

April 15, 2013

Ms. Katharine Kaplan
ENERGY STAR Set-Top Box Program
U.S. Environmental Protection Agency
1310 L Street, NW
Washington, DC

Subject: DIRECTV Comments on ENERGY STAR® Set-top Box Draft 1 Version 4.1 Specification

Dear Katharine:

DIRECTV, an ENERGY STAR Partner since 2009, appreciates this opportunity to provide comments on the ENERGY STAR Set-top Box Draft 1 Version 4.1 Specification. While EPA's proposed update takes into account some of the feedback provided by stakeholders including DIRECTV, it simply doesn't do enough to address the concerns of stakeholders participating in this rapidly changing product category.

DIRECTV has continued its industry leadership since providing you comments back in April 2012, receiving the Alliance to Save Energy's prestigious "Innovative Star of Energy Efficiency" award in October 2012¹ as well as moving 65 spots up (from 141 to 76) in the annual Newsweek "Green Rankings"². We were most excited, however, that after acknowledging our energy efficiency product design efforts with Excellence Awards in 2010, 2011, and 2012, the EPA honored DIRECTV with a Partner of the Year Award for 2013³...an award received in Washington DC last month by DIRECTV's CEO Mike White.

More important than any award, however, is the benefit DIRECTV's consumers get from their ENERGY STAR STBs, saving energy and money while continuing to enjoy their high quality, feature rich DIRECTV service. This benefit propels DIRECTV to continue designing and deploying energy efficient television delivery systems, systems that we hope will continue to be recognized with the ENERGY STAR logo once this newest revision of the ENERGY STAR STB program becomes effective.

Introducing DIRECTV's "ENERGY STAR 4.1 era" Products:

The newest generation DIRECTV Genie server, the HR44, debuted at CES2013 and will be in consumer homes later this year. This product is not a great leap forward in terms of customer features; rather it was designed for energy efficiency, increased reliability and lower cost in anticipation of the strong market success of DIRECTV Genie. The tables attached to this letter characterize HR44 within the ENERGY STAR V3 and Draft 1 V4.1 specifications and present QPL measurement data along with that of its predecessor, the (non-qualified) HR34 DIRECTV Genie server.

The ENERGY STAR V3 TEC for a DIRECTV Genie server is 208 kWh/yr, while its Draft 1 V4.1 AEC is 158 kWh/yr. The measured result, using the current ENERGY STAR V3 test procedure, is 244 kWh/yr for HR34 and 167 kWh/yr for the HR44, making HR44 better than 30% more efficient than its first-generation predecessor. This efficiency is gained for the most part through the use of more highly integrated and more

¹<http://ase.org/efficiencynews/2012-star-energy-efficiency-winners>

²<http://forums.solidsignal.com/content.php/1007-DIRECTV-gets-top-Green-Ranking-among-Pay-TV-Operators>

³<http://news.directv.com/2013/03/06/epa-names-directv-2013-energy-star-partner-of-the-year/>

efficient STB components, components that weren't available when HR34 was designed. While the HR44 complies with Version 3 by a healthy margin, it would unfortunately not qualify for Version 4.1 if the Draft 1 proposal remains unchanged.

The HR44 will be accompanied by a new generation DIRECTV C41Client, which similarly is more efficient than its first-generation (and ENERGY STAR qualified) predecessor, the C31. In this case as well, increased efficiency is gained mostly through the use of more highly integrated and more efficient STB components. Significantly smaller than a C31, the C41 also debuted at CES2013 and will be in consumer homes later this year.

The attached tables similarly characterize C41 within the ENERGY STAR V3 and Draft 1 V4.1 specifications as well as with C31. The ENERGY STAR V3 TEC for a DIRECTV Client is 82 kWh/yr, while its Draft 1 V4.1 AEC is 42 kWh/yr. The measured result for C31 is 47 kWh/yr and for the C41 model the result is 40 kWh/yr. While both of these devices comply with Version 3 by a healthy margin, C41 is marginal for Version 4.1 if the Draft 1 proposal remains unchanged.

With the average US household having 2.9 televisions, at DIRECTV a typical US installation in a new HD DVR household increasingly consists of a Genie server and two clients. Using the results presented above, the whole-home HD DVR energy usage in one of these typical households decreases from $(244+47+47=)$ 338 kWh/yr to just $(167+40+40=)$ 247 kWh/yr with the second generation Genie products, an improvement of more than 25%. Perhaps more significantly, on a per-TV-served basis DIRECTV's HR41/C41 Genie products have an energy consumption of $(247 / 3 =)$ 83 kWh/yr, a result that is not only well below the notable threshold of 100 kWh/yr, but one that outperforms the widely referenced HD DVRs from European satellite-industry leader BSkyB.

While these new products handily exceed the ENERGY STAR 3.0 program requirements and have truly world-class energy efficiency, they will not meet the proposed Draft 1 ENERGY STAR 4.1 program requirements proposed by EPA. Since these brand new products will not be updated by DIRECTV before the mid-2015 time frame, DIRECTV must urge EPA to consider the recommended changes to the Draft 1 specification that follow.

Comments on Draft 1 ENERGY STAR 4.1 Incentives:

DIRECTV would first like to applaud the EPA for its innovative approach for encouraging advancements in the areas of deep sleep, and client-only operational modes for servers. We recognize that the EPA is obligated to follow the DOE Test Procedure NOPR framework for quantifying these incentives, and appreciate that the EPA has found a way to offer them in spite of the complexities raised by this constraint. EPA's approach provides valuable encouragement for STB manufacturers and Service Providers to further investigate energy saving possibilities via these modes of operation.

At the same time, DIRECTV strongly objects to the EPA's suggestion that a mandatory requirement for "Deep Sleep" would form part of the STB Version 5 specification. Due to the limitations of one-way satellite broadcast systems, mandating such a requirement places the ability of satellite service providers to compete with the remainder of the Pay-TV industry at risk and could make participation in the STB product program infeasible. It is more practical to achieve such operational modes in thin client devices, however, although in the case of thin clients the benefit is lessened as they already consume relatively low levels of power.

We would urge to EPA to consider another incentive that encourages the purchase of servers which, through the use of industry standards such as RVU (www.rvualliance.org) and DLNA (www.dlna.org), can result in the elimination of thin clients entirely. For example, Smart TVs with RVU technology embedded in the connected TV as virtual inputs are being produced today by television industry leaders Samsung and Sony.

This “receiver-less output” incentive could be applied in a manner similar to that proposed for the deep sleep or client-only mode incentives, or alternatively by directly reducing the effective AEC number for the server by an amount proportional to the AEC allowance of the thin client that would become unnecessary in that event. In this case, which is similar to the strategy that EPA employed in Version 3 to incentivize STBs that can support multiple TVs, DIRECTV would recommend reduction of the AEC allowance by a value equal to half of the AEC allowance for the corresponding thin client.

Comments on Draft 1 ENERGY STAR 4.1 Allowances:

DIRECTV agrees with the EPA’s decision to not change the multi-room allowance from the Version 3 value of 40 kWh/yr. These devices still have relatively small market share and are evolving quickly. The trend will be for servers to have increasing functionality and complexity, as it is more cost effective and energy efficient to have a single device deliver new and innovative services throughout the home instead of multiple devices. EPA should continue to look for incentives that encourage the replacement of traditional STBs with thin clients and no-clients, and should applaud service providers’ plans to incorporate new functionality such as transcoding and additional tuners that allow viewing on energy efficient devices such as tablets and smartphones.

DIRECTV is concerned about the aggressive reduction in the Version 3 base allowances for thin clients in excess of 50%. This combines with the currently inadequate HNI allowance (which, as explained during the March 29th public meeting, does not cover the minimum needed for MoCA) to make the Version 4.1 thin client targets extremely challenging. Comparisons to IPTV STBs can be misleading, as the supported features and hardware capability differ (e.g. elements for video processing capability, network interface capability, reliability and security). We urge the EPA to use a thin-client allowance of 20 kWh/yr that it proposed in the previous draft, a reduction of 43% from the Version 3 level. In addition, we continue to recommend that the EPA not reduce the HNI allowance from the ENERGY STAR V3 level of 10 kWh/yr.

Functionality	Version 3 allowance	Draft Version 4 allowance	Draft1 Version 4.1 allowance	Requested V4.1 allowance
Thin Client/Remote	35	20	10	20
Home Network Interface	10	8	8	10

The concept of an HNI additional allowance for MIMO wireless interfaces designed to provide “service provider quality” real-time video services is welcome. Based on product information already made available for first generation products, however, we observe that the proposed allowance is not adequate. Measured results, again using the current ENERGY STAR V3 procedures, follow for DIRECTV C41 and C41W models from the same DIRECTV manufacturer:

Model	PTV	PSLEEP	PAPD	PDEEP SLEEP	PPLAYBACK	PRECORD	TEC
	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(kWh/yr)
C41-100	6.01	4.56	4.56				43.65
C41W-100	7.92	6.3	6.3				59.33

As the C41W simply replaces the C41’s MoCA capability with a new, service provider grade, wireless capability, there is no better “apples to apples” comparison available that this. We conclude from this actual

product data that the difference attributable to the wireless portion of DIRECTV’s implementation is 16 kWh/yr. The C41W uses two spatial streams in the 5 GHz range, so the adder from the Draft 1 specification would be 4 kWh/yr. DIRECTV recommends a quadrupling of the adder for each spatial stream and in both the 2.4 GHz and 5 GHz bands. The reliability of the wireless link is the most important element for the success of this technology, a reliability that demands higher power operation than may be typical of general purpose broadband wireless devices.

Regarding MoCA, it was widely reported in the March 29 meeting that MoCA uses more power than other network interfaces. DIRECTV suggests that an HNI adder of 5kWh/yr would bring the total allocation for a MoCA interface more in line with real-world experience.

Functionality	Draft 1 Version 4.1 Adder	Requested Version 4.1 HNI Adder
MIMI Wi-Fi HNI	$N_{2.4\text{ GHz}} + 2 \times N_{5\text{ GHz}}$	$4 \times N_{2.4\text{ GHz}} + 8 \times N_{5\text{ GHz}}$
MoCA HNI	N/A	5

Proposed New Allowances:

As the effective date for V4.1 is delayed, the likelihood increases greatly that V4.1 will overlap with the introduction of set-top boxes supporting Ultra HD (4K) and HEVC. Including such considerations in the specification will help allow for innovation in the market. It is important to understand that the addition of capabilities such as Ultra HD and HEVC in a product tends to increase complexity and possible energy use of the basic product even if the new feature in question is not being specifically exercised. DIRECTV suggests that the EPA align with the numbers in the European Voluntary Agreement, using values of 30 kWh/yr and 20 kWh/yr respectively. Note that while volumes of first generation products with this feature will be limited, addition of this feature in ENERGY STAR 4.1 will encourage innovation in this area. Furthermore, the EPA need not be concerned that these adders would be invoked by manufacturers and service providers in order to gain margin for ENERGY STAR compliance, as the cost of initial implementations are expected to be high due to their significant technological complexity.

The EPA has suggested that the complexity of a transcoder may be included in the Advanced Video Processing function defined in their document, or even in the displayless video gateway, whereas such transcoding functionality is not included in today’s servers for supporting the whole-home architecture. A next generation server with transcoding included in it will offer increased flexibility in distributing the service providers’ content to customers, and will be able to support additional devices such as tablets and mobile phones in and out of the home. The transcoding functionality will tend to incur additional energy use. DIRECTV reminds EPA of its earlier request for an additional allowance of 13 kWh/yr for each instance of a transcoding function.

Allowance for the complexity of multiple simultaneous decoding would also be appropriate whenever the device is capable of supporting direct video output to multiple displays or if the device supports a Picture-in-Picture capability: DIRECTV recommends a value of 10 kWh/yr for this capability.

Functionality	Requested Version 4.1 adder (kWh/yr)
Ultra HD	30
HEVC	20
Transcoding	$N \times 13$
Multiple video decode (per additional decode)	10

We urge the EPA to also consider the use-case of a server device simultaneously streaming content to multiple client devices via multiple HNI interfaces. As an example, a video server might include both a wireless video interface to communicate with one thin client and a MoCA interface to simultaneously communicate with another thin client. While there might be limited implementation of such architectures today, it is an approach expected to prove beneficial to service providers as they extend the availability of services throughout the home.

With regards to the definition of a server, we note that EPA's current definition of a "Displayless Video Gateway" introduces a lot of specifics that simply cover the more general functions of a Video Gateway, whether it is "Displayless" or not. In essence the Video gateway is simply a Multiroom STB without a direct display. It does not necessarily include additional encode and decode capability to connect to a client. The connection between a server and a client is not a "security layer", and it might be best to leave the definition of a home networking technology open so that it covers all possible technologies and instances of the protocol layers all the way from the Physical layer to the Application layer. It may be appropriate to simply call a "Displayless Video Gateway" a STB without direct video output.

Finally, DIRECTV would like to comment on the anticipated V4.1 Specification development timeline presented at the March 29 stakeholder meeting. EPA is allowing itself less than two months to both assimilate stakeholders' comments and revise Draft 1 into a specification that is so thoroughly vetted that it could be considered a Final Draft by a consensus of stakeholders. Given EPA's own guidance is that a Final Draft requires nothing more than editorial changes and text clarifications to become a Final Spec, this seems an overly ambitious goal. While the desire to proceed with haste is understandable given that Version 3 has been in effect for 18 months, EPA should strongly consider including a "Draft 2" specification and review cycle in this process.

DIRECTV looks forward to continued participation in this Version 4.1 review process, and welcomes a continued conversation on each of the recommendations raised. The ENERGY STAR STB program has in only a few years made a remarkable impact on the energy efficiency of this very complex product category, and DIRECTV has been very proud to be an integral part of this extremely successful and important voluntary initiative.

Kuriacose Joseph
Director, Engineering

Cc:
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Attachment: DIRECTV Genie Product Data

Table: ENERGY STAR Version 3 & Draft 1 Version 4.1 Allowances for a DIRECTV Genie server.

(1) Choose Version	Version 3.0	Draft 4.1
(2) Choose Base functionality	<i>Base Functionality</i> Satellite	<i>Allowance (kWh/yr)</i> 70
(3) Select Additional Functionalities	<i>Allowance (kWh/yr)</i>	<i>Allowance (kWh/yr)</i>
Multi-Stream Cable/Satellite	TRUE	16
Multi-Stream-Terrestrial/IP	FALSE	0
Adv. Video Processing	TRUE	12
DVR	TRUE	45
High Definition	TRUE	25
Removable Media Player	FALSE	0
Removable Media Player/Recorder	FALSE	0
Multi-Room	TRUE	40
Cable Card - Enter Numbers	0	0
DOCSIS	FALSE	0
Home network Interface	FALSE	0
(4) Annual Allowance	208	158

Table: HR34 and HR44 measured results, using the current ENERGY STAR Version 3 test procedure.

Model	P TV	P SLEEP	P PAPD	P DEEP SLEEP	P PLAYBACK	P RECORD	TEC
	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(kWh/yr)
HR34-700	28.51	26.86			28.28	28.35	243.73
HR44-500	19.7	18.8	18.8				167

Attachment: DIRECTV Thin Client Product Data

Table: ENERGY STAR Version 3 & Draft 1 Version 4.1 Allowances for a DIRECTV Thin Client

(1) Choose Version	Version 3.0	Draft 4.1
(2) Choose Base functionality	<i>Base Functionality</i> Thin-Client/Remote	<i>Allowance (kWh/yr)</i> 35
(3) Select Additional Functionalities	<i>Allowance (kWh/yr)</i>	<i>Allowance (kWh/yr)</i>
Multi-Stream Cable/Satellite	FALSE	0
Multi-Stream-Terrestrial/IP	FALSE	0
Adv. Video Processing	TRUE	12
DVR	FALSE	0
High Definition	TRUE	25
Removable Media Player	FALSE	0
Removable Media Player/Recorder	FALSE	0
Multi-Room	FALSE	0
Cable Card - Enter Numbers	0	0
DOCSIS	FALSE	0
Home network Interface	TRUE	10
(4) Annual Allowance	82	42

Table: C31 and C41 measured results, using the current ENERGY STAR Version 3 test procedure. Both models are from the same DIRECTV manufacturer.

Model	P _{TV}	P _{SLEEP}	P _{APD}	P _{DEEP SLEEP}	P _{PLAYBACK}	P _{RECORD}	TEC
	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(Watt)	(kWh/yr)
C31-700	5.87	4.54					47
C41-700	5.50	4.22	4.21				40