



ENERGY STAR® Audio/Video Version 4.0 Discussion Document Webinar

July 17, 2017

ENERGY STAR Products Labeling Program



Webinar Details

- Webinar slides and related materials will be available on the Audio/Video Product Development Web page:
 - www.energystar.gov/RevisedSpecs
 - Follow link to “Version 4.0 is in Development” under “Audio/Video”
- Audio provided via teleconference:
 - Call in:** +1 (877) 423-6338 (U.S.)
+1 (571) 281-2578 (International)
 - Code:** 773-366 #
 - Phone lines will remain open during discussion
 - Please mute line unless speaking
 - Press *6 to mute and *6 to un-mute your line



Webinar Agenda

- ENERGY STAR Specification Development Process
- Goals for Revision
- Testing Issues
 - Amplifier testing
 - Wireless testing
- New Product Types
 - Multi-room speakers
 - Prosumer products
- Other Items for Consideration for V4.0
 - Multi-enclosure products
 - Soundbars
 - Applicability of efficiency requirements in the specification
 - Voice activated digital assistants
- Timeline



ENERGY STAR Specification Development

Time	Topic
1:00–1:10	ENERGY STAR Specification Development
1:10–1:20	Goals for Revision
1:20–2:15	Testing Issues
2:15–2:45	New Product Types
2:45–3:15	Other Considerations for V4.0
3:15–3:30	Timeline



Introductions

Verena Radulovic

U.S. Environmental Protection Agency

Matt Malinowski

ICF

Emmy Feldman

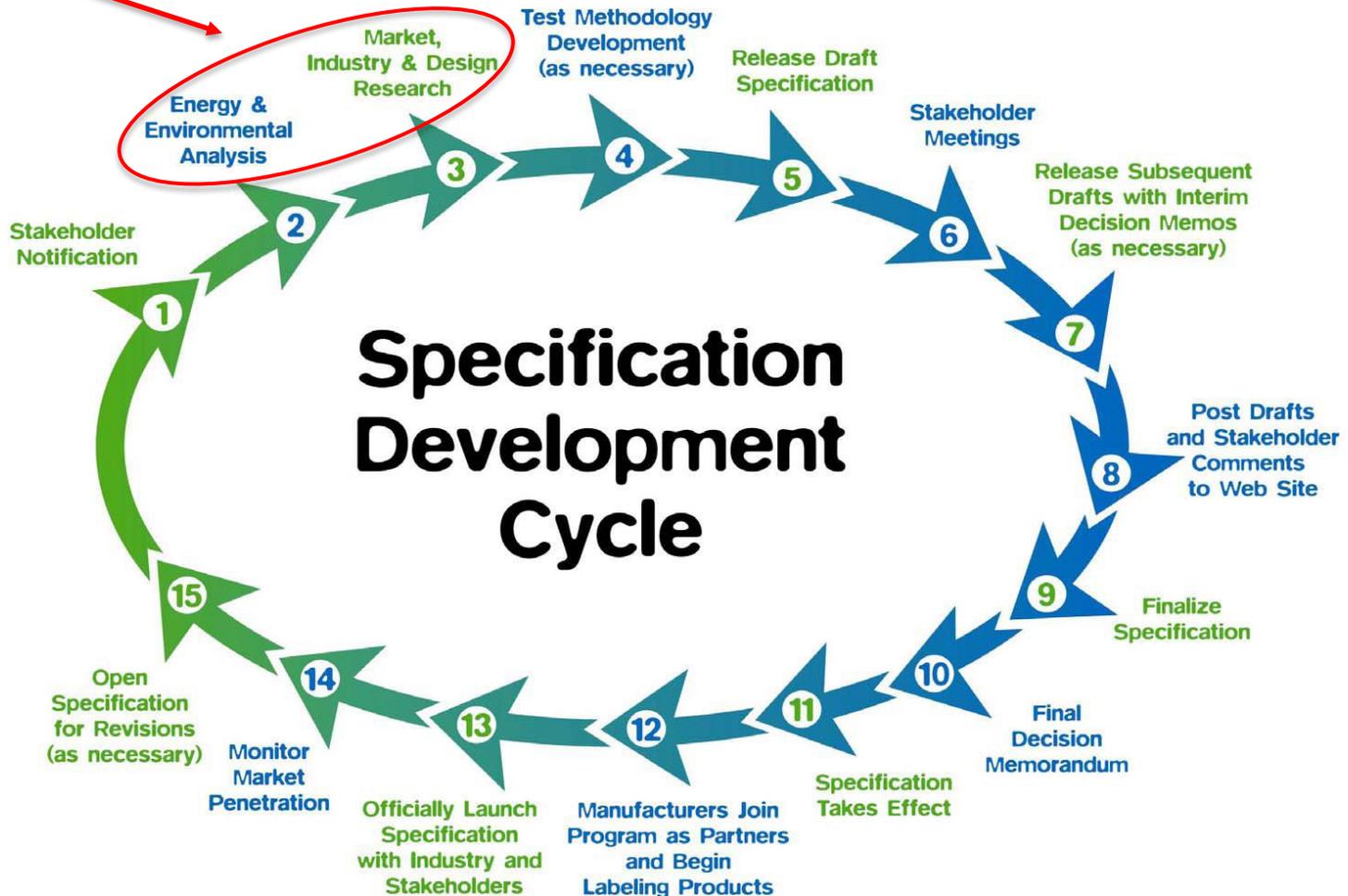
ICF

Chris Calwell

Ecos Research

Specification Development Process

We are here





Goals for Revision

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1:00–1:10	ENERGY STAR Specification Development
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Goals for V4.0

- Version 3.0 has been in effect since May 2013 and the market has changed in the last 4 years
- Market share has grown for key audio/video product significantly
 - Nearly 5 million ENERGY STAR certified Blu-ray players shipped in 2015, reflecting a 60% market share that continues to grow
 - New product types have types and features are now available
- Stakeholders have provided feedback and questions on both the test method and the specification, noting key issues that could be addressed with a revision



Priorities for Version 4.0

- Examine new efficiency opportunities for audio/video products
 - Address high market penetration for Blu-ray and DVD players
 - Determine additional energy saving features available in products and incentivize their use
- Incorporate new product types and new product features
- Fix test procedure issues to make testing more repeatable and representative of real-world conditions
- Analyze power consumption in different modes



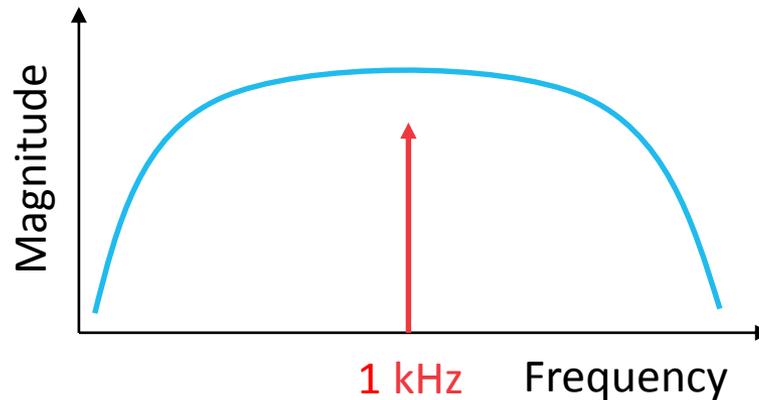
Testing Issues

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Amplifier Testing – Multi-channel Systems

- A stakeholder noted that the current test method may not be repeatable in multi-channel systems

1) Connect an input of the UUT to a generated 1 kHz sine wave input signal per Section 5.F).

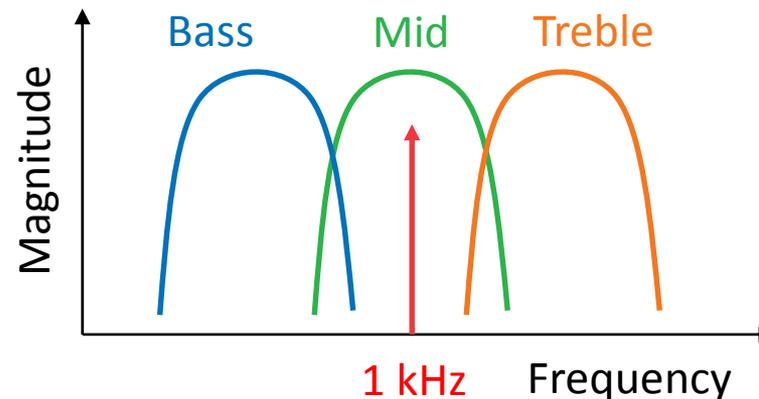


Amplifier Testing – Multi-channel Systems

- A 1 kHz sine wave input signal may not be appropriate

iii) If 1 kHz is outside the range of any bandwidth-limited channel in the UUT and the UUT has AV inputs, sweep the input signal frequency between the upper and lower -3 dB points of each channel. Record the input signal frequency when the UUT input power is at its maximum and use this frequency for the bandwidth-limited channel for the remainder of the test.

- 1 kHz may be within the range (pass band) of one channel, but not others (especially the bass)

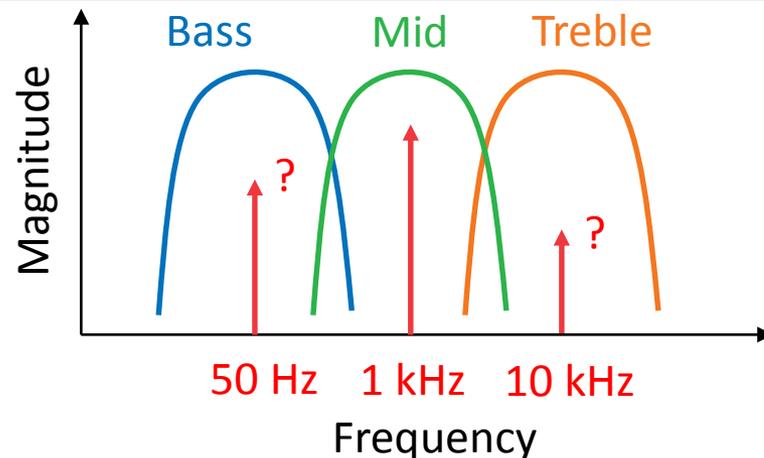


Amplifier Testing – Multi-channel Systems

- If multiple frequencies are used because 1 kHz is outside the pass band of any channel, the ratio of their amplitudes is not specified

iii) If 1 kHz is outside the range of any bandwidth-limited channel in the UUT and the UUT has AV inputs, sweep the input signal frequency between the upper and lower -3 dB points of each channel. Record the input signal frequency when the UUT input power is at its maximum and use this frequency for the bandwidth-limited channel for the remainder of the test.

- 2) Monitor each channel, one at a time, with a distortion analyzer and power meter.
- 3) Set the volume of the UUT to 100% and adjust the amplitude of the input signal until the THD of one or more channels is 1% or greater. For devices without AV inputs that are tested with an audio disc, adjust the volume until the THD of any single channel is 1% or greater.



Amplifier Testing – Multi-channel Systems

- This results in one or more channels that is not fully exercised, so the total measured input power of the device at 1/8th of Maximum Undistorted Power (MUP) may be less than 20 W

Table 5: Amplifier Efficiency Requirements

Amplifier Input Power at 1/8 MUP with 1 kHz Sinusoidal Input, P_{IN} (W)	Version 3.0 Minimum Amplifier Efficiency, η
$P_{IN} < 20$	N/A
$20 \leq P_{IN} < 100$	0.44

- As seen in Table 5 in Version 3.0, there is no efficiency requirements if the input power is below 20 W
- Since the test procedure may not properly capture the MUP, this may result in the product not being subject to an efficiency requirement that it otherwise should be



Amplifier Testing – Multi-channel Systems

EPA seeks feedback from stakeholders on how the test procedure can better account for multi-channel systems so it captures an accurate MUP from all output channels simultaneously

- Can MUP be obtained from all output channels at the same time?
- Should an input signal be specified for a given frequency range that might provide the best average MUP
 - For example, if the complete channel circuit responds to a frequency range of 500 Hz to 5 kHz, what frequency signal be used?



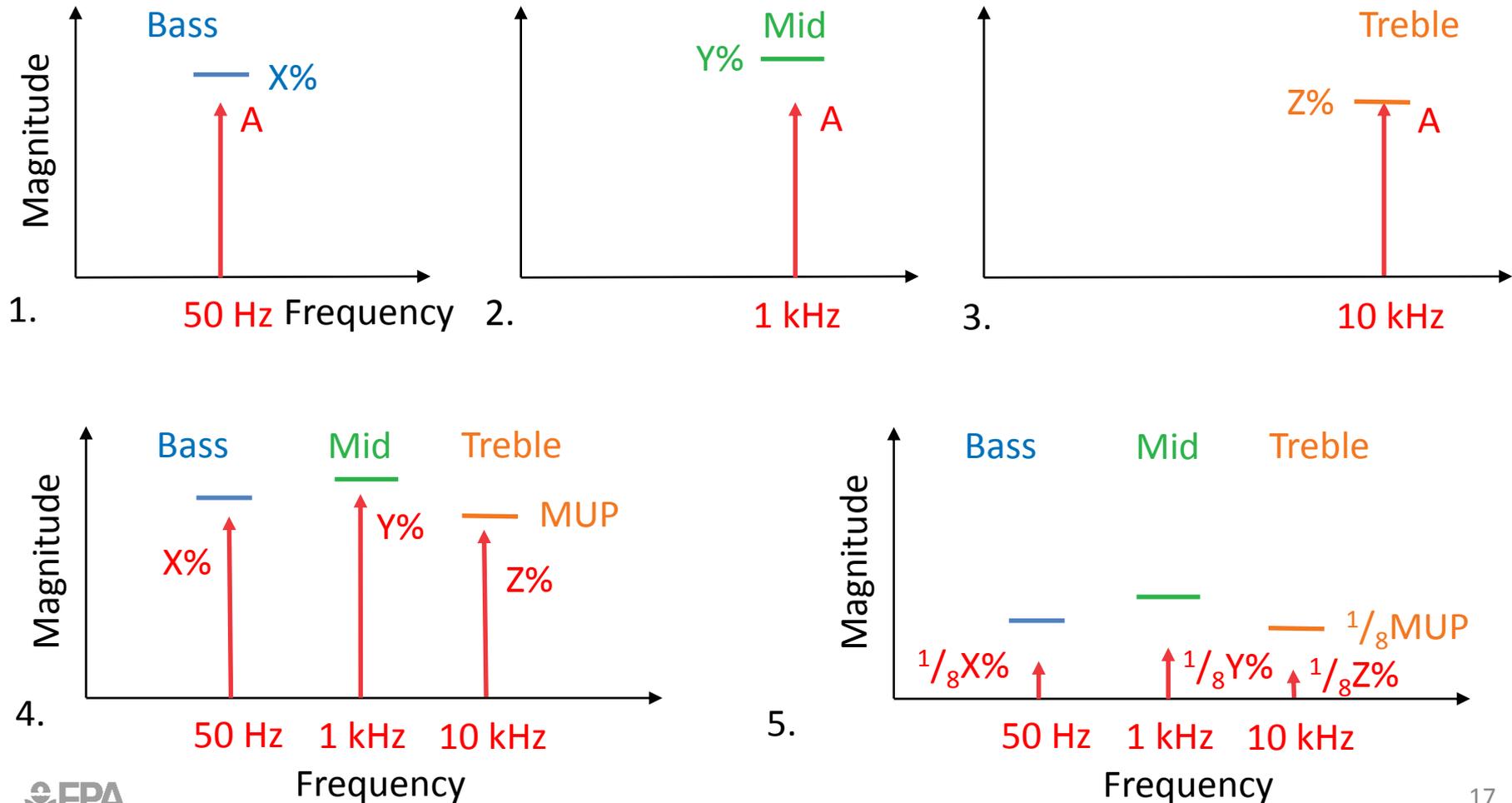
Amplifier Testing – Multi-channel Systems Proposal

EPA seeks feedback on this possible approach to determine the proportion of output power contributed by each channel at representative levels:

1. Measure each channel's output power capacity relative to the other channels (possibly with the other channels disconnected).
2. Calculate the percentage of each channel's output power relative to the overall total.
3. Bring all channels to the MUP at the same time in the proportion calculated above (within a reasonable tolerance).
4. Measure the MUP for each channel and divide by 8 ($1/8^{\text{th}}$ of MUP)
5. Measure the efficiency.



Amplifier Testing – Multi-channel Systems Proposal





Amplifier Testing - Load

- The test method requires the use of a resistive load when testing an amplifier that ships without speakers. EPA believes that this may not correctly model the response of a typical speaker.

L) Speaker Outputs:

- 1) If the UUT includes speaker outputs, connect a resistive load across each pair of output terminals equivalent to the minimum nominal rated load impedance (e.g., 6 ohm if rated 6–8 ohm). The same resistive load shall be used for all amplifier tests.
- 2) For self-powered or internal speakers with no accessible output terminals, output power must be measured across the speaker input leads, using the attached speaker as the load.

EPA is considering requiring an LR (inductive-resistive) circuit rather than simply a resistive circuit as a load. Would this be more reflective of a typical speaker?



Amplifier Testing – Load Proposal

EPA is also considering the use of a reference speaker as a load:

1. Select two different reference speaker designs (e.g., a lower cost, small 2-way design and a higher end, 3-way design)
2. Place them in an anechoic chamber
3. Connect each, in sequence to the amplifier under test
4. Play a standardized reference signal through the amplifier and steadily increase the volume until particular target decibel levels are achieved that reflect assumed maximum listening volumes
 - Possibly 85-95 decibels

EPA seeks feedback on whether this proposed approach would be an appropriate way to demonstrate the response of a typical speaker.



Amplifier Testing – Load Proposal

5. Assemble a standardized audio test clip of a few minutes in length
6. Play the test clip at the volume levels determined with the signal and record average power consumption.
 - Efficiency could be calculated based on which products achieve the lowest average AC power consumption (average across the two reference speakers and two volume levels)

EPA requests stakeholder input on the feasibility of assembling a representative standard audio test clip that would produce results comparable to range of typical listening content.



Wireless Testing

- Stakeholders have noted that the instructions for testing wireless products are unclear:

D) **Multi-component Systems:** For products composed of multiple components in separate housings, all components shall be connected together in a typical end-use configuration. Power shall be measured at each unique plug connection to the power source.

- Should this include being connected via routers, an existing home network, or other networking equipment intended for transmission?



Wireless Testing – 1st Proposal

- EPA is considering clarifying the test set up in the following two ways:

EPA is considering specifying minimum system components that shall be procured and used by the laboratory to replicate a typical setup.

Which components should be included (or excluded) from a 'minimum system' that could apply to all wireless audio products to best represent a typical end-use configuration?



Wireless Testing – 2nd Proposal

- Wireless audio products are likely to be used with wireless connections (e.g., Wi-Fi, Bluetooth, AirPlay); however, the test method currently prioritizes wired connections:

M) AV Signal Interconnections: If the UUT offers several audio and video interconnection options, select and configure the system with one of the following interconnections, in order of preference: HDMI, component, S-video, and composite. Only the connections needed to perform the test shall be connected at the time of test.

Wireless Testing – 2nd Proposal

EPA seeks feedback on changing the test method to:

- a) Prioritize wireless connections over wired, if applicable, and
- b) Include language that describes testing a product that has network connection capabilities

Example from ENERGY STAR Displays Specification:

- c) **Networking:** If the UUT has networking capability (i.e., it has the ability to obtain an IP address when configured and connected to a network) the networking capability shall be activated, and the UUT shall be connected to a live physical network (e.g., WiFi, Ethernet, etc.). The physical network shall support the highest and lowest data speeds of the UUT's network function. An active connection is defined as a live physical connection over the physical layer of the networking protocol. In the case of Ethernet, the connection shall be via a standard Cat 5e or better Ethernet cable to an Ethernet switch or router. In the case of WiFi the device shall be connected and tested in proximity to a wireless access point (AP). The tester shall configure the address layer of the protocol, taking note of the following:
- i. Internet Protocol (IP) v4 and IPv6 have neighbor discovery and will generally configure a limited, non-routable connection automatically.
 - ii. IP can be configured manually or by using Dynamic Host Configuration Protocol (DHCP) with an address in the 192.168.1.x Network Address Translation (NAT) address space if the UUT does not behave normally when autoIP is used. The network shall be configured to support the NAT address space and/or autoIP.
 - iii. The UUT shall maintain this live connection to the network for the duration of testing unless otherwise specified in this Test Method, disregarding any brief lapses (e.g., when transitioning between link speeds). If the UUT is equipped with multiple network capabilities, only one connection shall be made in the following order of preference:
 - a. WiFi (Institution of Electrical and Electronics Engineers - IEEE 802.11- 2007²)
 - b. Ethernet (IEEE 802.3). If the UUT supports Energy Efficient Ethernet (IEEE 802.3az- 2010³), then it shall be connected to a device that also supports IEEE 802.3az
 - c. Thunderbolt
 - d. USB
 - e. Firewire (IEEE 1394)
 - f. Other



Wireless Testing – 2nd Proposal

- What additional instructions regarding configuring network connections would be helpful to partners?
- Should EPA continue to require that all available network protocols be engaged during testing or include a list of preferences like in the example from the Displays Specification?
 - If a list of preferences would be more appropriate, which protocols should be included and in which order?



General Testing Question

Should the test method be updated to include testing for Dc-powered products?



New Product Types

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Multi-Room Speakers

- In addition to concerns regarding testing wireless products with wireless connections, as opposed to wired connections, stakeholders have noted that the configuration of certain wireless products are not properly accounted for in the specification and test procedure
- Whole-home audio and wireless home theater audio require the synchronization of several amplifiers so there is no noticeable delay in the sound emitted through their speakers.
- Some or all of the following components are necessary to enable a whole-home system ¹ :
 - Network bridge if the system uses the home Wi-Fi network for all or part of its connectivity;
 - Alternatively, a router or hub if the system uses its own dedicated network;
 - As a final option, some products can receive signals directly from another device;
 - Wireless amplifier modules/speakers capable of connecting to the bridge without a physical connection;
 - Wireless music source; and
 - Control device



Multi-Room Speakers

- Most wireless speakers and whole-home audio components are included in the scope of the Version 3.0 Audio/Video Specification
 - Except whole-home systems or dedicated whole-home audio bridges and hubs/routers
- EPA is interested in reviewing the power demands of the wireless functionality of wireless whole-home audio systems to ensure that the specification requirements reflect top performing products
 - Especially as the majority of products will be redesigned to provide wireless functionality in the future
- Although the test method can accommodate these products, it may not test them in a manner representative of typical use



Multi-Room Speakers

How can the Version 4.0 AV Test Method better account for dedicated audio bridges and hubs?

- For example, does the specification need to include dedicated whole-home audio bridges and hubs/routers in scope to better account for power draw of the wireless functionality of the whole-home system?
- Should dedicated bridges and hubs be considered as unique products or as a part of a wireless home audio system?



“Prosumer” Products

- Some stakeholders have noted that certain products remained out of scope for Version 3.0,
 - Or that it was difficult for them to meet the criteria, since such products were considered neither strictly consumer nor strictly commercial, according to the definitions in the specification

EPA is interested in understanding the extent to which these ‘prosumer’ products have evolved since the last AV specification revision to determine if an opportunity exists for developing more appropriate criteria for such products.

Please share information regarding the current state of the technology and energy use for these products as well as the market.



New Product Type – Discussion Question

- Are there any other products that are not included in the scope that should be considered? Either types of products or new configurations of products.
- Or that are not appropriately accounted for in the specification or test method?



Other Considerations for V4.0

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Multi-Enclosure Products

- The V3.0 specification requires all enclosures of a system to be tested and qualified against the requirements separately
- This results in products appearing side-by-side on the ENERGY STAR Product Finder without clear information on the power draw when products are intended to be used together as a system

EPA is considering requiring that all enclosures be tested and qualified against the requirements as a whole system.



Multi-Enclosure Products

- What benefits and drawbacks exist in requiring that all enclosures be tested and qualified as a system?
- Is there a better way to make it easy for consumers and other users of the ENERGY STAR Product Finder to compare the energy use of the whole product or system they are considering?



Soundbars

It was estimated that 5.8 million soundbars shipped in 2015.

- Given the prevalence of this product type, EPA is interested in ensuring that the specification and test method accurately account for these products in V4.0
- EPA requests feedback on updates to the test method to ensure that the ENERGY STAR test method continues to be appropriate for today's soundbars, including their likely deployments and operation (i.e., connected to a TV and always awaiting a signal).
 - EPA seeks data on the newest soundbar products to determine criteria that recognizes the most efficient soundbars on the market today.



Applicability of Efficiency Requirements

- The V3.0 specification requires products with audio amplification to meet requirements in Sleep, Idle, and Active modes
 - However, the Idle requirement does not apply to products that have Automatic Power Down (APD) enabled by default where its timing cannot be increased past 30 minutes.
 - Furthermore, the Active (efficiency) requirement does not apply to products with input power less than 20 W at 1/8 of Maximum Undistorted Power.

As a result, a large proportion of products are available on the market that only need to meet the Sleep Mode requirement



Applicability of Efficiency Requirements

EPA is interested in better understanding the power consumption and use profile associated with:

- 1) **Idle Mode** for products that are currently exempt due to having APD enabled by default where the timing cannot be increased past 30 minutes, and,
- 2) **Active Mode** for products with input power less than 20 W at 1/8 of Maximum Undistorted Power

- AV products may be in used multiple times per day by many users, so the total time spent Idling each day could exceed 30 minutes
- Power consumption associated with Active Mode may also be significantly higher than Idle Mode for many audio products, making Active Mode a meaningful contributor to total annual energy



Voice Activated Digital Assistants

Voice activated digital assistants, also called virtual assistants, are expected to be used at least once monthly by 60 million people in the U.S. this year.

Unit sales for these products have been predicted to reach 4.5 million units in 2017, a 52% increase over 2016².

- EPA is currently exploring opportunities related to the role these products are currently or could potentially play as home energy assistants and the impacts they may have on energy use in a home

² <https://www.cta.tech/News/Press-Releases/2016/January/Record-Year-Ahead-Consumer-Enthusiasm-for-Connect.aspx>



Voice Activated Digital Assistants

- How are voice activated digital assistants serving/able to serve as hubs for home energy management today, and how can they expand or improve in serving this function?
- What additional benefits/services can they provide to help consumers save and manage energy use in the home?
- Are there any technological or market challenges preventing them from serving as the ultimate home energy hub?



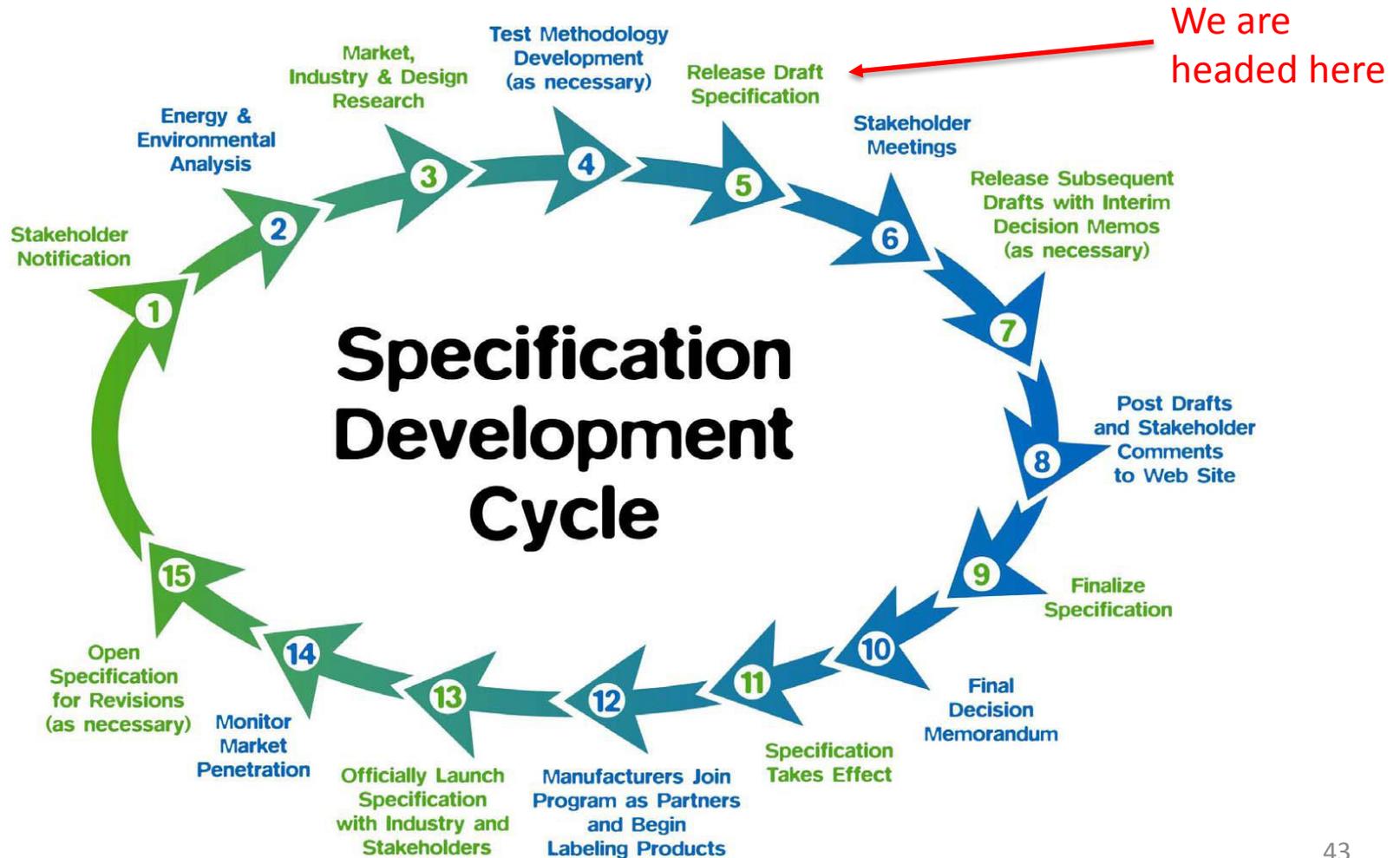
Discussion Questions



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Next Steps: After Data Assembly and Stakeholder Feedback





Next Steps for Version 8.0

Event	Date
<i>Launch of Version 4.0 Discussion Document</i>	<i>June 26, 2017</i>
<i>Discussion Document Webinar</i>	<i>July 17, 2017</i>
Discussion Document Comment Deadline	July 26, 2017
Draft 1 Specification Release	September 2017



Comments

- Comments on the Discussion Document are due on **July 26, 2016**.
- Please send all comments to:

audiovideo@energystar.gov

- Unless marked as confidential, all comments will be posted to the Audio/Video product development page at https://www.energystar.gov/products/spec/audiovideo_specification_version_4_0_pd
- Accessible through www.energystar.gov/RevisedSpecs and clicking on “Version 4.0 is in development” under “Audio/Video”



Thank you!

To be added to EPA's stakeholder listserve
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