



Building on the Eco-design Directive EuP Group Analysis (I)

ENTR Lot 3 Sound and Imaging
Equipment
Draft Task 1-7
Executive Summary

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Executive Summary

This is the executive summary for the preparatory study for ENTR Lot 3: Sound and imaging equipment: video players and recorders, projectors, and games consoles. The work was carried out by AEA Group and Intertek between January 2009 and May 2010. The study has followed the European Commission's MEEuP methodology, and our findings to date (in Task order) have shown that:

Task 1 - Definition

There is a wide range of products available for the presentation of video images. To facilitate manageability of this study, three product types have been investigated¹ covering video players / recorders, projectors, and games consoles. This is a product area which is undergoing rapid technological change. Newer products are being developed continually that offer more functionality and sophistication to enhance the consumer's visual appreciation. Consequently, the time scale from new to obsolescence is very short. Many of the products are very new to the European market or reflect a step change in functionality and storage technology (e.g. Blu-Ray Disc playing and recording equipment).

The first task in the MEEuP methodology and consequently to the study was to develop a product definition to be used throughout the work and to identify the existing legislation and standards that are pertinent to these products.

The definition discussion for these products started in task 1 with a review of existing definitions found in various publicly available sources, continued with a risk assessment of those definitions in order to assess their robustness and flexibility, and concluded with a suggested preliminary definition for each product type. Following the preliminary definition of Task 1, the definition of the three products is given in task 7 (see definition there).

Some specific products types have been excluded from the work including those:

- that are designed for use using a battery power supply,
- that are niche market products (e.g. professional cinema projectors)

In addition to the preliminary definitions, Task 1 identified and commented on standards, existing legislation, voluntary agreements, and labelling initiatives that affect the products of this study and can be found at the European Union (EU), in the Member States and outside Europe.

Standards:

Standards, within the European Union, are developed by European standardisation bodies. Harmonised standards to assess conformity of certain products might be developed based on a mandate issued by the European Commission. Standards are also developed by internationally recognised standardisation bodies and often share ratification and published as European standards.

European and international standards relevant to video players / recorders, projectors, and games consoles pertain to power consumption, environmental impact, health and safety requirements and electromagnetic compatibility.

Directives and Regulations

The key European Directives and Regulations affecting these products are Waste Electrical and Electronic Equipment (WEEE) (2002/96/EC), Restriction on hazardous substances (RoHS) (2002/95/EC), Low Voltage Directive (2006/95/EC), Electromagnetic compatibility (EMC) Directive (2004/108/EC) and Regulation 1275/2008 (Ecodesign requirements for standby and off mode power consumption of household and office equipment).

Voluntary measures/agreements

¹ Note: An initial assessment of Digital Picture Frames was also carried out for Tasks 1, 2 and 3 only. This has been published as a separate report.

In total 10 voluntary agreements have been identified that relate to video players / recorders, projectors, and games consoles. Four of them within the European geographical area and the remaining in countries outside EU.

Table 1: Voluntary measures at European and International level

EU	International
EICAT – self commitment to improve energy efficiency	Energy Star (US)
The Nordic Ecolabel (Scandinavia)	The Korean Eco Label (Korea)
The Blue Angel (Germany)	Green Mark (Taiwan)
TCO Label	California Energy Efficiency Regulations
	Top Runner Program (Japan)
	The IEA '1 Watt Plan'

Task 2 – Economic and Market Analysis

The main manufacturing and assembly bases for these product groups are situated outside the EU in East Asia, including Malaysia and China. However, small amounts are manufactured in Eastern Europe. Thus, amounts imported to the EU-27 are high compared with amounts produced in the EU-27.

Whilst annual sales of video players/recorders are declining slightly (~1% per year) and sales of projectors are currently flat, annual sales of games consoles are growing.

The video recorder market has peaked at approximately 40 million devices sold per year. It is expected to decline at approximately 1% a year. Substitution of DVD with Blu-ray is also expected and DVD will become obsolete between 2015-2020.

For projectors and games consoles, commercial market research data is more difficult to obtain and assess. For projectors, this can be partly explained by the complicated cross-over of internet based direct sales and sales of school projectors that are usually obtained through bulk procurement contracts and are not necessarily registered in commercial market research databases. Games consoles, on the other hand, face high market competition with publications of sales data being subject to increased market pressure and thus are not always available.

Overall annual sales for projectors are expected to saturate by 2015, with forecast of annual sales at around 1.7M to 2.2M units. For games consoles, the market is dominated by three main manufacturers all of whom are competing for share of a growing games market. Due to the nature of the market there is a great uncertainty around the product both in terms of future sales and timing and type of new products to be launched into the market. Based on assumptions and scenarios developed by the project team, sales of games consoles are projected to fluctuate over the years and finally decline by approximately 30% of 2009 levels by 2020, while new products (e.g. thin client games consoles) are expected to be launched after 2012.

Current stock of actively used video players/recorders is expected to be approximately 180 million with a maximum figure of 350 million. For projectors the figure is much smaller, at around 8 million. However, this figure could be much higher if internet based sales and school projectors were included. Games consoles are assumed to peak at approximately 87 million units. All product types exhibit significantly higher numbers than the threshold number of 200,000 units indicatively required for consideration under the Ecodesign Directive.

For video players/recorders there is a competitive market including most major Consumer Electronic Manufacturers, each offering a range of different models covering price points from around 30 Euros to over 1000 Euros. New models are released on a 6-12 month lifecycle and usually are available for retail sales for between 12-24 months.

The projector market is now quite mature as there is over a decade of established core technology. Development of alternative lamp technology is a priority for all key current manufacturers but it is considered unlikely that this will be a catalyst for new players entering the market. High end products with only minor changes to the main specification tend to have a comparatively long retail shelf life -

over periods of up to five years. New models with no significant production changes are released on a nine to twelve month manufacturing cycle.

For games consoles, competition can be distinguished between those competing for the high definition gaming enthusiast market (demand for enhanced graphics and more advanced game playing) and those competing for standard definition products. The current products on the market are designed and developed over long periods of time and are usually launched with state of the art components.

The replacement cost of many consumer electronic products is currently significantly less than, or equal to, the basic inspection charge levied by electronic product repair workshops. Diagnosing faults other than those associated with the power supply can be time consuming and repairs at chip level can be very complex. For these reasons, it is unlikely that an electronic device costing up to 150 Euros, will be repaired in its lifetime.

Task 3 – User Behaviour

The use pattern of video players/recorders is assumed to depend on its features. The video recorders/players with the lowest use are most likely to be those that provide playback only. Recorders have longer use periods, and if the device is used in the same way as a set-top box (STB), i.e. for pausing live TV, use is at least as long as the TV on-time.

Other factors that could influence power consumption are auto power down and standby modes. For video players, auto power down and switch to stand by mode is a common feature but recorders are less likely to offer this feature and thus on-time use can be significantly longer.

The market segmentation of projectors, i.e. home cinema, office and schools, generates very different usage patterns. For a home cinema, the average usage can vary from 0.5 hours per day in on-mode operation to 23.5 hours per day in standby mode, while that could change to 6 hours/day and 4 hours/day respectively for a school projector (the rest of the day it is switched off).

Games consoles have increased their usage pattern through the launch of the seventh generation products. Current estimates suggest that the most prolific gamers (accounting for 75% of all gaming time) use their games consoles for over 5 hours each day that they play. Average use hours across each product in stock are expected to be significantly lower than this at less than one hour per day. Use is predicted to increase further as more games become available for download.

These multimedia items have a typical lifetime of around 6 years. The EU WEEE Directive sets an overall collection target for all WEEE and also sets specific targets for the recovery and the reuse and recycling of consumer equipment (Category 4 appliances). Further to this, following a 2008 review of the WEEE Directive, in December 2008, the European Commission issued proposals to increase these targets including setting a collection target founded on a different basis (proportion of what is placed on the market). Product replacement is driven by fashion and new technology trends. In addition, the very low cost products may be designed for shorter lifespans and faster replacement cycles. Data on waste arisings of these products are very limited and estimates based on stock/lifetime calculations are very approximate.

Task 4 – Assessment of Base-Case

Generally, items in this product group comprise of about 20-40% by weight of plastics (various types) and about 15-30%% metals (assembly). Cardboard packaging accounts for about 30% of the weight as purchased. For the purposes of this assessment, compliance with the WEEE Directive has been assumed for the 'end-of-life' phase of these products.

	Video player/recorder	Projector	Games Console
Materials	%	%	%
Bulk Plastics	22.5%	18.3%	27.8%
Tech Plastics	-	21.2%	0.3%
Ferro	29.8%	6.2%	8.8%
Non-ferro	2.6%	11.0%	7.6%
Coating	-	0.0%	-
Electronics	11.2%	14.4%	17.0%

Misc.	33.9%	28.8%	38.5%
Total weight	100.0%	100.0%	100.0%

Three base cases were agreed with stakeholders for this study. These were: a typical video player/recorder, projector and games console. The Eco-report outputs on the base cases indicated that the 'use phase' accounts for a large proportion of the impacts (in some impact categories more than 90%) for these products. This was found to be particularly the case for Total Energy consumption, Electricity consumption, greenhouse gas emissions and acidification emissions to air. The total electricity consumption for these multimedia products (8.6 TWh) represents about 30% of the total energy (GER) consumption. This amount of electricity consumption is equivalent to slightly less than the total electricity consumption of Lithuania, and is equivalent to about 0.3% of the total electricity consumed in the EU.

In terms of greenhouse gas (GHG) emissions, 6 million tonnes CO₂eq is equivalent to around 0.14% of the EU-15 base year emissions of GHG (fixed at 4265.5 mtCO₂eq).

In terms of acidification impact, 36 ktSO₂eq represents about 0.8% of National Emissions Ceiling Directive target for 2010 for the EU-15.

Total annual consumer expenditure was significant at around 13 billion Euros – mainly on price paid for products.

	Video Player	Video Recorder	Projector	Games Console
Product Price	1,300	1,568	1,280	7,416
Installation costs	0	0	800	0
Electricity	481	234	161	393
Repair and maintenance	0	0	567	0
Total	1,781	1,802	2,807	7,809

Task 5 – Technical Analysis BAT and BNAT

The analysis of best available technology (BAT) identified a range of options for improving the environmental performance and efficiency of these multimedia products. For video players/recorders, the study concluded that the two best options for BAT were:

- the use of optimally designed docking station architecture with external HDD, and
- the use of energy optimised chip sets.

For projectors, BAT options include optimisation of:

- the Lamp/light module,
- the lens system,
- the light path beam splitting optics, and
- the elimination of leaded glass from the lens elements.

For games consoles, BAT would include optimisations of

- the inclusion of additional components to reduce the need to run non-gaming applications through the main high specification components,
- the inclusion of additional power management functionality,
- using the most efficient power supplies available, and
- maximising processor performance scaling to reduce power consumption when maximum computing performance not required.
- noting the achievements made in the personal computer industry to reduce wider environmental impacts around end of life, material content and upgradability

The pace of development in consumer electronics technology is increasing and the introduction of new innovations is seemingly constant. What might have been considered as BNAT (Best “not yet” Available Technology) can become BAT very quickly. Thus, improvements tend to be accommodated within the design cycle typical for these products. BNAT options for these multimedia products relate to changes in product type and consumer behaviour and response to innovations on the ways that the consumer’s visual experience is enhanced.

Task 6 – Improvement Potential

The purpose of this task was to identify design options, their monetary consequences in terms of Life Cycle Cost for the user, their environmental costs and benefits, their economic and possible social impacts and pinpointing the solution with the Least Life Cycle Costs (LLCC) and the Best Available Technology (BAT). Design options considered included: Auto Power Down (APD) feature, operational mode requirements (efficiency improvement of active/idle/quick start mode), hard On/Off switch, product lightweighting, PVC-free products, BFR-free products, improved recyclability, increased product durability (lifetime), reusable components, and minimum recycled content requirement for plastics.

In all of the product types assessed in this task, there was a common theme of improvement suggestions that appear to offer the LLCC point. These are:

- Operational mode requirements
- Product lightweighting
- APD feature
- Reusable components

Combination of two or more of these above improvement options leads to the LLCC point for these products. This provided the basis upon which recommendations for policy actions were made (see Task 7). Note that although the incorporation of APD (option 1) showed little improvement for projectors, this does not mean that its use as an improvement option should be ignored. A power down feature is already utilised in conventional projectors as part of the lamp cooling regime for protecting the lamp life. With technology trends towards the use of LED/laser lamp combinations in projectors, lamp life protection is no longer an issue. Therefore it is important to ensure that APD is retained and not dispensed with (see Task 7).

Sensitivity analysis showed that product price has a major effect in the life cycle cost of all products and can particular affect the LCC-curve for the product lightweighting option. The effect is less significant with changes in electricity prices or discount rates.

In addition, analysis showed that the use pattern plays a critical role. The level of variation in the total environmental impact score due to changes in usage pattern is about the same order of magnitude as the level of benefits derivable from the improvement options assessed earlier.

Task 7 – Policy and Impact Analysis

Task 7 looked at suitable policy measures to achieve potential power consumption improvements for the three product groups (Video Players / Recorders, Projectors, Games Consoles). There are a number of other environmental impacts associated with these products, however, given that no ecodesign measures for other electronics products have included wide ranging requirements on non-energy in use impacts it would be unsuitable to suggest these type of requirements for the products of this study in isolation.

Video players/recorders

Following the definition risk assessment of Task 1, the definition of video players/recorders is given in the box below:

A video player/recorder is a stand alone device whose primary function:

- **Decodes video to a to an output audio/video signal**
- **from recorded or recordable media via a powered or integrated media interface such as an optical drive, USB or HDD interface**
- **Has no tuner unless it records on a removable media in a standard library format**
- **Is primarily mains powered**
- **Does not have a display for viewing video**
- ~~**Is not designed for a broad range of home or office applications (to be discussed at third stakeholder meeting)**~~

For video players/recorder it is suggested that the preliminary definition changes to 'is primarily mains powered' to prevent a potential loophole for products that might use auxiliary battery power.

The advances in technology expected in future years could increase the consumption that video player/recorders have in on-power and stand-by mode. However it is difficult to predict the exact future power consumption levels of these products as the technology is rapidly evolving.

For video players/recorders two overall operational modes are recognised. These are the idle modes (further broken down to off/stand-by, network stand by and fast start) and active modes (broken down to secondary functions, video playback and recording).

Only one tier is assumed to apply in 2012 setting the following power limits as ecodesign requirements:

- On-play HD = 15W
- On-play SD = 10W
- Live pause = 13W
- Idle modes = 7kWh per year

No second or third tiers have been proposed as it would not be possible to address every operational mode and use case individually.

Standby and off mode power consumption of video players/recorders is already appropriately covered by ecodesign Commission Regulation No 1275/2008.

The potential for power management lies within the Auto Power Down function and should apply to the fast start, on-idle, content navigation and live pause operating modes. It should activate after no user input in less than 30 minutes for video players and three hours for video recorders.

The energy savings potential resulting from the introduction of the aforementioned ecodesign requirements are in the scale of 11.9 TWh in 2015 increasing to 12.3 TWh in 2020.

For video players/recorders a new energy label or an ecolabel is not considered appropriate as for these products public procurement rates are relatively low and also have low power consumption. However, it could be more useful and effective if it was integrated into a voluntary agreement and marketed by manufacturers to help expose free riders.

Projectors

Following the definition risk assessment of Task 1, the definition of projectors is given in the box below:

A projector is a primarily mains powered, optical device, for processing analogue or digital video image information, in any, broadcasting, storage or networking format to modulate a light source and project the resulting image onto an external screen. Audio information, in analogue or digital format, may be processed as an optional function of the projector.

For projectors, professional products are excluded from the scope of this study and the task 1 definition statement 'is mains powered' is qualified to 'is primarily mains powered' to prevent a potential loophole for these portable and personal projector products.

Two overall operational modes are defined (idle and active) which are broken down into sub-modes. As video projection mode completely dominates the in-use power requirement, in this assessment two tiers are assumed to apply. The first in 2012 based on a minimum luminous efficiency of 0.09 W/Lumen while the second is proposed on the assumption that the light output efficiency could be increased to 0.05 W/lumen.

Potential idle mode and maintained power management requirements are outlined in task 7.3.2 for discussion at third stakeholder meeting. Standby and off mode power consumption of projectors is already appropriately covered by ecodesign Commission Regulation No 1275/2008.

Auto Power Down function is currently a normal projector design criterion as the protection of the lamp life is still a design priority. A trend towards long life lamp solution could turn this functionality into an unnecessary design criterion; however it is proposed that it should still apply to projectors so as to ensure that some power is saved from the lamp.

Based on the above energy efficiency requirements the savings compared with the baseline could be between 0.6 to 1.3 TWh in 2015 and 2020.

The implementing measure could be complemented by an industry voluntary agreement to eliminate mercury from all projector lamps and lead from light path glass. In addition, an eco labelling could be introduced to support public procurement and target Schools Projectors as this is the largest market in the EU-27.

Games consoles

Following the definition risk assessment of Task 1, the definition of games consoles is given in the box below:

A "Games Console" is a mains powered stand alone device which is marketed as a product providing video game playing as its primary function through an external screen and which has the following features:

Hardware Architecture

- CPU
- System memory
- Video architecture
- Network architecture
- Optical drives (optional)
- Hard drives or other internal memory (optional)
- Mains connected internal or external power supply unit

Input devices

- Typically hand held controllers or other interactive controllers rather than keyboards or mice

Optional Secondary functions

- Optical disk playback

- Digital picture viewing (via an external screen)
- Digital music playback
- General internet connectivity

Excluded components or functionalities:

- Integrated screens
- Conventional Personal Computing (PC) operating systems
- Internal batteries for powering products over extended periods of time

In task 7, the definition of a game console has slightly changed to include the term 'general internet connectivity'. That is to reflect the fact that games consoles are being also increasingly used for general internet based applications.

Looking towards computers it seems that similar measures and approaches can be also adopted for games consoles, albeit at different levels. An example is the scalable chip that many desktop and notebook PCs are now incorporating that can increase or decrease CPUs power demand depending on processing demands.

Most of the power modes, except the active mode, present a good potential for reducing power consumption. Idle and sleep mode power demand could be reduced to the levels provided in the draft ENERGY STAR specification, while for off mode no further power requirements are deemed necessary as it is already appropriately covered by the ecodesign Commission Regulation No 1275/2008.

In terms of power management requirements, three APD requirements are suggested for games consoles. Tier I addresses high definition consoles and includes a period of 30 minutes of inactivity in any power mode other than Game Play, Game Pause, Game Play Idle or Media Play before the game console auto-powers down. Tier II/1 captures all games consoles in System Idle, Game Play Idle, Game Pause, Media Play Idle and Media Pause, or any state other than Game Play or Media Play and also allows for 30 minutes of user inactivity before power down. Finally Tier II/2 applies an auto-save feature ahead of a games console powering down to a sleep/network standby/standby mode. For any power management functionality to ensure that works effectively and is accepted by users it is essential to ensure that game publishers are also involved to ensure that power management has no impact on the gaming experience.

Given the above policy measures if these were to be implemented the savings would have been considerable, ranging from 9.1 TWh in 2016 for applying Idle Mode limits to all modes to 10.5 TWh in 2020. While the savings would have been greater if power down after 30 minutes and idle mode limits were to apply – 11.6 TWh in 2016 to 13.4 TWh in 2010.

In addition to minimum ecodesign requirements an EU ecolabel could be extended to cover games consoles. The EU ecolabel could be developed to reflect the best performance of the games consoles on the market and automatically apply to the one product that met the specification. This process could be useful where one manufacturer has not taken the same steps as a competitor to reduce environmental impacts such as in use energy or reductions in material usage.

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