July 29, 2013

By Email (docket@energy.ca.gov)

Joshua Butzbaugh
California Energy Commission
Sacramento, CA

Re: **Invitation to Submit Proposals – Game Consoles**
In the Matter of 2013 Appliance Efficiency Pre-Rulemaking
Docket # 12-AAER-2A

Dear Mr. Butzbaugh:

The Entertainment Software Association appreciates the opportunity to submit this letter in response to the California Energy Commission's request for proposals in connection with the current appliance efficiency pre-rulemaking.

As noted below, we believe that auto-power down represents the best choice for improving game console energy efficiency. We explain our rationale for that conclusion, and we detail the significant progress console makers have made toward implementing that feature across the installed base of the latest game consoles. Before turning to APD, however, we would like to address the threshold question of whether there exists sufficient data for which the Commission may adopt an energy efficiency standard for game consoles.

Right now, there is not sufficient data. As set forth in the template that accompanied the Invitation to Submit Proposals, in order to establish a mandatory standard the Commission must first determine such factors as:

- The annual of hours of use of game consoles,
- California stock and sales,
- The lifecycle cost and cost-to-benefit ratio of the proposed measure,
- The incremental first costs of imposing the proposed measure,
- Consumer incremental costs and savings,
- Infrastructure costs and savings, and
- Lifecycle cost and net benefit (if any).

Unfortunately, there is little, if any, available data on these factors.

Moreover, while a specific proposed efficiency measure, such as a power cap, may theoretically make a particular product more efficient, it also may impair the functionality and the performance of the console. Consumer acceptance and use of energy saving features in game consoles is different than it is for household appliances. Game consumers place a premium on state-of-the-art technology, such as multi-core processors and highly capable GPUs (graphics processing units). State-of-the-art chipsets, by their nature, are often not as efficient in their early iterations as they are in subsequent refinements through die shrink. The risk of imposing a power cap on a

console is that it may limit the introduction of new gaming experiences on that platform and limit the potential of the device to provide such features. There are better means to improve energy efficiency of game consoles than to impose mandatory power caps.

Auto-Power Down

We believe that the single best way to improve energy efficiency of game consoles is through a robust auto-power down ("APD") feature enabled by default and implemented industry-wide. Researchers at Carnegie Mellon University have reached a similar conclusion:

> [I]t is apparent that addressing the auto power down feature is the most effective way to reduce energy consumption, even if only 10 % of users leave their consoles on when not in use.[1]

For the past four years, console makers have worked toward an agreed framework for implementing APD that will cover Microsoft Xbox 360, Sony PlayStation 3, and Nintendo Wii U game consoles.[2] These consoles will have APD enabled by default for all modes,[3] as will the forthcoming Microsoft Xbox One and Sony PlayStation 4 game consoles.

The video game industry's draft voluntary APD framework has a number of features designed to maximize the total energy savings and to promote a good user experience:

- Consoles will be shipped with APD enabled by default.

- The APD timer is set for one hour for all modes except Media Playback, which is configured for a four hour timer so that users enjoy an uninterrupted movie watching experience.[4]

- APD will not occur during a download or installation to avoid interrupting the process. If the console automatically wakes for required system maintenance, it will enter APD within five minutes after completing that task.

- An overly rigid APD solution will not be successful. There must be some allowance for consumers to tune the feature to their preferences. For example, some consumers may want to adjust the default timer to a different time span or disable APD for certain modes, game titles, or types of games (like simulation

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[1] *See* Eric Hittinger, Kimberly A. Mullins & Ines L. Azevedo, Electricity Consumption and Energy Savings Potential of Video Game Consoles in the United States (2011), at p. 11 (hereinafter "Carnegie Mellon study").

[2] The voluntary outline proposal is still in draft form, as console makers update it to account for the new generation systems.

[3] Some software published for previous generation consoles (i.e., legacy software) may not be compatible with the APD functions of these newer systems.

[4] These timeframes are consistent with ENERGY STAR program requirements, with the exception that for Media Playback, our framework sets the time at four hours for both active and pause modes. *See* U.S. Environmental Protection Agency, Recognition Program for Game Consoles Performance Requirements Version 1.0 (2013) at 4, *available at* https://www.energystar.gov/products/specs/sites/products/files/Final%20Version%201%200%20EPA%20Voluntary%20Criteria%20for%20Energy%20Efficient%20Game%20Consoles.pdf.

programs). Without this flexibility, many consumers may become irritated with APD and disable it altogether, a far worse result than a targeted override. The console makers' APD framework includes some leeway for user modifications. That said, APD is not given prominence in the menu systems. Nor are users encouraged to change the default values.

- It is unlikely that APD will result in meaningful loss of unsaved game play. Many of today's games auto-save frequently.[5] Nevertheless, console makers are working with publishers to help ensure that APD occurs in an elegant manner that does not disrupt the game play experience. Console operating systems will transmit an imminent APD alert to the game software through an application programmable interface (API) or other means. Publishers will have discretion to respond to the APD alert in whatever way works best for that particular game.

- Console makers are committed to updating and improving the APD framework as new innovations warrant.

Please see **Appendix #1** for the full text of the draft APD framework, which the industry is working toward implementing.

The industry is committed to implementing this APD solution, but it is not possible to codify this feature in a California appliance efficiency standard at this time. In order to implement such a standard, the Commission must first find that the APD would be cost effective over the design life of the product. This finding must be based upon accurate and reliable data. However, it is difficult to provide an accurate calculation of the total energy saved through a robust APD default for at least two reasons. First, some users may opt to leave their consoles on precisely because they configured their system to APD.[6] Second, as pointed out by Carnegie Mellon, the power down behavior of consoles after use is "largely unknown."[7]

In the face of this information gap, the Carnegie Mellon researchers considered a theoretical range of energy savings that would be possible depending upon what percentage of consumers manually powered down their consoles after use.[8] Here is what they found:

[5] *See* Comments of the Entertainment Software Association, Docket 12-AAER-2A, at 24 (submitted May 9, 2013).
[6] The APD feature has evolved over time but has been present in one form or another in both the Xbox 360 and PlayStation 3 for several years.
[7] Carnegie Mellon study at p. 12.
[8] The video game industry was not involved in the Carnegie Mellon study and is not in a position to endorse the particular methodology or confirm the veracity of the figures used. However, we find that the reasoning used by the researchers in analyzing the APD function is compelling.

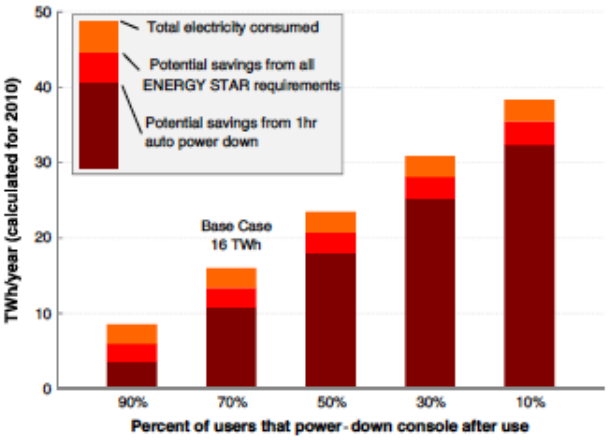

Fig. 5 Total electricity consumed by video game consoles and potential savings of auto power down and all ENERGY STAR Tier 3 requirements, as a function of the percent of users that manually power down the console after use. Except when consoles are almost always powered down manually, the 1-h auto power down saves more electricity than the other ENERGY STAR requirements combined

The chart is revealing. Across all scenarios, it shows that APD is the best option for achieving significant gains in energy efficiency relative to other options. Following this theoretical experiment, Carnegie Mellon concluded that APD "appears to be the most valuable ENERGY STAR requirement."[9]

We agree, which is why the industry has taken steps to ensure the widest possible reach for APD. Not only have console makers added "APD by default" as a going-forward feature, but they've enhanced the APD functionality of previously sold consoles of the same model. Through remote software updates, users who bought earlier versions of the covered systems also have received enhancements to APD.[10] In this manner, much of the installed base for the covered systems has the latest APD.[11]

For all of these reasons, we believe that the voluntary APD framework proposed in **Appendix #1** represents the best option for improving the energy efficiency of game consoles.[12] Console makers are already working toward voluntary implementation of the APD feature, even in the absence of specific data regarding energy savings. This progress renders a mandatory standard for the installation of this product feature unnecessary.

The balance of our comments address the other questions posed by the CEC in the template document. In many cases, we were not able to provide the cost and energy savings numbers requested because we do not collect the underlying data needed to compute those figures.

[9] Carnegie Mellon study at p.12.
[10] For example, in a 2011 software update for the Xbox 360, Microsoft informed users of new additions to the APD functionality. That update gave consumers the choice of whether to enable APD.
[11] Some consumers do not connect their systems to the Internet, and in that case it would not be possible to update the firmware.
[12] Although our industry does not support the final ENERGY STAR program requirements, we largely support the APD framework embodied in Version 1.0. We could implement it with some minor changes.

Technical Details

The chart below includes the hardware specs for all currently sold home consoles and what details we can provide regarding the forthcoming Microsoft Xbox One and Sony PlayStation 4.

	PlayStation 3	**PlayStation 4**
Processor	CPU: Cell Broadband Engine GPU: RSX	Single-chip custom processor; CPU: low power x86-64 AMD "Jaguar", 8 cores; GPU: 1.84 TFLOPS, AMD Radeon Graphics Core Next engine
Memory	256MB XDR Main RAM 256MB GDDR3 VRAM	GDDR5 8 GB
Storage	[Varies by model]	
Optical Drive	CD x 24 DVD x 8 BD x 2	BD 6xCAV DVD 8xCAV
AV Output	HDMI AV MULTI OUT connector Digital audio: DIGITAL OUT (OPTICAL) connector Blu-ray™/DVD/CD DRIVE	HDMI Digital Output (optical)
Communication	Ethernet (10BASE-T, 100BASE-TX, 1000BASE-T) IEEE 802.11 b/g Wi-Fi Bluetooth 2.0 (EDR), USB 2.0 x 2	Ethernet IEEE 802.11 b/g/n Bluetooth 2.1 (EDR) USB 3.0 AUX

	Xbox 360	**Xbox One**
Processor	Xenon triple-core	8-core x86
Memory	512MB GDDR3	8GB DDR3
Storage	[varies by model]	500GB
Optical Drive	DVD	Blu-ray™ player
AV Output	Composite, S-Video, RGB, Component, HDMI	HDMI (with HDMI pass-through)
Communication	802.11n Wi-Fi,	Wi-Fi, Bluetooth 2.1

	Ethernet, USB 2.0	

	Wii	Wii U
Processor	PowerPC CPU (code-named "Broadway") jointly developed with and manufactured by IBM. GPU developed with ATI/AMD.	IBM Power-based multi-core; AMD Radeon-based GPU
Storage	512MB Flash memory	Premium Set: 32 GB Standard Set: 8 GB
Optical Drive	Wii Optical Disc	Wii U Optical Disc
AV Output	An AV Multi-output port for component, composite or S-video.	HDMI, AV multi-output port for component, composite, or S-video
Communication	802.11 b/g Wi-Fi, Bluetooth 2.0 (EDR), 2 x USB 2.0, SD card slot	802.11b/g/n Wi-Fi, Bluetoth 4.0, 4x USB 2.0, SD card slot

One of the notable aspects of the new generation of hardware is the shift from the highly customized architecture of the prior generation to a hardware configuration that relies upon more general-purpose chipsets. By switching to this more standardized architecture, console makers are able to more readily implement new, energy efficient chipsets, as appropriate for use in home game consoles, than was possible with more highly customized chipsets.[13]

Design Life

Q: How long will the product be in use after purchase?

A: We do not have data on how long consumers continue to use their consoles following purchase, but generally speaking console makers design their systems to support new games and features for at least five years.

Not all consumers purchase new consoles in sync with the release of new systems. In fact, the percentage of users who buy at launch accounts for only a small fraction of total sales over the lifespan of the device in the marketplace.[14]

[13] Although game consoles share some of the same core components of a PC, they are engineered for a different purpose and their operation reflects those differences. For example, unlike a PC, a game console has no "idle" mode.

[14] For example, the number of PlayStation 3 consoles sold within one year of its launch (2006) accounted for roughly 12 percent of the total PlayStation 3 consoles sold from 2006-2012.

Given this staggered purchase cycle, many consumers continue to use their legacy consoles after the next generation is launched. For example, Microsoft continued to support access to Xbox LIVE, the online service for the Xbox family of consoles, for users of the original Xbox game console until April 2010, over four years after Microsoft launched the Xbox 360 and nearly a decade since launch of the original Xbox.[15] However, the length of time that consumers use game consoles and the period of time that consoles are used is not known.

Manufacturing Cycle

Q: How often are new models introduced into the market?

A: Historically, console makers have introduced new home console systems approximately every 5-7 years.

Q: How frequently are software updates sent to units in operation?

A: The frequency varies by manufacturer but, in general, console makers update their firmware multiple times per year.[16]

Product Classes

The term "Game Console" means a standalone computer-like device whose primary use is to play video games. Game Consoles use a hardware architecture based in part on typical computer components (e.g., processors, system memory, video architecture, optical and/or hard drives, etc.). The primary input for game consoles are special handheld controllers rather than the mouse and keyboard used by more conventional computer types. Game Consoles are also equipped with audio visual outputs for use with televisions as the primary display, rather than (or in addition to) an external or integrated display. These devices do not typically use a conventional personal computer (PC) operating system, but often perform a variety of multimedia functions such as: DVD/ Compact Disc (CD) playback, digital picture viewing, and digital music playback.

The definition excludes two types of devices: (i) handheld gaming devices, typically battery powered and intended for use with an integral display as the primary display; and (ii) game consoles incapable of rendering HD video output (video output with a display resolution of 720 lines or greater) via HDMI.

California Stock & Sales

[15] Larry Hryb, *Xbox LIVE being discontinued for Original Xbox consoles and games*, **Major Nelson Blog** (February 5, 2010), available at http://majornelson.com/2010/02/05/xbox-live-being-discontinued-for-original-xbox-consoles-and-games/.

[16] Some energy savings features require a combination of software and hardware changes and cannot be implemented by software alone.

We do not have data on console sales in California. Please see our May 9, 2013 filing for national sales data.

Efficiency Options: Current Market and Future Market Adoption

APD enabled by default is a feature present in recently sold Xbox 360, PlayStation 3, and Wii U consoles.[17] Also, console makers have offered additional APD enhancements to users of previously sold consoles of the same model through periodic software updates. The Xbox One and PlayStation 4 will ship with APD enabled by default.

State or Local Government Costs and Savings

We understand that this question is typically addressed by state and local agencies once a particular standard has been proposed, based on the estimated cost and difficulty of enforcing the standard, or based upon savings to agencies if they make widespread use of the product to which the standard applies.

Federal Preemption or Other Regulatory or Legislative Considerations

An energy efficiency standard for game consoles would not duplicate or conflict with federal regulations contained in the Code of Federal Regulations that address the same product. There are no existing federal standards in effect for game consoles. On March 5, 2013, EPA announced its Game Console Version 1.0 Recognition Program. The program presents voluntary criteria for energy efficient game consoles, which include performance requirements as well as a test method. However, the performance requirements were not based on a lifecycle cost analysis and were not intended to address state-of-the art game play. As EPA noted in response to comments "[s]tate-of-the-Art gam[ing], what game consoles have always been about, is, in essence, not covered by power requirements in this program."[18]

Bibliography

Eric Hittinger, Kimberly A. Mullins & Ines L. Azevedo, Electricity Consumption and Energy Savings Potential of Video Game Consoles in the United States (2011)

Conclusion

[17] Earlier versions of the Xbox 360 and PlayStation 3 consoles included a more limited form of APD, which was not enabled by default.

[18] Final Draft Version 1.0 EPA Game Console Performance Requirements and Test Method Comment Summary and Response, at page 5; https://www.energystar.gov/products/specs/sites/products/files/Final%20Draft%20Version%201%200%20Comment%20Response%20Document.pdf

All three console makers recognize that energy efficiency is an important consideration in console design. They also know that the viability of game consoles in a crowded and competitive electronics and entertainment market is tied to delivering the most innovative and exciting interactive experiences that game companies can create. As a result, console makers believe that an APD framework is the best way to improve the energy efficiency of game consoles, a conclusion shared by researchers at Carnegie Mellon University. The industry has already embraced APD, and thus we do not believe a mandatory standard is needed to implement this framework. More data on consumer use of game consoles, design life and the costs of incremental energy improvements will be needed before the Commission can realistically assess the opportunity for specific performance standards for game consoles. ESA looks forward to working with the Commission and stakeholders to better understand how consumers use game consoles.

Respectfully submitted,

ENTERTAINMENT SOFTWARE ASSOCIATION

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APPENDIX #1 – DRAFT VOLUNTARY APD FRAMEWORK

General Auto-Power Down Requirements

The following requirements, which will be introduced region by region to determine acceptance by users, form the basis of an advanced auto-power down proposal (APD) for games consoles. These requirements combine best practices across several categories of Energy related Products:

- Games consoles with forced menu on initial activation of the games console shall provide auto-power-down as the default choice on initial activation of the console.
- When auto-powering down consoles shall auto-power down to Standby mode, Network Standby mode or another condition that does not exceed the maximum power consumption permitted for Standby mode.
- Consoles shall be shipped with activation of an auto-power down mode that complies with applicable laws.
- The user shall have the option to disable APD for all modes. Consoles may present the option of disabling APD for Active Game mode only first so as to encourage users to leave APD enabled for other modes.
- The user may have the option to change the time settings for the auto-power down function from within the equivalent system settings menu options e.g. for retail display purposes or for heavy game users.
- For Operational modes other than Media Playback, the period of inactivity required to trigger auto-power down shall be set at 1 hour or less from the time of the last user input. In Media Playback mode, auto-power down shall be triggered after 4 hours or less of audio or video media playback (including video files, streaming audio-visual content, IPTV or Digital TV) or triggered by user inactivity of 1 hour or less after termination of video media content.
- In limited circumstances, users may be prompted to suspend APD temporarily to allow certain types of games or software applications to run without user input, e.g. simulation games and video streaming which run without user input for periods longer than 1 hour. Once selected, the temporary APD suspension may remain enabled for replay of such game or media content upon restart of the console.

- APD shall be suspended temporarily to allow for the uninterrupted performance of any system update, system maintenance, software installation or content download and shall not occur during the display of an error message to users in the event of a system error.
- After an automatic wake event, consoles shall power down within 5 minutes after performing required system maintenance and downloads, or other functions that may require an automatic wake-up.
- Accessories bundled with the console and using the console as a direct power source shall also power down and shall be included in auto-power down power measurements.
- Console operating systems shall communicate an imminent auto-power down event through an application programmable interface (API) or other means.
- Some software published for current or previous-generation consoles may not necessarily be compatible with the APD functions described in this proposal. Console manufacturers will use best efforts to work with the video game software industry with a view to incorporating these APD functions when publishing software for consoles covered by this proposal.
- Individual console producers may introduce new and innovative approaches to APD as and when the same or better energy saving are possible along with improved consumer experiences. As possible this guideline will be updated to reflect any such significant innovations.