

To: Kathleen Vokes, US Environmental Protection Agency January 23, 2009
Steve Pantano, ICF International

Sub: Biamp comments - Products for Inclusion and General Approach -
ENERGY STAR Audio Video Specification 2.0 to address Professional
Audio Video Equipment.

Dear Kathleen and Steve,

It was a pleasure for Biamp to participate in the ENERGY STAR Audio Video Stakeholder Meeting held January 10 at CES. Biamp Systems is still very interested in promoting ENERGY STAR Specifications to address the unique usage patterns associated with Professional Audio Video Equipment and supporting EPA efforts during the development cycle.

Significant Energy Savings for Professional AV:

I have been seeking specific data that could lead to an estimate of total US energy use by the currently installed base of Professional Audio Video equipment, and have concern that this task is somewhat impractical.

I have corresponded with Joelle Michaels of the US Department of Energy who administers their Commercial Buildings Energy Consumption Survey (CBECS) for the Energy Information Administration. Joelle stated in attached e-mail:

"We collect total consumption data from buildings, and then use an engineering-based model to separate the total consumption into components such as heating, cooling, and lighting. Estimating even these major end uses is a difficult task, and so it would be impossible to make estimates for more specialized uses of energy."

Biamp will continue to seek an estimate for Professional AV energy use through our various trade organizations. I realize that EPA ENERGY STAR must be able to report on the results of their efforts; however, this cannot overshadow your primary goal of promoting energy conservation. Since commercial energy use as a whole significantly surpasses household energy use, and considering the number of Professional AV installations that are operated in Active mode 12 to 24 hours per day, the potential for **significant energy savings** becomes apparent.

Product Differentiation - Defining Professional AV:

Biamp Systems is associated with Professional AV trade organization [InfoComm International](#). InfoComm describes the Professional Audio Video Industry by products and markets as follows:

Products include audio systems, video and data projectors, displays and screens, digital signage, racks and cases, lecterns, cables and connectors, computer and AV networking, control systems, interfacing and signal distribution.

Markets in which pro-AV systems are used include schools and universities, government, the military, businesses, healthcare, legal, retail, museums, churches, sports arenas, entertainment, transportation.

For the context of ENERGY STAR AV Specification, Biamp recommends using InfoComm's definition and additionally defining Professional AV by its characteristic usage pattern operating in Active Mode between 12-24 hours per day.

Adding this usage pattern to the definition will create a clear ***product differentiation*** between manufacturer's marketing to Consumer (Household) vs. Professional Audio Video markets.

Professional AV Product Types and Functions May Include:

- Signal Processors
- Digital Signal Processors (DSP)
- Amplifiers
- Conferencing Systems
- Public Address Systems
- Mass Notification Systems
- Video Displays
- Video Projectors
- Message Boards
- Networks
- Control Systems
- Signal Distribution
- Media Servers

Professional AV Operating Modes and Specifications:

To avoid imposing additional requirements on Consumer AV products that are used in Active Mode for limited periods of time, Active Mode Specifications should be applicable to Professional AV only.

Active Mode (Amplifiers) – Amplifiers are an area where substantial energy savings may be realized. At the 1-10-09 ENERGY STAR Audio Video Stakeholder Meeting, theoretical efficiencies were presented for various amplifier topologies as follows:

Class A: 50%

Class AB: <78.5%

Class D: >90%

There is a fair amount of confusion concerning amplifier efficiency. High efficiency means more power is converted to usable audio output to drive a speaker coil and less power is wasted in the form of heat dissipation over the range of operating conditions represented by a real world application.

Class A and Class AB – In most amplifier designs, the bulk of the power loss occurs in the transistors in an output stage. These output transistors function as variable resistors in accordance with the input signal, but remaining energy available from the power supply that is not delivered to the speaker loads is converted to heat. Therefore, a Class A or Class AB amplifier circuit can only approach its theoretical maximum efficiency when it is producing a continuous sine wave output at maximum undistorted volume.

This most efficient operating condition for these amplifiers does not match real world operating conditions. Lows and peaks of music or speech signals and the need to reduce output to a comfortable listening volume dramatically increases power that must be dissipated as wasted heat such that maximum theoretical efficiencies are never approached using music or speech signals in these types of amplifiers.

Class D amplifiers – Class D amplifier designs operate on a similar principle to a Switch Mode Power Supply. Output transistors are replaced by pulse-width modulating semiconductors that turn the energy available from the power supply either on or off, keeping heat dissipation to a minimum. A filter is then used to convert the on/off pulses to an analog audio signal. Class D amplifiers use a minimal amount of power to overcome switching losses with a minimal amount of heat dissipation under all operating conditions represented by real world signals. This type of amplifier circuit comes much closer to approaching its theoretical 90 percent transfer of energy from the power supply to drive speaker loads.

Measurement of amplifier efficiency – In Professional Applications, audio wattage requirements are determined by factors such as room size, intelligibility requirements, acoustics, etc. Therefore, energy use must be budgeted as a function of maximum undistorted audio output power.

A sine wave signal can be used to identify a variety of volume levels for efficiency testing such as 100%, 30% and 12.5% maximum undistorted output.

A Pink Noise signal can then be applied and efficiency measured at these same volume levels. Final efficiency can be calculated as an average of the measurements at the various volume levels. Biamp can assist in determining efficiency guidelines by piloting test methods and providing data for our Class AB vs. Class D amplifiers along with data from a limited number of competitors if we are able to obtain samples.

Active Mode (Signal Processing, Control, Distribution and Networking) – This type of equipment employs many of the same load devices included in PCs or Set Top Boxes (hard drives, optical drives, network connections, modems, etc.) Therefore, these devices would lend themselves well to energy budgets based on product functions provided.

Standby Mode – Requirements similar to those for Consumer AV should be applicable to Professional AV having wireless remote monitoring, clocks or other circuitry that would prompt users to leave them connected to power source continuously. An exception should be provided for applications requiring instant access such as emergency paging for Mass Notification Systems which must be able to product pages on demand.

Off Mode – Because Professional AV equipment is typically powered through power management devices such power strips, equipment rack power distribution or dedicated branch circuit breakers, On/Off switches are less useful as energy conservation means. Individual equipment On/Off switches can be seen as a nescience due to concern for inadvertent disconnection of power. With suitable use of Standby Modes and recommendation to use external power management devices, a physical power disconnect within an individual chassis should not be required.

Thank you again for the opportunity to work with EPA as an ENERGY STAR partner. I will be happy to answer any questions or provide clarification and additional input as needed to develop some of these ideas further or work with other stakeholders to integrate my suggestions with their ideas.

Warm Regards,
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