



# ENERGY STAR® Set-Top Boxes Draft 2 Version 4.1 Specification

## Stakeholder Webinar June 17, 2013

U.S. Environmental Protection Agency  
U.S. Department of Energy

  Learn more at [energystar.gov](http://energystar.gov)

## Agenda



- 1 Introduction
- 2 Definitions & Scope
- 3 AEC Requirements
- 4 Deep Sleep & Power Management
- 5 Other Testing Clarifications
- 6 Partner Commitments
- 7 Next Steps & Open Comment

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## Webinar Details



- Audio provided via conference call in:
  - Call in:** +1.877.423.6338 (in the US)  
+1.571.281.2578 (international)
  - Code:** 456417
  - Please keep phone lines on mute unless speaking
  - Press \*6 to mute and un-mute your line
- Webinar materials will be available online shortly
  - Go to: [www.energystar.gov/RevisedSpecs](http://www.energystar.gov/RevisedSpecs)
  - Look for Set-Top Boxes & Cable Boxes
  - Click on: “Version 4.1 is under review.”



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## Introduction



- EPA and DOE appreciate stakeholders’ feedback on the Draft 1 specification and participation in today’s webinar

### **Katharine Kaplan**

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ENERGY STAR Product Development

### **Matt Malinowski**

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ICF International

### **Tom Bolioli**

Terra Novum

### **Jeremy Domm**

U.S. Department of Energy

### **Mansi Thakkar**

Navigant



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## Webinar Goals



1. Discuss Draft 2 specification changes and responses to Draft 1 comments
2. Hear stakeholder comments on all aspects of the specification
3. Discuss timeline to finalization



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## Definitions & Scope



1	Introduction
2	Definitions & Scope
3	AEC Requirements
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## Displayless Gateway



- Per stakeholder comment, EPA has simplified the definition, removing references to specific protocols

**Displayless Gateway:** A device combining hardware components with software programming designed for the primary purpose of receiving television and related services from terrestrial, cable, satellite, broadband, or local networks and *providing video without any direct video connection.*

- Definition now mirrors that for STBs.



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## Product Classification



- EPA has updated the product classification chart per the revised Displayless Gateway definition

		Primary purpose is receiving television and related services?		
		Yes		No
		Local Video Connection?		
		Yes	No	
Direct Service Provider Source Input?	Yes	STB	Displayless Video Gateway	Small Network Equipment covered in separate ENERGY STAR Specification
	No	Thin Client/ Remote STB	Excluded from Scope	



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## Service Provider



- Per stakeholder comment, EPA has clarified the definition of Service Provider to include organizations with customers who self-install their equipment

**Service Provider:** A business entity that provides video content, a delivery network, and associated *installation or support services* to subscribers with whom it has an ongoing contractual relationship.

## Product Family



- EPA has reverted back to the Product Family definition while the Basic Model concept is being finalized under the DOE Test Procedure process

**Product Family:** A group of product models that are

- (1) made by the same manufacturer,
- (2) subject to the same ENERGY STAR qualification criteria, and
- (3) of a common basic design.

Product models within a family differ from each other according to one or more characteristics or features that either

- (1) have no impact on product performance with regard to ENERGY STAR qualification criteria, or
- (2) are specified herein as acceptable variations within a product family. For Set-top Boxes, acceptable variations within a product family include aesthetic housing changes that do not affect the thermal characteristics of the device (e.g., color, labeling, or other cosmetic modifications).

## Product Family (cont'd)



- This Product Family definition and structure for certification allows for updates to the STB firmware or software as long as those changes continue to meet the ENERGY STAR requirements
- DOE and EPA are committed to harmonizing in all aspects of STB test procedures
- Therefore, EPA intends to migrate the ENERGY STAR specification to the Basic Model approach once DOE finalizes the test procedure rulemaking and provides the additional clarify stakeholders requested



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## Scope



- Cable DTAs
  - EPA has re-instated Cable DTAs within the scope of Version 4.1 ENERGY STAR specification as stakeholder feedback indicated that service providers remain committed to offering this product type in the near term.
- Networking Features
  - EPA wishes to clarify that gateways that combine TV services with networking are within scope



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# AEC Requirements



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- 2 Definitions & Scope
- 3 **AEC Requirements**
- 4 Deep Sleep & Power Management
- 5 Other Testing Clarifications
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# AEC Requirement



- AEC is the only metric for representation

$$(1 - Incentive_{DEEP\_SLEEP} - Incentive_{CLIENT\_ONLY}) \times AEC \leq AEC_{SPEC\_MAX}$$

Optional  
Incentives

AEC

≤ AEC<sub>BASE\_MAX</sub>

Base  
Allowance

+ ∑<sub>1</sub><sup>n</sup> AEC<sub>ADDL\_i</sub>

Additional  
Functionality  
Allowances



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## Additional Functionality Allowances Overview



- Definition Changes:
  - Multi-room definition **revision**
  - **New Functionalities**: Ultra HD, High Efficiency Video Processing, Three-dimensional (3D) Capability
- Allowance Changes:
  - **Removal** of Advanced Video Processing and High Definition (HD) Resolution
  - **Revisions**: Home Network Interface, MIMO Wi-Fi, Multi-room, DVR, DOCSIS
  - Networking **Additions**: Access Point, Router, Telephony



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## Multi-Room Definition



- The Multi-room allowance will no longer apply to STBs that only serve as whole-home DVRs
  - Whole-home DVRs continue to require clients that connect to the service provider network, limiting energy savings
- Definition also revised to apply more broadly to all single-family units, including apartments in multi-family buildings

**Multi-room**: The capability to **provide independent live audio/video content** to multiple devices (2 or more Clients) within a single family **living unit**. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.



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## New Functionality Definitions



- EPA has included the following definitions and may consider reasonable allowances in a future STB specification once performance data for these functionalities become available

**Ultra HD (4k) Resolution:** The capability to transmit or display video signals with a minimum output resolution of 3840x2160 pixels in progressive scan mode at minimum frame rate of 24 fps (abbreviated 2160p24).

**High Efficiency Video Processing:** Video decoding providing compression efficiency significantly higher than H.264/AVC, for example HEVC (H.265).

**Three-dimensional (3D) Capability:** The capability to transmit or display video signals with 3D depth information for stereoscopic display.



## Proposed V4.0 Allowances



Additional Functionality	V3.0 Allowance (kWh/yr)	V4.1 Draft 1 Allowance (kWh/yr)	V4.1 Draft 2 Allowance (kWh/yr)
Advanced Video Processing	12	8	0
CableCARD	15	15	15
Digital Video Recorder (DVR)	45	36	45
DOCSIS®	20	15	20
High Definition (HD)	25	16	0
Home Network Interface (HNI)	10	8	10
MIMO Wi-Fi HNI	-	$N_{2.4GHz} + N_{5GHz}$	$2N_{2.4GHz} + 7N_{5GHz}$
Multi-room	40	40	56
Multi-stream – Cable/Satellite	16	8	16
Multi-stream – Terrestrial/IP	8	6	6
Router	-	-	27
Access Point	-	-	8
Telephony	-	-	4
Removable Media Player	8	0	0
Removable Media Player / Recorder	10	0	0



## Removal of AVP & HD



- Due to the widespread adoption of AVP and HD resolution, EPA is proposing to eliminate allowances for these functionalities
- EPA has deleted the relevant definitions in this draft and re-analyzed the base allowances accordingly

**X** Advanced Video Processing: The capability to encode, decode, and/or transcode audio/video signals in accordance with standards H.264/MPEG 4 or SMPTE 421M.

**X** High Definition (HD) Resolution: The capability to transmit or display video signals with a minimum output resolution of 1280×720 pixels in progressive scan mode at minimum frame rate of 59.94 fps (abbreviated 720p60) or a minimum output resolution of 1920×1080 pixels in interlaced scan mode at 29.97 fps (abbreviated 1080i30).



## Existing Allowance Revisions



- EPA has increased the following allowances to account for highly-featured STBs that deliver whole-home energy savings through Thin Clients

Additional Functionality	V3.0 Allowance (kWh/yr)	V4.1 Draft 1 Allowance (kWh/yr)	V4.1 Draft 2 Allowance (kWh/yr)
Digital Video Recorder (DVR)	45	36	45
DOCSIS®	20	15	20
Multi-room	40	40	56
Multi-stream – Cable/Satellite	16	8	16



## Home Networking Interface



- EPA proposes to retain the Version 3.0 allowance of 10 kWh for HNI
- Although stakeholders commented that MoCA requires additional power, the 10 kWh adder should cover most of the energy of MoCA 2.0:

- Multi-room STBs:

$$3.5 \text{ W} \times 5 \text{ h} (H_{\text{MULTI-STREAM}}) + 0.5 \text{ W} \times 19 \text{ h} \rightarrow 9.9 \text{ kWh/yr}$$

- Thin Client/Remote STBs:

$$3.5 \text{ W} \times 7 \text{ h} (H_{\text{WATCH}}) + 0.5 \text{ W} \times 17 \text{ h} \rightarrow 12 \text{ kWh/yr}$$



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## WiFi Allowance Revision



- Allowance limited to systems with Wi-Fi “providing the primary video transport for the device”
- Revised to be in line with Version 1.0 Small Networking Equipment specification:
  - Per-stream 2.4 GHz allowance: 0.2 W → **1.8 kWh/yr**
  - Per-stream 5 GHz allowance: 1.3 W → **11 kWh/yr**

$$\text{MIMO Wi-Fi HNI: } 2 \times N_{2.4\text{GHz}} + 7 \times N_{5\text{GHz}}$$

Where:

*N is the number of spatial streams at the given frequency*

- Note that STB proposal also accounts for the 10 kWh/yr HNI allowance



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## New Networking Allowances



- EPA has provided new allowances based on those in the Version 1.0 ENERGY STAR Small Networking Equipment specification, currently under development

The Router and Access Point allowances **may only be applied once per STB**, and must be combined with the Home Network Interface allowance.

**Access Point:** The capability to provide wireless network connectivity to multiple clients. For the purposes of this specification, Access Point functionality includes only IEEE 802.11 (Wi-Fi) connectivity. **8 kWh/hr**

**Router:** The capability to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information. Router functionality includes Access Point functionality. **27 kWh/yr**

**Telephony:** The ability to provide analog telephone service through one or more RJ11 or RJ14 jacks. **4 kWh/yr**



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## Base Functionality Allowances Overview



- Clarified order of applying base functionality allowances
- Adjusted the base allowance amounts in response to new models qualifying and changes to the additional functionality allowances



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## Base Functionality Hierarchy



- Per stakeholder comments, EPA has revised the Base Type definitions such that a single STB can meet more than one

**Draft 1:**

**Cable:** A STB or Displayless Video Gateway *whose primary function is to* receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with Conditional Access (CA) or a STB capable of receiving cable service after installation of a CableCARD or other type of Conditional Access system.

**Draft 2:**

**Cable:** A STB or Displayless Video Gateway *that can receive* television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with Conditional Access (CA) or a STB capable of receiving cable service after installation of a CableCARD or other type of Conditional Access system.



## Base Functionality Hierarchy



- STBs can now meet more than one Base Type definition
- But only one Base Functionality Allowance shall be applied in the order specified in Table 1:

Base Type (Use Topmost if Multiple Apply)
1. Cable DTA
2. Cable
3. Satellite
4. Service Provider Internet Protocol (IP)
5. Over-the-top (OTT) Internet Protocol (IP)
6. Terrestrial
7. Thin-client / Remote

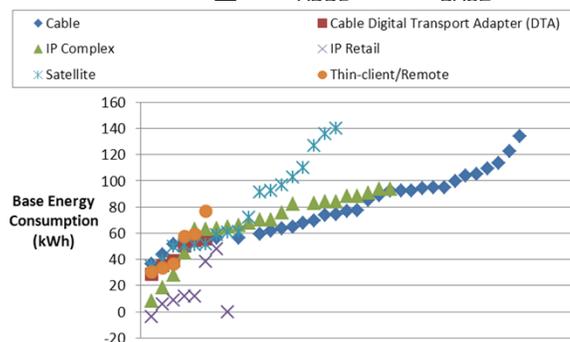


## Base Energy Consumption



- The base energy consumption for STBs in the dataset was calculated by subtracting the revised additional functionality allowances from the calculated AEC:

$$AEC - \sum AEC_{ADDL} = AEC_{BASE}$$

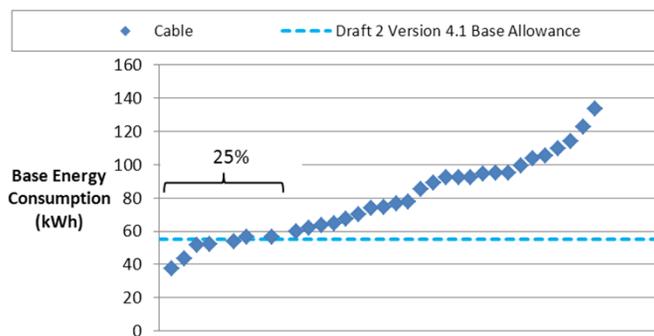


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## Base Functionality Allowances



- The base functionality allowances were then set by taking approximately the 25<sup>th</sup> percentile:



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## Base Functionality Allowances



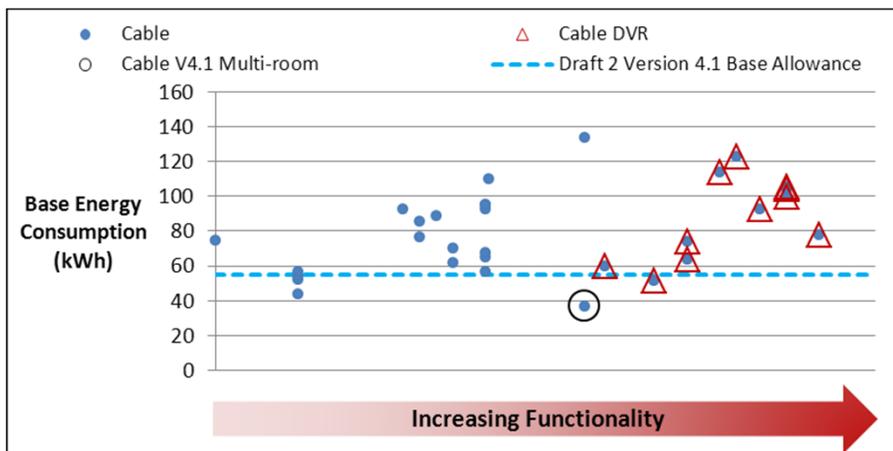
- EPA then adjusted the base allowance to ensure the following requirements were met:
  - Highly efficient models would be recognized
  - Consumers choice would be preserved
  - Highly functional models would continue to qualify
- The exception was Thin Clients, where EPA expects models to qualify pending low-power Sleep Mode implementation under MoCA 2.0

## Base Functionalities



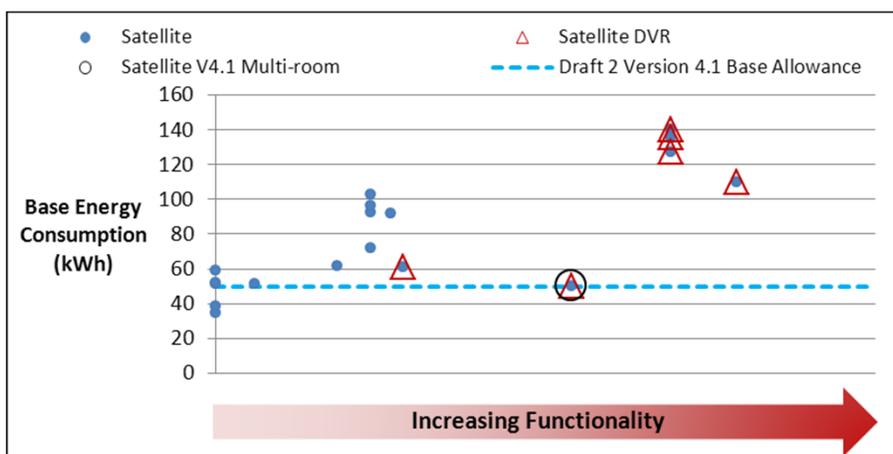
Base Type	Version 4.1 Draft 1 Allowance (kWh/yr)	Version 4.1 Draft 2 Allowance (kWh/yr)
1. Cable DTA	0	35
2. Cable	45	55
3. Satellite	50	50
4. Service Provider Internet Protocol (IP)	45	45
5. Over-the-top (OTT) Internet Protocol (IP)	10	10
6. Terrestrial	18	18
7. Thin-client / Remote	10	15

# Cable



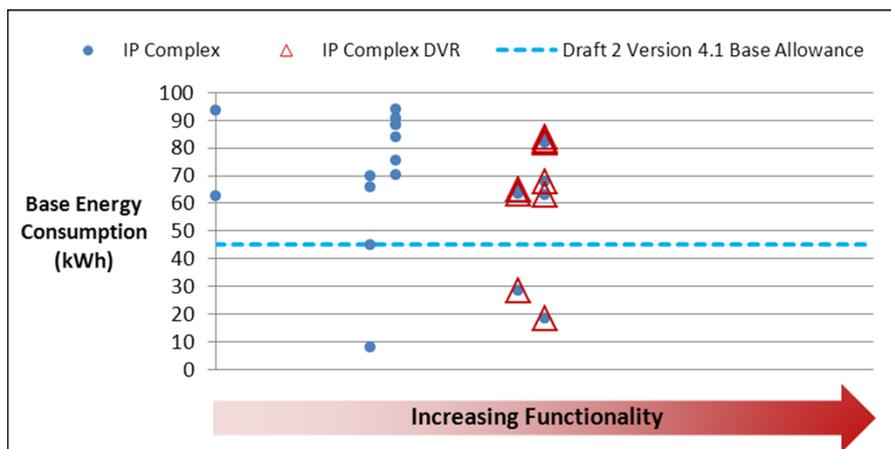
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# Satellite



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## Service Provider IP



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## Thin Client/Remote



- No currently-qualified Thin Client/Remote STBs would be able to meet proposed Draft 2 levels.
- Levels set to encourage adoption of MoCA 2:

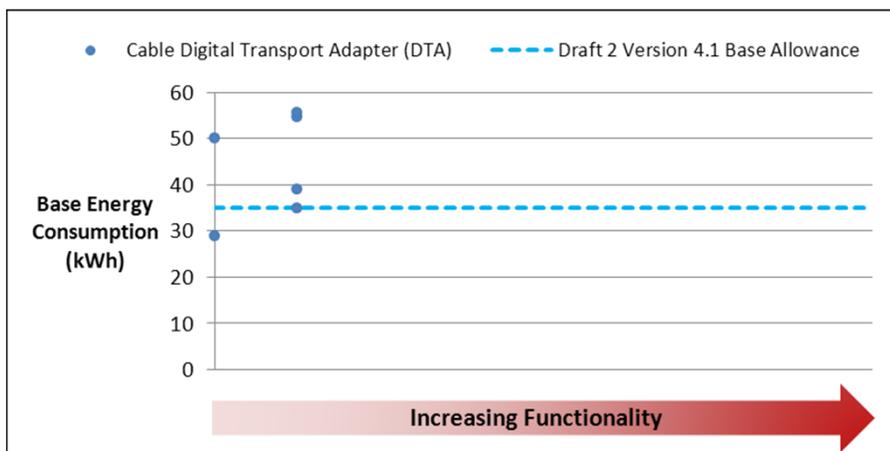
$$6.0 \text{ W} \times 7 \text{ h} (H_{\text{WATCH}}) + 1.5 \text{ W} \times 17 \text{ h} (H_{\text{SLEEP\_MANUAL}} + H_{\text{SLEEP\_APD}}) \rightarrow 25 \text{ kWh/yr}$$

- HNI Allowance: **10 kWh/yr**
- Base Allowance: **15 kWh/yr**



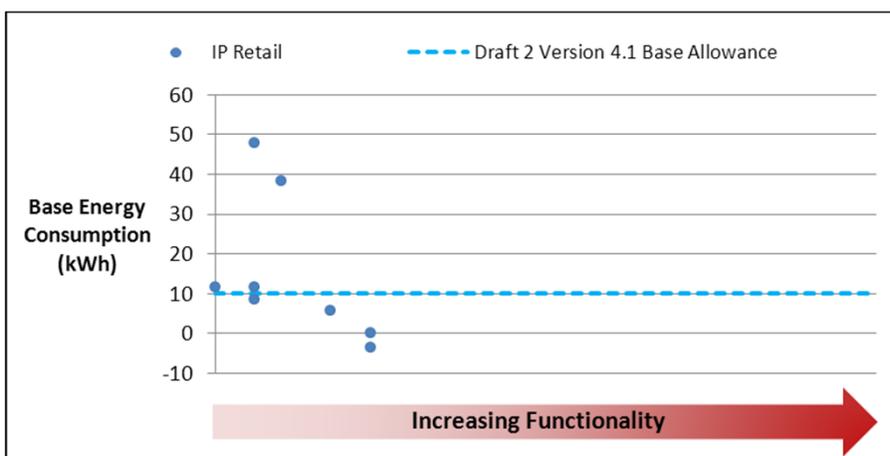
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## Cable DTA



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## Over-the-top IP



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## Deep Sleep & Power Management



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## Deep Sleep State Changes



- EPA and DOE have made a number of changes to the Deep Sleep State incentive to ensure that savings are realized
- New requirements for:
  - Power savings
  - Functionality
  - Testing
- The incentive no longer applies to Thin Clients or Over-the-top IP STBs
- No changes to the incentive amount: 17%



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## Deep Sleep State Savings



- Deep Sleep State has been redefined as a state within Sleep Mode
  - Deep Sleep State shall provide at least 5% savings over Sleep Mode as measured per DOE NOPR
  - Prevents double-counting of Sleep Mode Savings

STBs:

$$P_{SLEEP\_SP} \leq \min[\max(0.15 \times P_{WATCH}, 3 W), 0.95 \times P_{SLEEP\_APD}, 0.95 \times P_{SLEEP\_MANUAL}],$$

Displayless Gateways:

$$P_{SLEEP\_SP} \leq \min[\max(0.15 \times P_{WATCH}, 3 W), 0.95 \times P_{SLEEP}]$$



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## Deep Sleep State Functionality



- Deep Sleep State has been redefined as a state within Sleep Mode
  - Requires recovery within 30 seconds
- Deep Sleep State Incentive requirements have been revised
  - Activation through remote control or signal or timer; no more front panel activation
  - Deep sleep shall be enabled by default
  - Deep sleep shall not prevent user-scheduled DVR actions and vice-versa



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## Deep Sleep State Testing



- Two Methods for Testing Deep Sleep
  - **User-activated Deep Sleep:**  
Enabled per manufacturer instructions and process recorded
  - **Scheduled Deep Sleep:**  
New instructions specifying test duration and timing, including that test shall begin in On Mode

## Other Testing Clarifications



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5	<b>Other Testing Clarifications</b>
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## Home Network Interface Connections

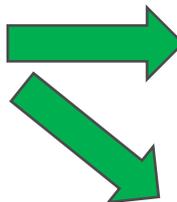


- EPA has separated Network connections for test

### Draft 1

Table 6: Input/Network Connections

Connection (Protocol)
1. Coax (QAM/DOCSIS)
2. Coax (MoCa)
3. Coax (HPNA)
4. Coax (Satellite)
5. WiFi
6. Ethernet
7. HomePlug AV
8. Other



### Draft 2

Table 6: Input Connections

Connection (Protocol)
1. Coax (QAM/DOCSIS)
2. Coax (Satellite)
3. WiFi
4. Ethernet
5. Other

Table 7: Network Connections

Connection (Protocol)
1. Coax (MoCa)
2. Coax (HPNA)
3. Wi-Fi
4. Ethernet
5. HomePlug AV
6. Other



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## Gateway Test Setup



- Simplified the testing conditions for Displayless Video Gateways
  - No substantive changes: gateways still connected to available network and telephony services, but not active



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## Partner Commitments



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## Manufacturer Partner Commitments



- EPA has removed recyclability from the Draft Manufacturer Partner Commitments
  - Stakeholder noted additional security of STBs and high refurbishment and recycling rates
- EPA has retained the toxicity requirements, harmonizing with European Union RoHS

*Product material requirements as defined in restriction of hazardous substances (RoHS) regulations, as generally accepted. This includes exemptions in force at the date of product manufacture, where the maximum concentration values tolerated by weight in homogeneous materials are: lead (0.1%), mercury (0.1%), cadmium (0.01%), hexavalent chromium (0.1%), polybrominated biphenyls (PBB) (0.1%), or polybrominated diphenyl ethers (PBDE) (0.1%). Batteries are exempt.*



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## Service Provider Partner Commitments



- No changes are proposed to the Service Provider Partner Commitments



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## Next Steps & Open Comment



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## Open Comment



- EPA would now like to open up the line for any additional comments from stakeholders

## Anticipated V4.1 Specification Development Timeline



Milestone	Anticipated Date
Final Draft	July 2013
Final Specification	August 2013
Effective Date	Spring 2014

## Written Comments



- In addition to making verbal comments during today's meeting, stakeholders are strongly encouraged to submit written comments and data
- Please send all comments to: [stbs@energystar.gov](mailto:stbs@energystar.gov)

### Comment Deadline

Wednesday, June 26, 2013



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## Contact Information



### Send Comments to:

[STBs@energystar.gov](mailto:STBs@energystar.gov)

### Other Questions:

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## References and Resources



- ENERGY STAR STB specification development:  
Go to [www.energystar.gov/RevisedSpecs](http://www.energystar.gov/RevisedSpecs)  
Look for “Set-top Boxes and Cable Boxes” and  
Click on “Version 4.1 is under review.”
- U.S. Department of Energy Set-top Box Rulemaking:  
[http://www1.eere.energy.gov/buildings/appliance\\_standard/rulemaking.aspx/ruleid/33](http://www1.eere.energy.gov/buildings/appliance_standard/rulemaking.aspx/ruleid/33)
- CEA-2043, Set-top Box Power Measurement  
[http://standards.ce.org/apps/group\\_public/project/details.php?project\\_id=51](http://standards.ce.org/apps/group_public/project/details.php?project_id=51)



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## Thank you!



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