Digital STBs available in Australia generally have two operational modes: on/active and passive standby, although some STBs also have an off mode.

On/Active mode. 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 characteristics to the active

standby measurements of other products. STBs can be left in this in-use mode for extended periods while producing no visible output.

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.

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.

The definitions shown in Table 1 are based on international definitions and are those proposed to be used in Australia.

Table 1: Definition of Power Modes

Mode	Definition
Off	The equipment is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, an external or internal signal.
Passive Standby	The appliance is connected to a power source, fulfils not the main function but can be switched into another mode with the remote control unit or an internal signal.
Active Standby	The appliance is connected to a power source, fulfils not 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 a minimal level of data from an external source.
On mode (in-use)	The appliance is connected to a power source and fulfils a main function, including the provision of signals to supported devices.

Power Usage of New Products

For the past three years, NAEEEEC 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 4 models were found. In 2003/04 the survey found 29 different models in the stores. The average consumption when in use was 15.4W with a minimum of 6.9W and a maximum of 35.3W. In passive standby mode 26 units were measured ranging from 1.9W to 20.1W. The average passive standby consumption was 7.9W. Only 8 set top boxes had an off mode. All of these consumed less than 1W in this mode with 88% having zero consumption. Table 2 summarises these results.

Table 2 – A summary of digital set top box results

Mode	Number of Measurements	Average Power (W)	Power Max (W)	Power Min (W)
In Use/Active	28	15.4	35.3	6.9
Passive	26	7.9	20.1	1.9
Off	8	0.0	0.2	0.0
Total Number of Units	29			

The results from the NAEEEC 2003/04 survey are presented in Figure 1 for On/active mode. The majority of STBs consume between 10W and 20W in on/active mode.

Figure 1: Power measurements for digital STBs: on/active mode

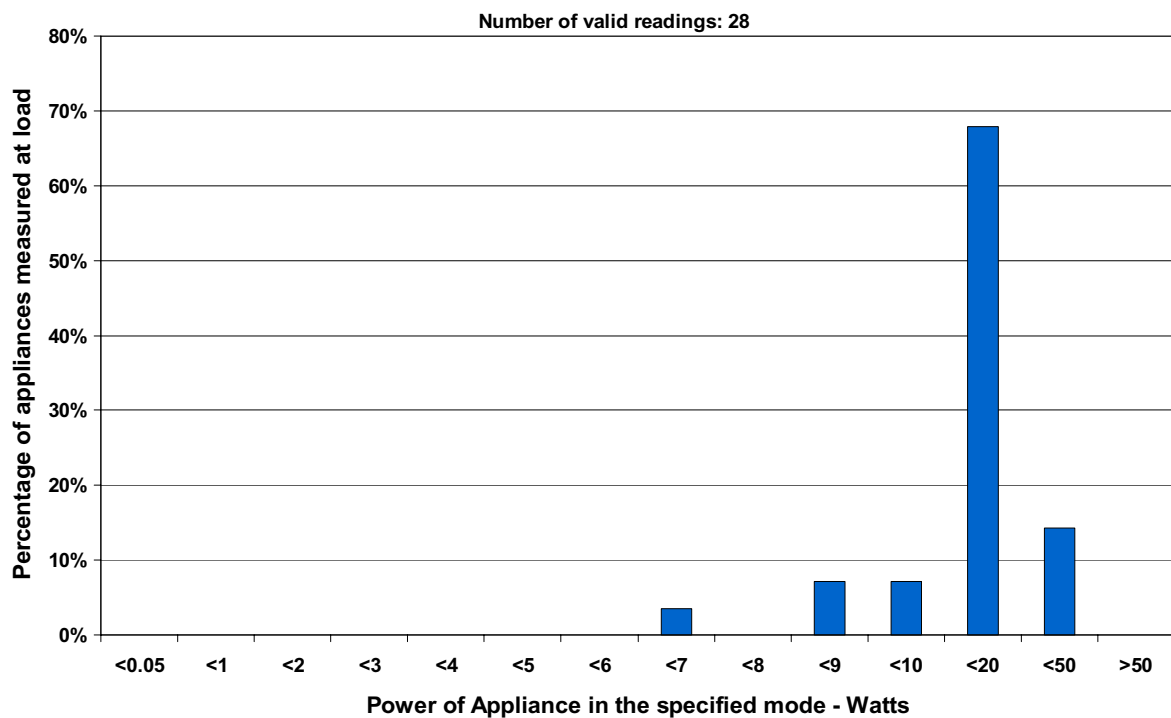
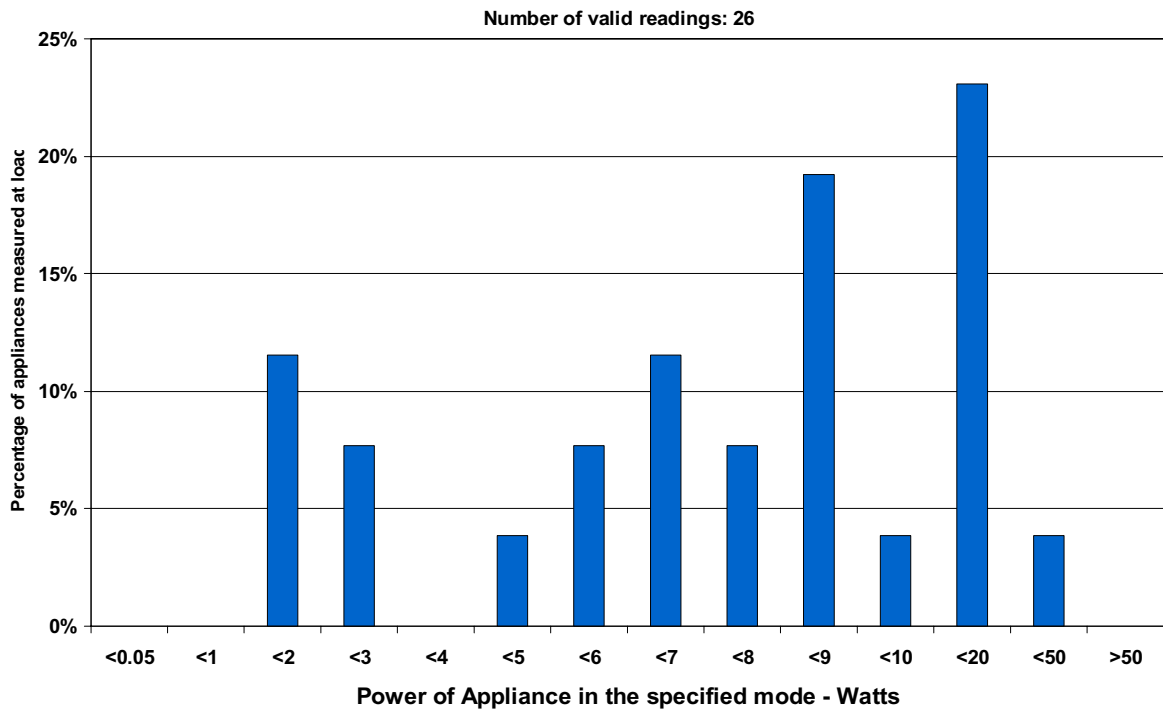


Figure 2 show the measurements of STBs in passive mode, with a significant number of STB measuring over 10W.

Figure 2: Power measurements for digital STBs: passive mode



The store survey results show a wide range of on/active mode and passive standby power consumption for STBs currently on the market. Some STBs showed very little difference in power usage between on and passive mode.

No measurements have been taken of STBs provided by pay TV companies.

Australian Market Characteristics

Current Ownership and Trends

Free to Air TV

The sales of terrestrial STBs and IDTVs (the latter contributing less than 10%) are shown in Table 3 and are increasing rapidly, with sales estimated at over 200,000 in 2003, and predicted to grow to 600,000 by the end of 2004. Over 35,000 STBs and IDTV are now being sold each month.

Table 3: Total sales of terrestrial digital STBs & IDTV 2000-2004, estimated sales to end 2004

Year	Total Sales
2000	0
2001	10,000
2002	40,000
2003	230,000
2004 – June	409,000
2004 - June	600,000(e)

Source: Digital Broadcasting Australia (DBA), Sep-Oct 2004 Information Bulletin

Industry sources (*Counterpoint February 2004*) suggest that total penetration of digital STBs is now approaching 3% of households (approximately 300,000), which concurs with the estimated sales in Table 3. Analog TV services are expected to end in mainland cities by 2008 and a slow phase out is expected in regional centres, signifying STBs will certainly increase their market share. It is expected that millions of STBs will be required over the next decade with the majority sold in the next 5 years. Unless the consumer makes the decision to purchase a TV capable of receiving digital images, an STB will be the only option available for those who have an existing analog TV after analog services phase out.

Pay TV

The total number of pay TV subscribers is estimated to be 1.5M as of December 2003. Over 1.1 million are with Foxtel and approximately 430,000 with Austar¹. While Austar have in place a digital platform, Foxtel are currently rolling out their digital STB for existing and new subscribers. Both Foxtel and Austar supply STBs with the pay TV

¹ Australian Film Commission, 2004. Pay TV subscriber numbers, total and by operator, 1995–2003. <http://www.afc.gov.au/gtp/wptvsubsxops.html>

service and the type of STB being provided varies depending on the date the subscriber joined or upgraded their service.

It is estimated that as customer numbers for Foxtel and Austar are predicted to increase, the number of new STBs delivered to pay TV subscribers will be in the order of 100,000 to 200,000 pa (excluding the change over of existing Foxtel subscribers to new digital STBs)

The latest Foxtel STB is provided by Pace Micro Technology plc, who are signatories to the EC Code of Conduct for Digital TV Services. The major supplier of STBs for Austar is ADB (Advanced Digital Broadcast).

Relevant National Standards

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, Set Top Boxes (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.

Review of International Approaches

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 is being implemented in two phases. Tier 1 concluded on 31 December 2003 while Tier 2 commenced 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 apply to products that manufacturers began to ship after 31 December 2003. More details can be found on www.energystar.gov.

In addition to the ENERGY STAR label, several US states are considering introducing legislation making the Tier 1 levels mandatory within the State.

USA - California

The California Energy Commission (CEC) is responsible for setting minimum energy performance standards in California and is about to include STBs as a regulated appliance. The latest rulemaking documents (Rulemaking 04-AAER-1) have proposed the minimum standby and in-use power levels for Digital TV Adaptor (DTA) and Integrated Receiver Decoder (IRD). 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*”, while IRD are an “*electronic device used for the reception and descrambling of broadcast signals received from a cable, satellite, or broadband source*”. The DTA is effectively a STB for digital terrestrial broadcast TV, while the IRD is a pay TV STB.

The CEC have proposed the following standards apply from 1 January 2006:

Device	Max Standby Power (W)	Maximum On Power (W)
DTA	1	8
IRD	15 (+ 5 x # LNB)	NA

Europe

European Commission

The European Commission has established a Code of Conduct for all digital TV service systems including, among other things, digital STBs. The Code of Conduct, which has several signatories including companies such as Philips, Sony, Pioneer, Nokia, Pace Micro Technology and Matsushita, aims to minimise the energy consumption of appliances listed in the code. The Code of Conduct is a voluntary agreement and signatories are obliged to provide, on a yearly basis, information concerning the power consumption of the equipment they produce. The maximum power consumption for STBs in passive standby mode is 6W while in active standby mode the maximum should not exceed 9W. The targets within the Code of Conduct became effective on January 1, 2003 and will remain in effect until December 31, 2005. In November 2003, targets were set for the 2006 - 2007 period and included different levels for different types of STBs, including the creation of the “simple converter” category. This category covers units that only transfer free digital signals to analog TVs and VCRs. All the target levels are summarised in Table 5

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

Table 4: Additional power consumption allowable for additional features

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

GEEA

The Group for Energy Efficient Appliances (GEEA), which is made up of representatives from a number of European national energy agencies and government departments, encourages industry best practice through a voluntary energy labelling scheme that covers a wide range of home electronics and office equipment. The criteria

for each product are generally reviewed (although not necessarily altered) on an annual basis. The criteria vary depending on the type of STB and apply until December 31 2005. STBs have been categorised as integrated receiver decoders (IRDs) and digital to analog converters (simple converter STBs) with separate criteria as follows:

- If the STB has an on/off switch, the power consumption in off mode must be 0.5W or less (applies 2004 & 2005);
- In passive standby mode, (this mode is optional) the maximum consumption is 1W for digital IRD, and 2W for a digital to analog (simple) converter box (applies 2004 & 2005); and
- In active standby mode, digital IRDs the 2004 limit is 9W, however, there are exceptions for additional features up to a maximum of 15W as outlined in Table 4. In 2006 these levels will change to 6W for terrestrial, 7W for cable and 8W for satellite. However the maximum allowed with add ons remains at 15W for digital to analog STBs. The maximum limit is 11W for cable and terrestrial and 14W for satellite units until the end of 2005.

The GEEA label criteria is summarised in Table 5. 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.

China

The Chinese standards organisation – China Certification Center 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 5: Summary of program requirements for STBs - Internationally

	Mode	Dates	Criteria
Energy Star	Passive standby Converter Cable Multi function	Tier 1: until 31/12/2003	≤3W ≤15W ≤20W
	Passive standby	Tier 2: from 1/01/2004	≤7W ¹
California (MEPS)	Passive standby DTA (STB)	From 1/1/2006	≤1W
	In Use DTA (STB)	From 1/1/2006	≤8W
	Active standby IRD (cable + satellite)	From 1/1/2006	≤15W+(5 x # of LNB)
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 & Terrestrial Satellite	From 1/1/2005	≤11W ≤14W
GEEA, Europe	Off (must have off mode)	Until 31/12/2003 From 1/1/2004	≤0.5W NA
	Passive standby Digital STB	Until 31/12/2005	≤1W
	Active standby Digital STB Terrestrial Cable Satellite	Until 31/12/2004 From 1/1/2005	≤9W ≤7W ² ≤6W ² ≤8W ²
	Passive standby Digital to analog	Until 31/12/2005	≤2W
	Active standby Digital to analog Terrestrial & Cable Satellite	Until 31/12/2005	≤11W ² ≤14W ²
Korea	Passive standby	From 1/1/2002	≤3W
China	Passive standby + in use	Under consideration	

Note: GEEA criteria are reviewed annually.

1. Tier 2 criteria cover all STBs including analog 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.

Recommended MEPS levels

As utilised in Europe and California, the method of determining maximum power input to STBs should take into consideration the functional requirements of different STB features, such as cable/satellite access, internal hard drive, PC interfaces and other consumer-desired features. This will ensure that manufacturers are not unduly penalised for providing more features for consumers. Hence, the MEPS methodology used in Australia should be close to the approach used by the European Commission Code of Conduct for Digital TV Services and the Californian Energy Commission (CEC) Appliance Standards.

Australia proposes to adopt the EC Code of Conduct for Digital TV Services as the basis for the MEPS program, with consideration given to proposed CEC MEPS levels. The EC and the CEC program specifies the maximum power levels for on mode and passive standby mode for simple converter STBs, and the active standby power levels for pay TV STBs.

The definitions of the two types of STBs are suggested in Table 6 and are based on the CEC and EC Code of Conduct product definitions.

Table 6: Definitions of STBs

Product Type	Definition
STB – Simple converter	Commercially-available electronic product which converts terrestrial digital video broadcast signals for use by a video display device such as a TV or VCR. Other features such as an integrated hard drive, may be included.
STB – All Pay TV	Electronic device used for the reception and descrambling of broadcast signals received from a cable, satellite, or broadband source

The supply of STBs in Australia is similar to Europe and the USA, especially as they are sourced from companies supplying both markets. The terrestrial STBs on the market in Australia are slightly different from the EC Code of Conduct “simple converter” as most products available in Australia include an RS232 interface to allow for software upgrade and signal outputs and rarely include analog RF. The basic definition of a STB is as follows:

- Single tuner/demodulator
- Single MPEG Decoder
- RF Modulator / Loop-through
- IR Remote Control
- Support for Off-air Software Upgrade
- Smart Card Interface
- Common Interface / Dataport
- RS232 Serial Port
- Support for remote IR Receiver / IR Blaster

- PSTN Modem

The recommended maximum power levels are shown in Table 7. The maximum active standby power allowed for satellite STBs, is proposed to be an additional 1.3W for each LNB (Low Noise Block down converters). This allowance is in addition to requirements listed in Table 7, and is based on the EC Code of Conduct.

Table 7: Recommended Maximum Power Levels (MEPS)

Product Type	Passive Standby – Max Power (W)	Active Standby – Max Power (W)	On mode – Max Power (W)
STB – Terrestrial Simple Converter	1.0W	NA	8W (up to 15W*)
STB – All Pay TV	1.0W (if applicable)	8W up to 15W*	NA

* This is a Maximum allowed power, allowance up this amount for features as shown in Table 8, excluding LNB power requirements for satellite STBs

As a STB is likely to include additional features as products develop; an allowance for these features is made for the STB maximum power levels for both active and on mode, up to a maximum of 15W, as shown in Table 8.

Table 8: 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 tuner	2.0W
Powered remote IR receiver	0.25W

The definitions for standby power are based on the EC Code of Conduct, as shown in Table 9.

Table 9: Definition of Power Modes

Mode	Definition
Off	The equipment is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, an external or internal signal.
Passive Standby	The appliance is connected to a power source, fulfils not the main function but can be switched into another mode with the remote control unit or an internal signal.
Active Standby	The appliance is connected to a power source, fulfils not 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 a minimal level of data from an external source.
On mode (in-use)	The appliance is connected to a power source and fulfils the main function of a STB, including the provision of signals to supported devices.

Table 10 shows the timetable for implementation of MEPS and labelling. The Part 2 Standard will be published at least 12 months in advance of the date the MEPS come into force, in order to provide industry with sufficient time to make the necessary purchasing decisions.

Table 10: Timetable for Implementation of Proposed MEPS

October 2004	Government publication of MEPS Proposals for STB
October 2004 - December 2004	Consultation on the MEPS with stakeholders
October 2004 - March 2005	Product Testing including international collaboration
October 2004 - March 2005	Consultation on Draft Standard(s) Part 2 by Standards Australia
April 2005	Publication of Standard by Standards Australia
2005	Regulatory Impact Statement(s) undertaken
April 2006	Introduce MEPS

Importantly, consultation with industry stakeholders will be required to ensure the proposed MEPS is developed to meet the goals of the program. Meetings will be held with the stakeholders on this subject over the period to December 2004.

Impact of MEPS

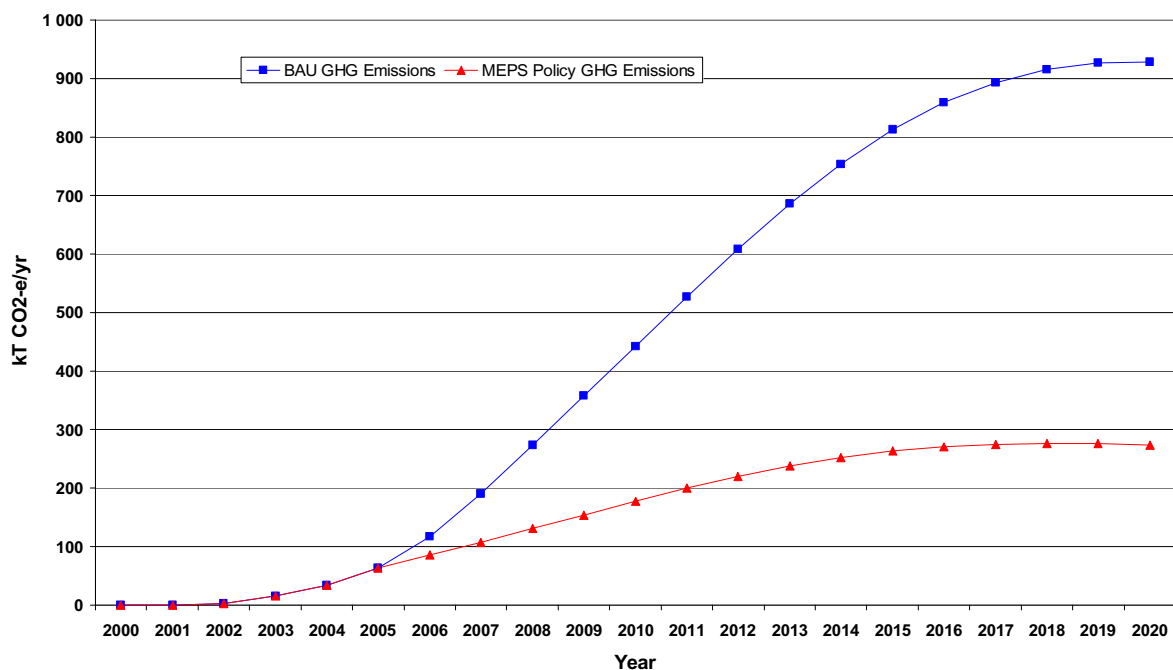
Greenhouse Emissions

For the purposes of estimating greenhouse emissions, it has been assumed that STBs are in-use for 1642 hours per year. 70% of the remaining time is spent in passive standby mode, 25% in active standby/on mode and 5% in off mode.

Energy consumption from STBs in 2012 is estimated to be over 700 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.

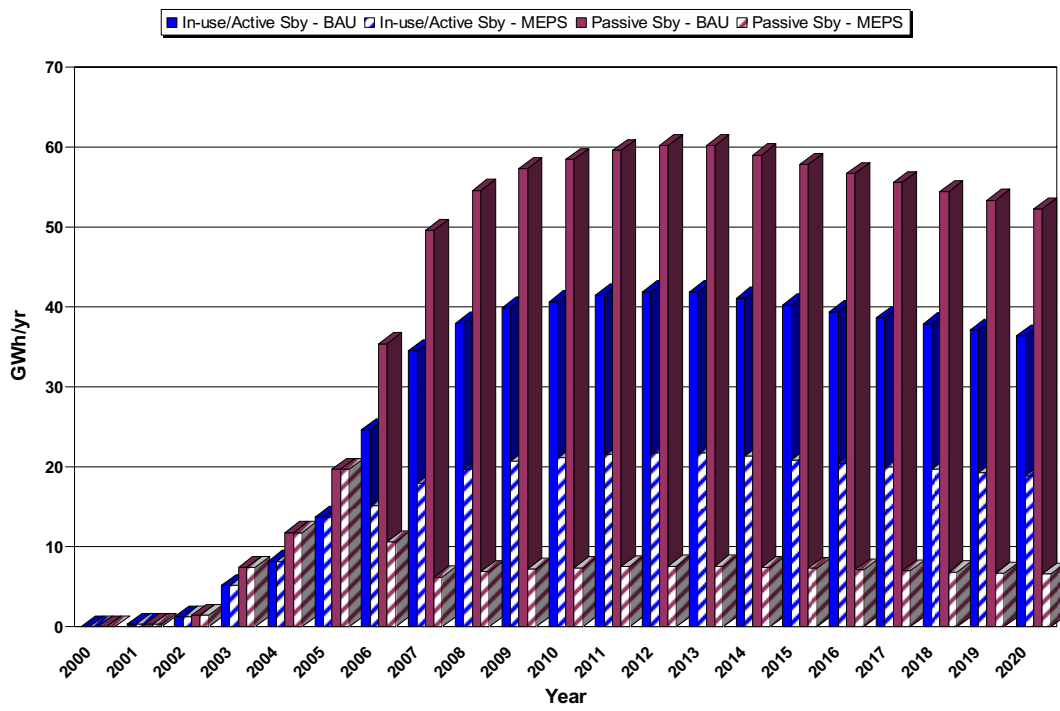
The greenhouse emissions reduction potential for the proposed MPES is shown in Figure 3. For simple converter STBs it is estimated to reduce annual energy consumption by 440 GWh/yr by 2012, and 760 GWh/yr by 2020. This is equivalent to reducing annual greenhouse emissions by 390 kt CO₂-e and 650 kt CO₂-e respectively. The total cumulative savings in emissions by these dates are approximately 1.4 Mt CO₂-e and 6 Mt CO₂-e.

Figure 3: BAU vs MEPS – GHG emissions for digital STBs



The projected effect on total annual energy consumption by new STBs based on the implementation of these MEPS in Australia is shown in Figure 4.

Figure 4: Annual effect on energy consumption of MEPS vs. BAU for digital STBs



Recommendations

NAEEEC proposes to introduce minimum energy performance standards regulation for STBs. No energy labelling scheme is proposed for STBs.

The key components of these regulations will be as follows:

1. That a MEPS for STBs be implemented to ensure that the worst performing STB products are removed from the Australian market. Any MEPS approach should cover both in-use and maximum standby power levels for simple converter STBs and maximum standby power for Pay TV and other STBs
2. The suggested MEPS levels are based on the CEC Appliance Standards to be introduced from 2006 and applicable elements of the EC Code of Conduct.
3. The MEPS be introduced in April 2006 for simple STBs. The potential MEPS for implementation in 2006 are suggested at 8W maximum power for in-use/active mode and a maximum 1 Watt for passive standby power for simple convert STBs. Almost all simple STB models surveyed since 2003 would not meet this MEPS level.
4. The MEPS be introduced in April 2006 for all other STBs, including Pay TV services and integrated recording devices. The potential MEPS for implementation in 2006 are suggested at 15W maximum power for active standby mode and a maximum 1 Watt for passive standby power, if applicable. The currently available Pay TV STBs without integrated recording devices are thought to meet this level.
5. The definitions for standby power are based on the EC Code of Conduct, as shown in **Error! Reference source not found.**

References

- California Energy Commission. Various CEC documents, including Analysis of Standards Options For Consumer Electronics Standby Losses, Sep 2004. http://www.energy.ca.gov/appliances/documents/case_studies/CASE_Consumer_Electronics.pdf
- EES & EnergyConsult 2003, *Appliance Standby Energy Consumption: Store Report 2003*, report for the National Appliance and Equipment Energy Efficiency Committee prepared by Energy Efficient Strategies & EnergyConsult, March 2003, Canberra. NAEEEEC Report 2003/04. www.energyrating.gov.au
- EES & EnergyConsult 2002, *Appliance Standby Energy Consumption: Store Report 2002*, report for the National Appliance and Equipment Energy Efficiency Committee prepared by Energy Efficient Strategies & EnergyConsult, June 2002, Canberra. NAEEEEC Report 2002/08. www.energyrating.gov.au
- EES & EnergyConsult 2001, *Quantification Of Residential Standby Power Consumption In Australia: Results Of Recent Survey Work*, report for the National Appliance and Equipment Energy Efficiency Committee prepared by Lloyd Harrington (EES) and Paula Kleverlaan (EnergyConsult), Canberra. www.energyrating.gov.au
- MCE 2002, *Australia's Standby Power Strategy 2002-2012 - "Money Isn't All Your Saving"*. Final report of long-term strategy to achieve Australia's One-Watt Goal 2002 to 2012, Ministerial Council on Energy. NAEEEEC Report 2002/12. www.energyrating.gov.au

*Appendix A: European Commission Code of Conduct on Energy Efficiency
of Digital TV Service Systems Version 2*



EUROPEAN COMMISSION
DIRECTORATE-GENERAL JRC
JOINT RESEARCH CENTRE
Institute for Environment and Sustainability
Renewable Energies Unit

Ispra, 26 May 2004

**Code of Conduct
on Energy Efficiency of Digital TV Service Systems
Version 2**

1. INTRODUCTION

Expectations are that equipment for the reception, decoding and interactive processing of digital broadcasting and related services will contribute substantially to the electricity consumption of households in European Community in the near future. Depending on the penetration level, the specifications of the equipment and the requirements of the service provider, a total European consumption of up to 23 TWh per year can be estimated for the year 2006. With the general principles and actions resulting from the implementation of this Code of Conduct the (maximum) electricity consumption could be limited to 15 TWh per year, this is equivalent to total saving of about 750 Million EURO per year.

The potential new electrical load represented by this equipment poses a problem for EU energy and environmental policies. It is important that the electrical efficiency of equipment required to support digital TV and related services is maximised.

To help all parties to address the issue of energy efficiency whilst avoiding competitive pressures to raise energy consumption of equipment all service providers, equipment and component manufacturers are invited to sign this Code of Conduct. Taking into account that the energy consumption of the equipment is influenced by the services offered, the number of features as well as the components used.

This Code of Conduct sets out the basic principles to be followed by all parties involved in digital TV services, operating in the European Community in respect of energy efficient equipment.

2. EQUIPMENT COVERED

This Code of Conduct covers equipment for the reception, decoding and interactive processing of digital broadcasting and related services (such as stand-alone integrated receiver decoders and other set-top boxes, digital TVs with built-in integrated receiver decoder, internet TV and basic converters to adapt analogue TVs and VCRs for the reception of digital transmissions. The basic Converter is defined as a stand alone device, using an integral or dedicated external power supply, for the reception of (free) digital broadcasting services and their conversion to analogue RF and / or line signals.

In the rest of this Code of Conduct these categories of equipment will be simply referred to as "equipment".

3. AIM

To minimise energy consumption (kWh) per appliance.

4. COMMITMENT

Signatories of this Code of Conduct agree to make all reasonable efforts to:

- 4.1 Abide by the General Principles contained in Annex A.
- 4.2 Achieve the power consumption targets set out in Annex B for new stand-alone products placed on the market after 1.1.2003, and for digital TVs with integrated receiver and decoder placed on the market after 1.1.2005.
- 4.3 Support the continuing development and acceptance through an ad-hoc Task Force of the Common Power Management Guidelines. (The current guidelines are shown in Annex D)
- 4.4 Co-operate with the European Commission and Member State authorities in an annual review of the scope of the Code of Conduct and the power consumption targets for two years ahead (for example in 2003 the power consumption targets for 2005 will be discussed and agreed).
- 4.5 Facilitate and encourage consumers to adopt energy efficient practices in connection with the use of digital TV services. In particular by providing information to consumers, as specified in Annex C.
- 4.6 Co-operate with the European Commission and Member States in monitoring the effectiveness of this Code of Conduct, through the procedure described in Section 5 of this Code of Conduct.
- 4.7 Ensure that procurement specifications for Digital TV services, systems, equipment and components are compliant with this Code of Conduct.

5. MONITORING

Signatories agree to provide to the European Commission on a yearly basis, starting with the year 2002, information concerning the power consumption of the equipment covered by the present Code of Conduct they produce, specify, buy, etc.

The reported results will be discussed starting with year 2003 at least once a year in a confidential and anonymous way by the signatories, the European Commission, Member States and their representatives in order to:

- a) Evaluate the level of compliance and the effectiveness of this Code of Conduct in achieving its aims.
- b) Evaluate current and future developments that influence energy consumption, (i.e.. Integrated Circuit development, Conditional Access systems, etc.) with a view to agreeing actions and/or amendments to the Code of Conduct, especially regarding the definition and / or modification of the Common Power Management Guidelines.

c) Set targets for future time periods

Reporting: The presentation of the results provided to the Commission will be in the form of the attached Excel Spreadsheet *Code of Conduct Digital TV Service Systems DATA sheet.xls* (*Annex E*).

Annex A – General Principles

Signatories of this Code of Conduct should endeavour and make all reasonable efforts to ensure:

- A.1 Digital TV services and systems are designed so as to minimise energy consumption.
- A.2 Operational and control systems are specified on the presumption that hardware has power management built in, i.e. depending on the functionality required of the unit, the hardware will automatically switch to the mode with the lowest possible power consumption.
- A.3 Digital TV service equipment is designed to minimise energy consumption, within the constraints of the operational specification.
- A.4 Digital TV service systems are designed on the assumption that the equipment may be physically disconnected from the mains supply by the consumer, from time to time, at his or her discretion, with minimal degradation of the quality of service provided, when physically reconnected to the mains supply.
- A.5 Common Power Management Guidelines are introduced to ensure that the equipment is always in the mode with the lowest possible power consumption for the functionality required at that moment. This condition applies to all the peripheral components and accessories controlled by the equipment. The Common Power Management Guidelines identify common power management capabilities required for functional blocks in a digital reception platform, and those peripheral components and accessories controlled by that platform, such that the power management system implemented for a specific digital service, can make use of commonly available technology. It is recognised by the signatories that universal power management signalling protocols could be used in the external data addressed to the digital reception platform, and the relevant functional building blocks should be designed with this capability in mind, but that such signalling is not a requirement of these Guidelines.
- A.6 Components and design facilitate, not limit, the development and introduction in the future of operational strategies, which would reduce energy consumption for consumers. To this end, functional blocks defined in the Common Power Management Guidelines should have the common power management control states, as appropriate, such as: Off, Low Power, On. The naming of these states is intended to define three levels of power consumption for any device, but is not intended to imply a direct relationship between these states and the definition of power ‘modes’ discussed elsewhere in this Code of Conduct.
- A.7 Equipment has, as appropriate, an on/off switch or as an alternative a low power mode (deep sleep or hibernation or off mode with power consumption <1 Watt), which is automatically activated when no function is provided.

Annex B – Power levels: targets and time schedule

The equipment covered by this Code of Conduct should meet the following maximum power consumption targets and time schedule.

1. For stand-alone STBs in the basic configuration (see below for the definition of the basic configuration)

Mode	from 1-1-2003 to 31-12-2005		
	<i>Cable</i>	<i>Terrestrial</i>	<i>Satellite</i>
Standby passive (Where specified)	6.0 W	6.0 W	6.0 W
Standby active	9.0 W	9.0 W	9.0 W

Mode	from 1-1-2006 to 31-12-2007		
	<i>Cable</i>	<i>Terrestrial</i>	<i>Satellite</i>
standby passive (where specified)	3.0 W	3.0 W	3.0 W
standby active	7.0 W	6.0 W	8.0 W

2. For digital TVs with integrated receiver and decoder (IRD) in the basic configuration:

Mode	From 1-1-2005 to 31-12-2006		
	<i>TV with built in Cable(IRD)</i>	<i>TV with built in Terrestrial(IRD)</i>	<i>TV with built in Satellite(IRD)</i>
standby passive (where specified)	3.0 W	3.0 W	3.0 W
standby active	8.0 W	7.0 W	9.0 W

3. For simple digital TV converters boxes:

Mode	From 1-1 2005 to 31-12-2005		
	<i>Simple Converters</i>		
	<i>Cable</i>	<i>Terrestrial</i>	<i>Satellite</i>
Standby Passive	2W	2W	2W
ON	11W	11W	14W

Definition of the basic configuration of stand alone Equipment and TV with integrated digital receiver and decoder

The calculation of the stand-by power consumption referred to in this Code of Conduct is based on a basic configuration with the following components/features:

CABLE	TERRESTRIAL	SATELLITE	SIMPLE CONVERTER (no CA support)
Single cable tuner /demodulator	Single UHF tuner /demodulator	Single satellite tuner /demodulator Single LNB feed	Cable: Single cable tuner/demodulator Terrestrial: Two RF tuners /demodulators Diversity reception processing. Active antenna powering Satellite: Single satellite tuner / demodulator. Single LNB feed.
+			
Single MPEG Decoder			
RF Modulator / Loop-through			
IR Remote Control			
Support for Off-air Software Upgrade			
Smart Card Interface			n/a
Common Interface / Dataport			n/a
RS232 Serial Port			n/a
Support for remote IR Receiver / IR Blaster			n/a
n/a	PSTN Modem	PSTN Modem	n/a

For additional components that may be added on to the equipment in the basic configuration the following additional power allowance can be added to the maximum Standby power consumption targets above. In any case **the total maximum power consumption targets in standby active mode should not exceed 15 W for the stand-alone equipment and 16 W for TVs with integrated digital receiver and decoder.**

Feature	Indicative additional maximum power consumption for additional features
Internal hard disk drive	2.2 W
IEEE1394 interface	0.8 W
Ethernet interface 100Mbit	0.4 W
Wireless interface	0.7 W
Each serial USB interface	0.3 W
Home automation interface	0.4 W
ADSL modem	2 W
Cable modem	0.7 W
Additional LNB feed	1.3 W (with an additional 85 mA for the LNB current)
Additional tuner/demodulator	2 W
Powered remote IR receiver	0.25 W

The following definition of the modes applies

Mode	Definition
Off	The equipment is connected to a power source, fulfils no function and cannot be switched into any other mode with the remote control unit, an external or internal signal.
Standby passive	The appliance is connected to a power source, fulfils not the main function but can be switched into another mode with the remote control unit or an internal signal.
Standby active	The appliance is connected to a power source, fulfils not 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 a minimal level of data from an external source.
On	The appliance is connected to a power source and fulfils a main function, including the provision of signals to supported devices.

Annex C – Information to be provided

Information on the following items shall be made available to the consumers:

- If the equipment has an off-mode, and in this case the power consumption of the equipment in the off mode
- Power consumption of the equipment in the standby passive mode
- Power consumption of the equipment in the standby active mode
- Power consumption of the equipment in the on mode

It is left to the individual manufacturers as to how to make available the above information to the consumer.

The power consumption shall be measured and declared according to IEC 62087 (first edition; 2002-03). However, the LNB current (for single LNB) should be set at 125 mA during test.

ANNEX D: INDICATIVE BLOCK FUNCTIONS FOR POWER MANAGEMENT

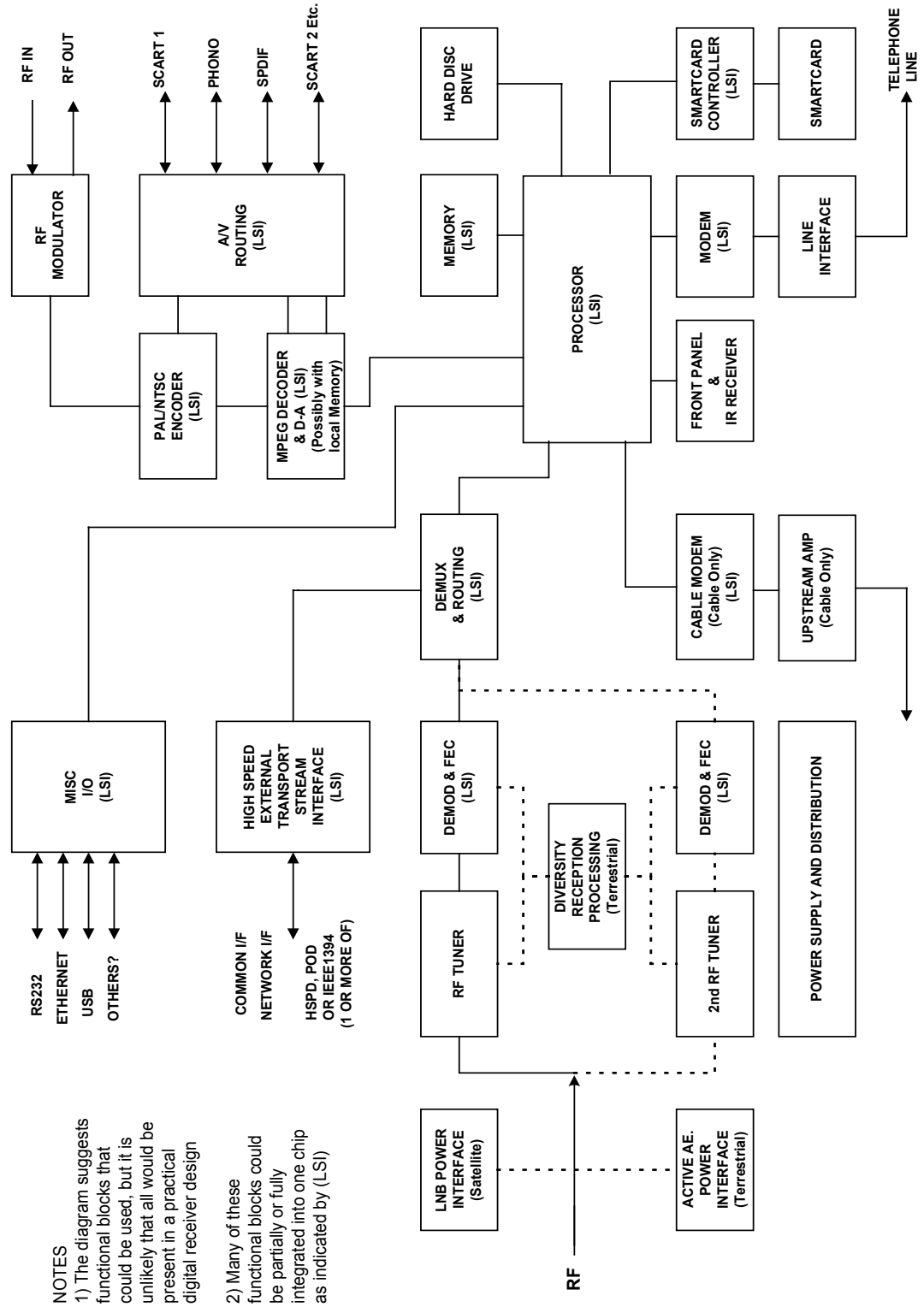
Indicative Power Management Guidelines

The special task force established under this Code of Conduct has identified the following as potential low power modes for each of the specific functional circuit blocks shown in the appended generic block diagram for a digital receiver. This table does not imply or infer any requirement for equipment made, supplied or specified, by signatories of this Code of Conduct, either to implement or conform to these modes for the standby state shown. Instead it indicates a common set of low power modes that, if implemented by component manufacturers, can be utilised as appropriate, by manufacturers and service providers to achieve the objectives of the Code of Conduct.

CIRCUIT BLOCK	EQUIPMENT STANDBY-ACTIVE	EQUIPMENT STANDBY - PASSIVE
1. RF tuner	Still fully tuned	Minimal Power Sleep Mode
2. 2nd RF tuner	Minimal Power Sleep Mode	Minimal Power Sleep Mode
3. Demodulator and FEC	Option for lower power requirement, e.g. where applicable through lower clock rate to save power when processing data with lower symbol rate.	Minimal Power Sleep Mode
4. 2 nd Demodulator and FEC	Minimal Power Sleep Mode	Minimal Power Sleep mode
5. Upstream amp (cable only)	Normally inactive but rapid wake-up possible when required	Minimal power sleep mode
6. Return path (cable only)	Normally inactive but rapid wake-up possible when required	Minimal power sleep mode
7. Demux & routing	Option to minimise processing by selecting just one signal path through to the processor	Minimal power sleep mode
8. Processor	Option for lower power requirement, e.g. lower level of activity meaning that clock rate can be reduced	Still active and running with reduced activity and lower clock rate
9. Memory	Option for lower power requirement, e.g. lower level of activity meaning that clock rate can be reduced	Low power, self-refresh mode

10. Smartcard controller	Option to render inactive, but rapid wake-up possible when required	Minimal power sleep mode
11. Misc I/O	Normally inactive but rapid wake-up possible when required	Minimal power sleep mode
12. Modem	Normally inactive but rapid wake-up possible when required	Minimal power sleep mode
13. Line interface	Minimal power sleep mode	
14. Front panel & IR receiver	Fully active but option to dim any display or indicators	
15. MPEG decoder and D-A	Minimal power sleep mode	
16. PAL/NTSC encoder	Minimal power sleep mode	
17. A/V routing	Only A/V loop through active	
18. RF modulator	Only RF loop through active	
19. Hard disk drive	Minimal power sleep mode	
20. High speed external transport stream interface.	Minimal power sleep mode	
21. LNB Power Interface	Lowest practicable power mode for polarisation	
22. Power supply unit and Power distribution	Best practicable efficiency across all modes of operation.	

An off mode (no functionality; 0 W power consumption) could be implemented by means of a hard on/off switch.



NOTES

- 1) The diagram suggests functional blocks that could be used, but it is unlikely that all would be present in a practical digital receiver design
- 2) Many of these functional blocks could be partially or fully integrated into one chip as indicated by (LSI)

GENERIC BLOCK DIAGRAM FOR A DIGITAL RECEIVER

**Code of Conduct
On Energy Efficiency of Digital TV Service Systems**

SIGNING FORM

The organisation/company/

.....

declares its willingness to sign the Code of Conduct on Efficiency of Digital TV Service Systems and to commit itself to abide to the principles described in point 4 “Commitment” for the equipment it produces, buys or specifies

The organisation, through regular upgrade reports, will keep the European Commission informed on the implementation of the Code of Conduct of Digital TV Service Systems.

for the organisation

Director or person authorised to sign:

Name:
Managerial Function:
Address
Tel. / Fax./

Signature

Please send the signed form to :

**Paolo Bertoldi
European Commission - DG JRC
TP 450
I-21020 Ispra (VA)
tel. +39 0332 78 9299 (secretary 9145)
fax. +39 0332 78 9992**

E-mail: paolo.bertoldi@cec.eu.int