[6450-01-P]

DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[Docket No. EERE-2016-BT-TP-0023]

RIN 1904-AD70

Energy Efficiency Program: Test Procedure for Televisions; Request for Information

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Request for Information (RFI).

SUMMARY: The U.S. Department of Energy (DOE) is initiating a rulemaking to consider whether revisions are needed to the test procedure for televisions. To inform interested parties and to facilitate this process, DOE has gathered data and identified several issues associated with the current DOE test procedure on which DOE is particularly interested in receiving comment. The issues outlined in this document mainly concern on-mode power measurement. DOE welcomes written comments from the public on any subject within the scope of the television test procedure (including topics not specifically raised in this request for information).

DATES: Written comments and information are requested on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN FEDERAL REGISTER]**.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at http://www.regulations.gov. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2016–BT–TP–0023, by any of the following methods:

- E-mail: Televisions2016TP0023@ee.doe.gov. Include docket number EERE–2016–BT–TP–0023 in the subject line of the message.
- Mail: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–5B, EERE–2016–BT–TP–0023, 1000 Independence Avenue, SW., Washington, DC 20585– 0121. Phone: (202) 586–2945. Please submit one signed paper original.
- Hand Delivery/Courier: Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 6th Floor, 950 L'Enfant Plaza, SW., Washington, DC 20024. Phone: (202) 586–2945. Please submit one signed paper original.
  Instructions: All submissions received must include the agency name and docket number for this rulemaking. No telefacsimilies (faxes) will be accepted.

Docket: For access to the docket to read background documents and comments received, go to the Federal eRulemaking Portal at http://www.regulations.gov/#!docketDetail;D=EERE-2016-BT-TP-0023.

FOR FURTHER INFORMATION CONTACT: Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–5B, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: 202–586–9870. E-mail: televisions@ee.doe.gov.

Jennifer Tiedeman, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: 202–287–6111. E-mail: jennifer.tiedeman@hq.doe.gov.

For information on how to submit or review public comments, contact Ms. Brenda Edwards, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Mailstop EE-5B, 1000 Independence Avenue SW., Washington, DC 20585-0121. Telephone: (202) 586-2945. Email: Brenda.Edwards@ee.doe.gov.

SUPPLEMENTARY INFORMATION:

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I. Introduction

On October 25, 2013, DOE published a final rule adopting the test procedure for televisions ("TV procedure final rule") at appendix H to subpart B of 10 CFR part 430. 78 FR 63823. This test procedure includes methods for measuring active mode (on-mode), standby mode, and off mode power draw; screen luminance; and the annual energy use of television sets. As part of the on-mode testing, DOE adopted the use of the "International Electrotechnical Commission 62087 Edition 3: Methods of measurement for the power consumption of audio, video, and related equipment" (IEC 62087). IEC 62087 includes a video test clip on a DVD and BluRay disc to be used when conducting on-mode testing (IEC test clip), as well as screen luminance measurements (3-bar image).

The Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291, et seq.; "EPCA") provides DOE the authority to consider and prescribe new energy conservation test procedures for TVs. (All references to EPCA refer to the statute as amended through the Energy Efficiency Improvement Act of 2015 (EEIA 2015), Public Law 114-11 (April 30, 2015)). Specifically, section 323 of EPCA sets forth generally applicable criteria and procedures for DOE's adoption and amendment of test procedures. EPCA provides that any test procedures prescribed or amended under this section must be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

II. Discussion

A. Evaluation of the IEC Test Clip

DOE performed initial testing on three Brand X televisions (TVs), one Brand Y TV, and one Brand Z TV to determine how representative the current IEC test clip is in terms of measuring the energy use of TVs during a representative average use cycle or period of use. Table 1 has a description of each TV model DOE tested.

Table 1: TVs Included in DOE's Initial Testing

ID #	Screen Size	Resolution (Horizontal x Vertical Pixels)	Smart TV (Y/N)	Backlight	Model Year
Brand X #1	48"	1920 x 1080 (1080p)	Y	LED	2015
Brand X #2	48"	1280 x 720 (720p)	N	LED	2014
Brand X #3	48"	3840 x 2160 (4k)	Y	LED	2015
Brand Y #4	49"	1920 x 1080 (1080p)	Y	LED	2015
Brand Z #5	48"	1920 x 1080 (1080p)	Y	LED	2015

DOE tested each TV using multiple video clips and compared the power measurements when using the IEC test clip compared to other video clips. All video clips were upconverted to the TV's native resolution. The following video clips were used for testing:

1. **IEC Test Clip**
   "IEC 62087 Edition 3.0 Blu-Ray Disc dynamic broadcast-content video signal." This is the standard video clip used as per the DOE test procedure. The video is 620 seconds long, including 10 seconds each of introduction and conclusion. The main content consists of various moving scenes, each typically lasting a few seconds.
2. **Recut IEC Test Clip**

To create the recut IEC video, DOE edited the video in the original IEC test clip. Specifically, DOE recut the original IEC video into twenty 30-second portions, plus the 10-second introduction and conclusion, and then shuffled the order of the clip.

3. **Movie 1**
   The Movie 1 video is a 620-second portion of the BluRay movie "Cloudy with a Chance of Meatballs."
4. **Movie 2**
   The Movie 2 video is a 620-second portion of a live-action movie ("National Treasure") recorded from an HD television broadcast. There are no commercials during this 620 second segment.
5. **News**
   The News video is a 620-second portion of live news programming recorded from an HD television broadcast. It contains approximately 260 seconds of commercials, which occur in a single portion.
6. **Sports 1**
   The Sports 1 video is a 620-second portion of a football game recorded from an HD (1080i) television broadcast. It contains approximately 270 seconds of commercials, which occur in two separate portions.
7. **Sports 2**
   The Sports 2 video is a 620-second portion of a soccer game recorded from an online HD (720p) source. It does not contain any commercials.

DOE performed all this testing according to the DOE TV test procedure (except for the substituted video clip). For TVs with automatic brightness control enabled by default, DOE performed the comparisons only at 100 lux lighting because DOE expects the same behavior at all lux values. Table 2 shows the average on-mode power draw in watts (W) for the TVs tested using the various video clips described in this section.

Table 2: 620-second Average On Mode Power Draw for Each Tested TV

Video Clip	Brand X #1 (W)	Brand X #2 (W)	Brand X #3 (W)	BRAND Y #4 (W)	Brand Z #5 (W)
IEC	52.7	29.7	91.1	42.6	69.4
Recut IEC	52.4	29.7	93.6	41.4	69.1
Movie 1	64.0	29.9	113.2	58.1	69.0
Movie 2	54.8	29.6	103.7	48.3	69.8
News	55.1	29.9	89.7	58.7	70.6
Sports 1	51.7	29.7	95.2	52.8	69.7
Sports 2	52.4	29.7	87.3	58.5	70.6

While there was no significant difference in power draw for the Brand X #2 or Brand Z #5 across all tested clips, Brand Y #4, Brand X #1, and Brand X #3 exhibited differences in power draw between the IEC test clips and other video sources. This difference in power draw appears to be related to the amount of motion in the video clips, discussed in further detail in the following section.

B. On-Mode Power Draw with Motion Detection Functionality

Brand X #1, Brand X #3 and Brand Y TVs have certain brightness features enabled by default settings that are sometimes referred by "Motion Lighting" (ML) or "Motion Eye Care" (MEC). According to the description in user manuals, these features reduce the brightness of the TV when displaying high-motion content. The ML feature has two options: On and Off. The MEC feature has three options: High, Low, and Off. By default, the Brand X TVs were set to "On" and the Brand Y TV was set to "High." DOE conducted its initial testing of these models using these default modes. DOE then disabled these features (i.e., DOE set the TVs to "ML Off" and "MEC Off," respectively) and re-ran all of the test clips to evaluate how the features affect

the TV power draw. Again, the test setup and power measurements were performed according to the DOE test procedure (except for the substituted video clips). The following sections describe the test results for each of the Brand X and Brand Y TVs.

1. Brand X #1

Table 3 shows the results of the tests for Brand X #1.

Table 3: 620-second Average Power Draw for Brand X #1 with ML On and ML Off

Video	Brand X #1 (W)		
	ML On	ML Off	% Increase
IEC	52.7	70.5	34%
Recut IEC	52.4	70.4	34%
Movie 1	64	70.2	10%
Movie 2	54.8	70.3	28%
News	55.1	70.4	28%
Sports 1	51.7	69.6	35%
Sports 2	52.4	70.4	34%

For Brand X #1, the IEC clip showed a 34% increase in power draw when ML was off compared to "ML On," which is the default setting. The same increase was found when the units were tested using the Sports 1 and Sports 2 clips, but the increase was much smaller when the units were tested using Movie 1. The following power traces over the duration of each clip show in greater detail how ML affected the TV's on-mode power draw.

Figure 1: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during IEC Video

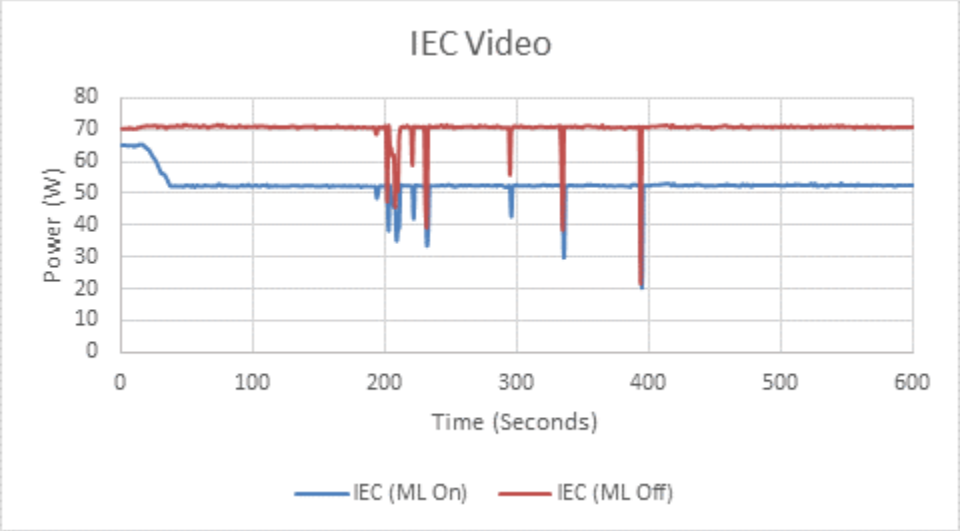


Figure 2: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during Recut IEC Video

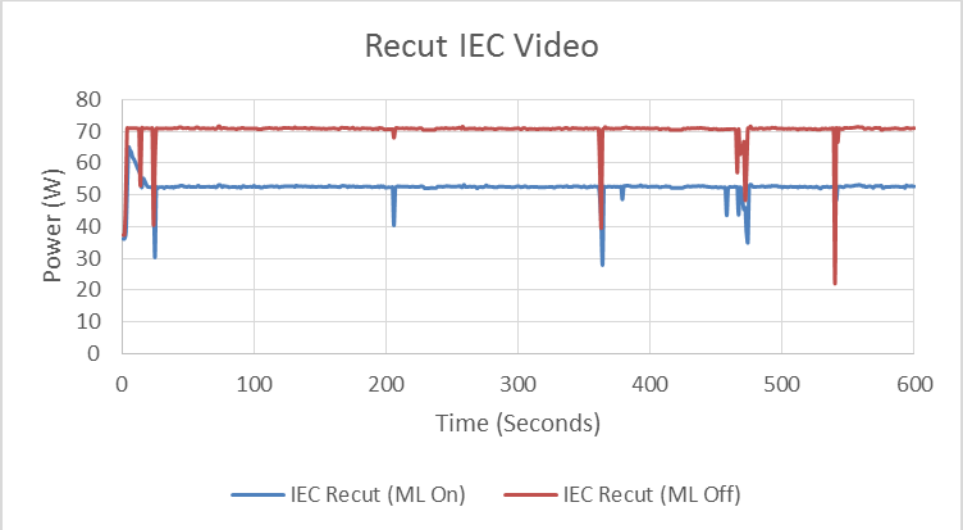


Figure 3: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during Movie 1 Video

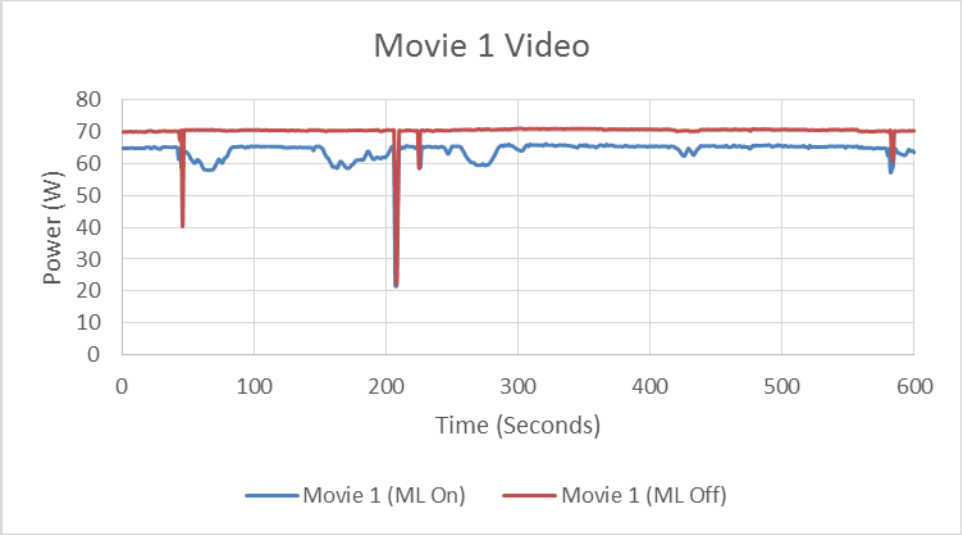


Figure 4: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during Movie 2 Video

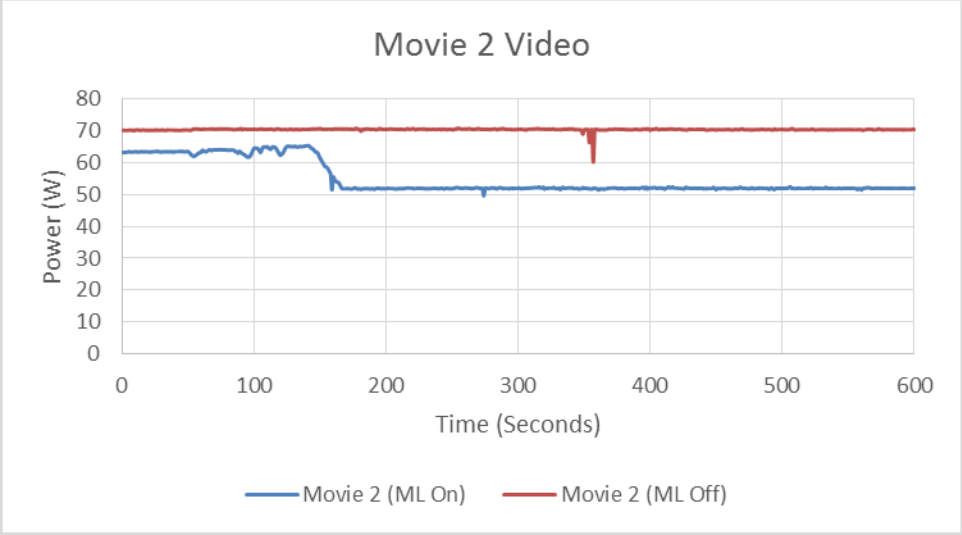


Figure 5: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during News Video

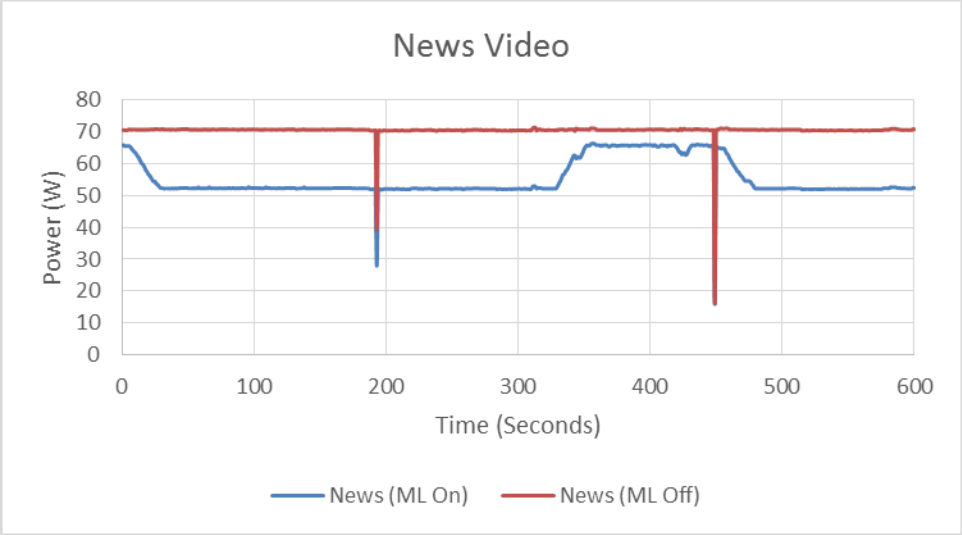


Figure 6: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during Sports 1 Video

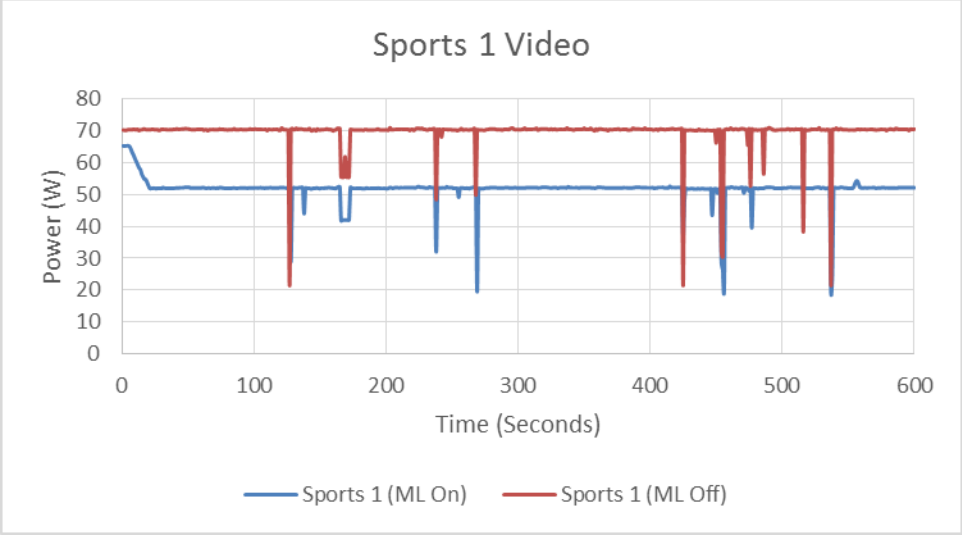
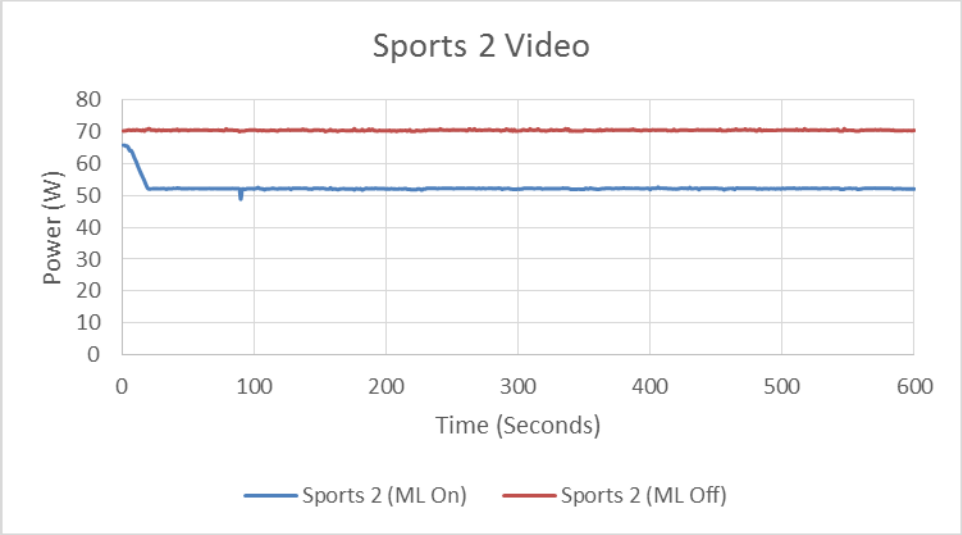


Figure 7: Comparison of Power Usage of ML On versus ML Off for Brand X #1 during Sports 2 Video



In summary, IEC, Sports 1, and Sports 2, ML On caused a sharp reduction in the power draw near the beginning of each clip, and the power draw remained lower for the duration of the clip. In the case of Movie 2, ML On did not cause a reduction in the power draw until much later in the clip. In the News clip, ML caused the TV to drop in power, except for one portion in the middle of the clip. And for Movie 1, ML had a much smaller impact and did not reduce Brand X 1's power draw significantly. Thus, ML appeared to detect motion and reduce power when a certain amount of motion was detected.

2. Brand X #3

Table 4 shows the results of the tests for Brand X #3.

Table 4: 620-second Average Power Draw for Brand X #3 with ML On and ML Off

Video	Brand X #3 (W)		
	ML On	ML Off	% Increase
IEC	91.1	103.3	13%
Recut IEC	93.6	102.9	10%
Movie 1	113.2	104.2	-8%
Movie 2	103.7	103.3	0%
News	89.7	104.2	16%
Sports 1	95.2	103.1	8%
Sports 2	87.3	104.6	20%

Brand X #3 showed a slightly different behavior than Brand X #1. Although the average power draw by Brand X #3 while playing IEC with ML On was still very close to the lowest power draw across all of the video clips, the power draw by Brand X #3 while playing News and Sports 2 content was even lower. For Movie 1 and Movie 2, the TV used even more power with ML On than ML Off. With ML Off, the power values were fairly consistent regardless of video clip. The following power traces over the duration of each clip show in greater detail how ML affected the TV's on-mode power draw.

Figure 8: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during IEC Video

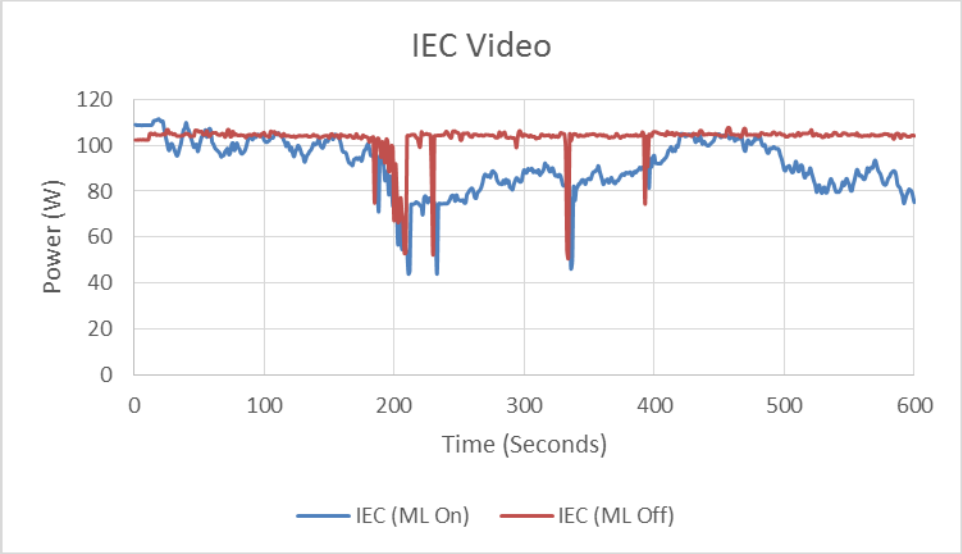


Figure 9: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during Recut IEC Video

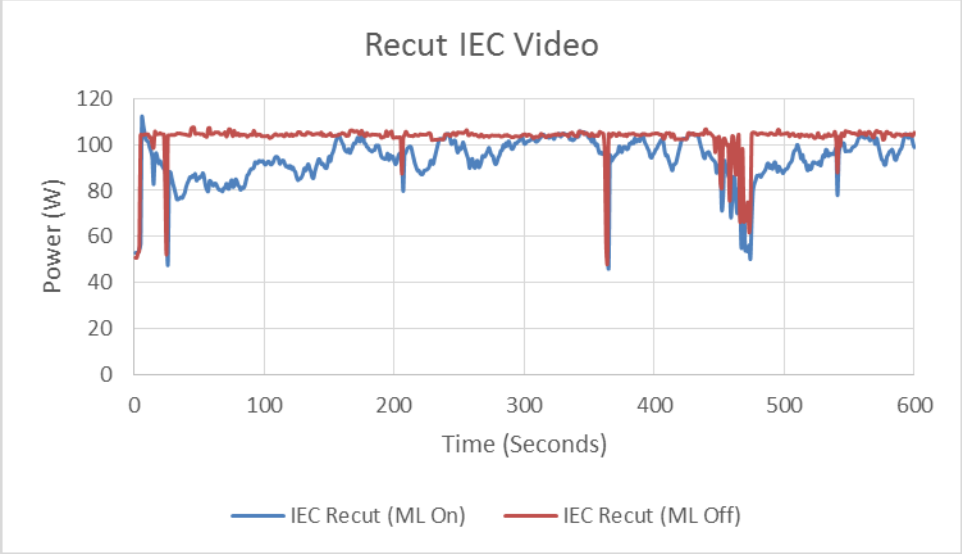


Figure 10: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during Movie 1 Video

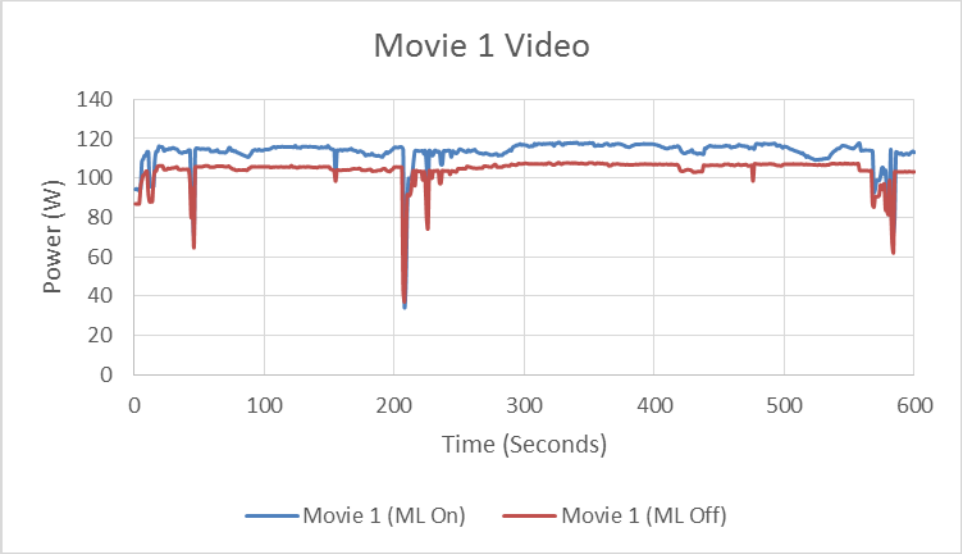


Figure 11: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during Movie 2 Video

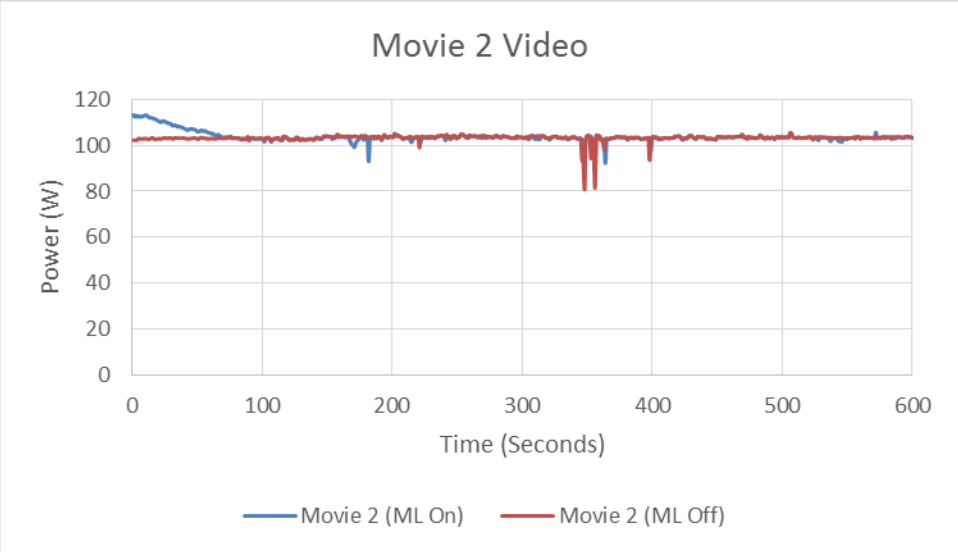


Figure 12: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during News Video

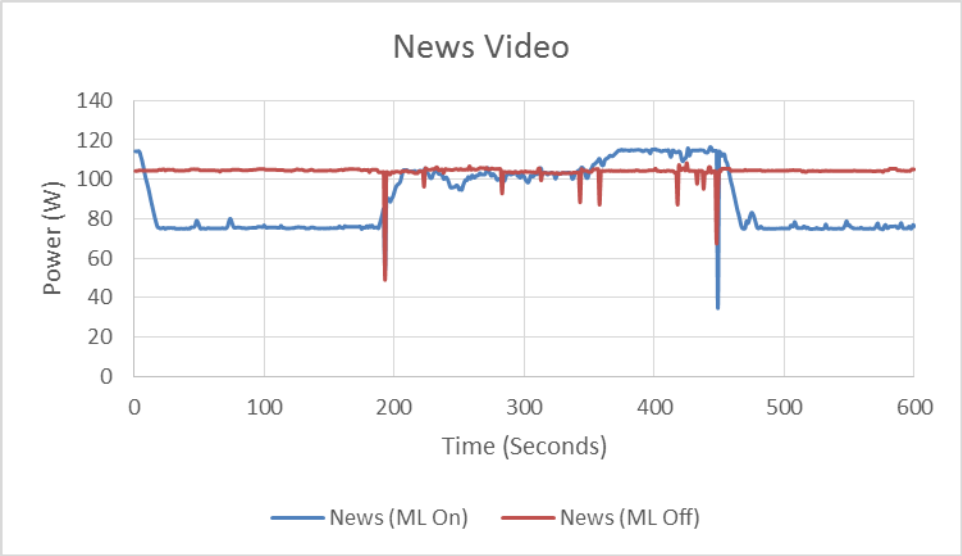


Figure 13: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during Sports 1 Video

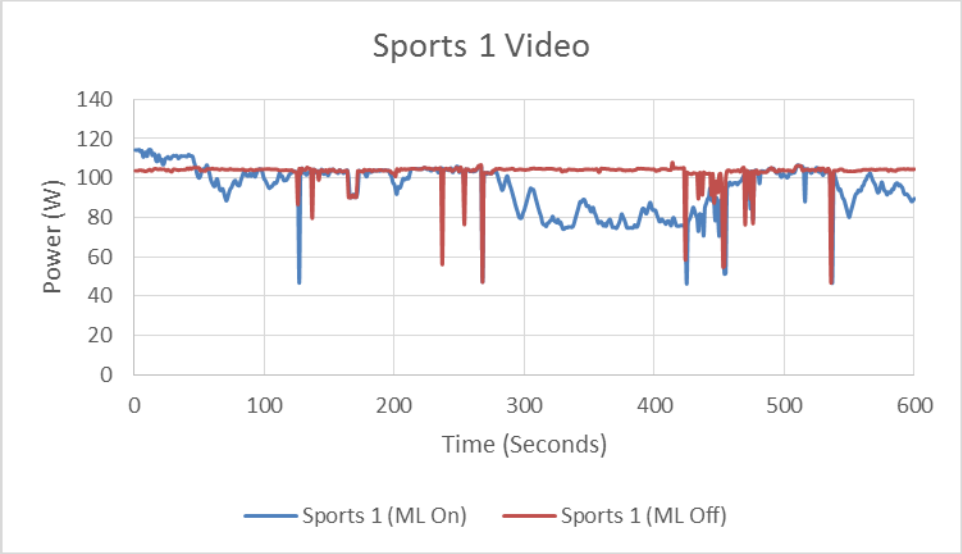
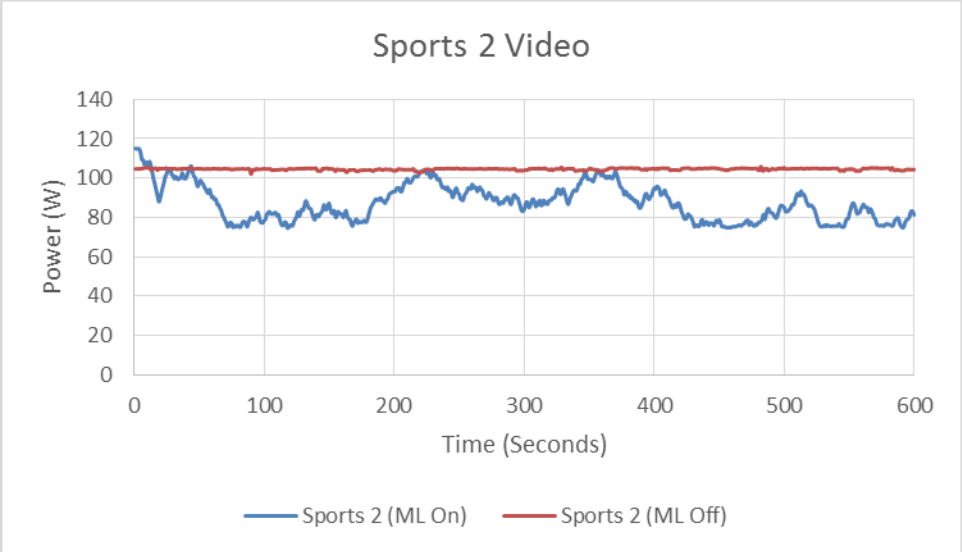


Figure 14: Comparison of Power Usage of ML On versus ML Off for Brand X #3 during Sports 2 Video



With ML Off, the power traces were all generally flat regardless of video clip. With ML On, the power measurement fluctuated significantly but, unlike Brand X #1, the measured power was greater for certain clips than with ML Off.

3. Brand Y #4

Table 5 shows the results of the tests for Brand Y #4.

Table 5: 620-second Average Power Draw for Brand Y #4 with MEC High and MEC Off

Video	Brand Y #4 (W)		
	MEC High	MEC Off	% Increase
IEC	42.6	60.7	42%
Recut IEC	41.4	60.6	46%
Movie 1	58.1	60.5	4%
Movie 2	48.3	60.5	25%
News	58.7	61.1	4%
Sports 1	52.8	60.6	15%
Sports 2	58.5	60.8	4%

For Brand Y #4, the IEC test clip showed the lowest power draw associated with any of the video clips using MEC High (default). Movie 1, News, and Sports 2 showed little difference between power draw using MEC High and MEC Off, whereas Movie 2 and Sports 1 showed a larger difference between the two modes. The largest difference in power between MEC High and MEC Off occurred when testing using the IEC clip and the recut IEC clip. The following power traces over the duration of each clip show in greater detail how MEC affected the TV's on-mode power draw.

Figure 15: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during IEC Video

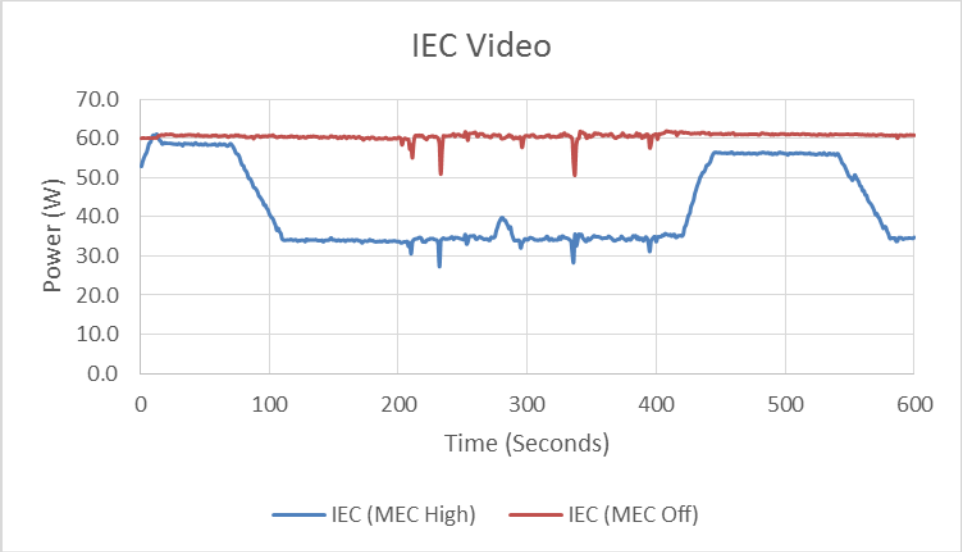


Figure 16: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during Recut IEC Video

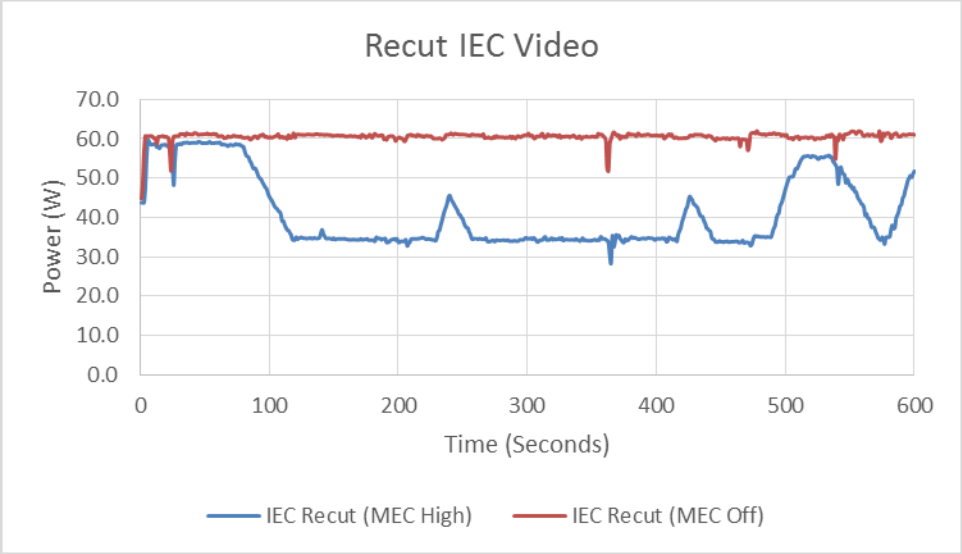


Figure 17: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during Movie 1 Video

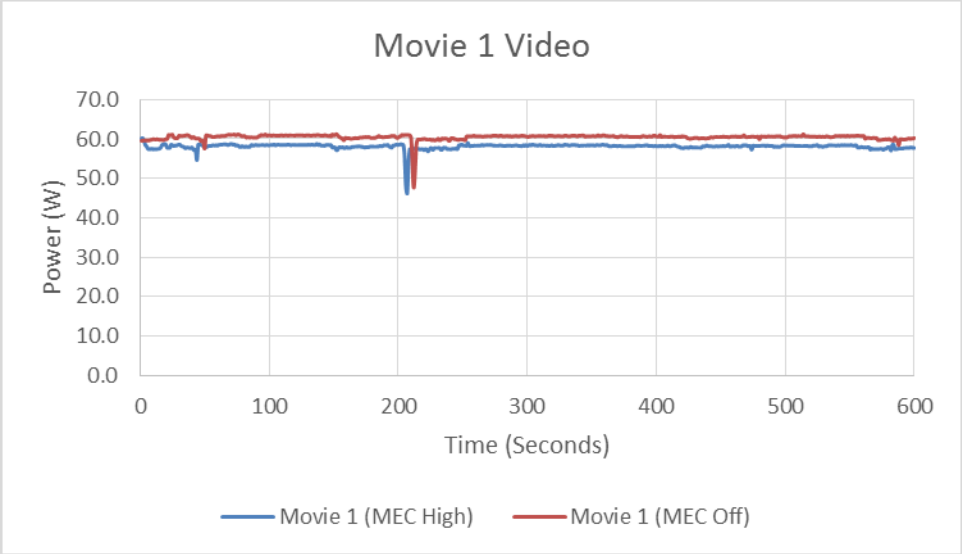


Figure 18: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during Movie 2 Video

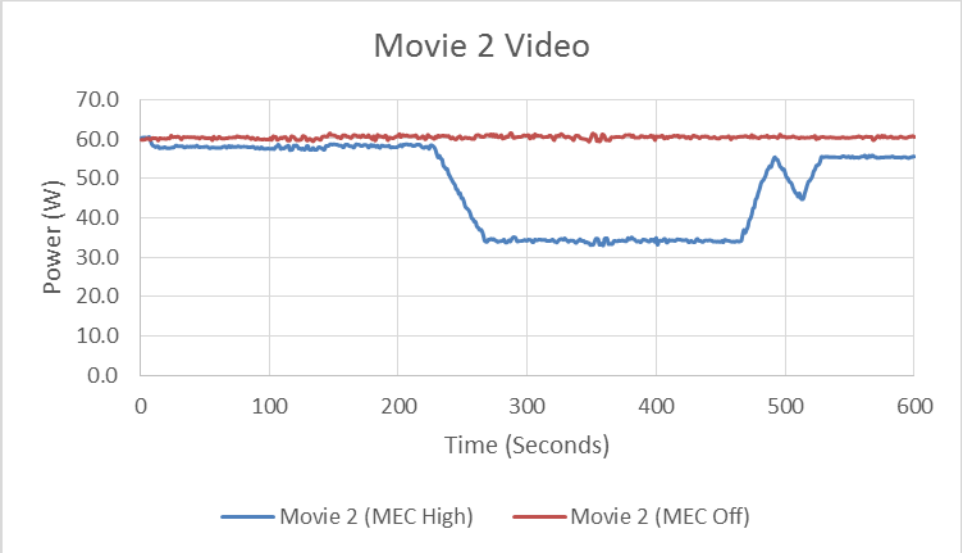


Figure 19: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during News Video

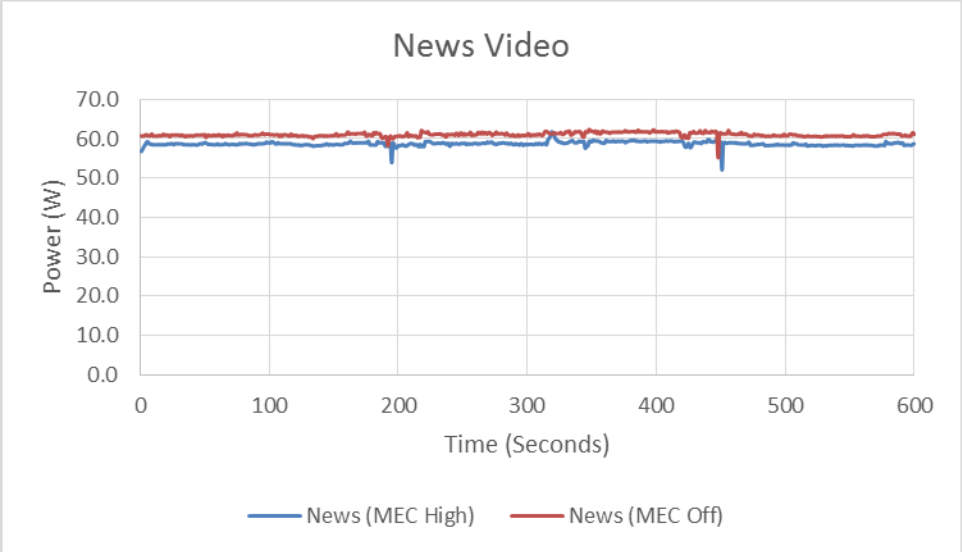


Figure 20: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during Sports 1 Video

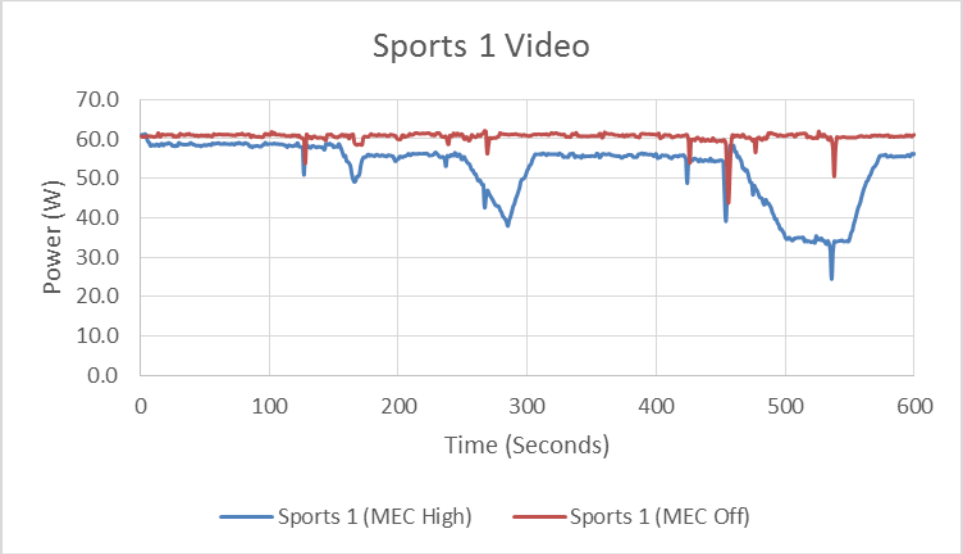
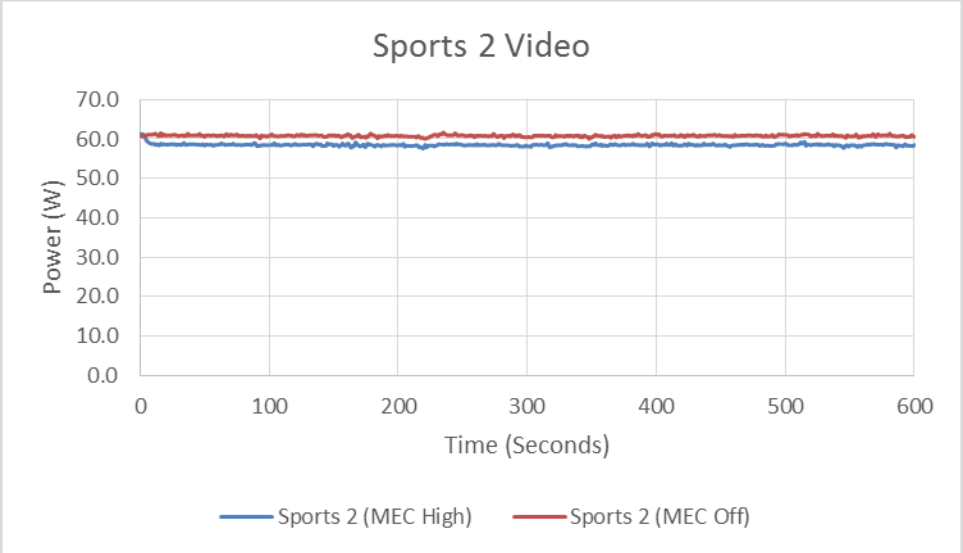


Figure 21: Comparison of Power Usage of MEC High versus MEC Off for Brand Y #4 during Sports 2 Video



For all video clips other than IEC and recut IEC, MEC seemed to have very little impact on the power draw of the TV. Although the MEC setting had some impact on power draw during the Movie 2 and Sports 1 clips, the impact was much less significant than with respect to the IEC clip.

4. Observations

Based on the results, it appears that ML and MEC have different impacts on power draw among different content and TV models. However, for all tested models, the IEC clip usually triggered the largest reduction in power when enabled, implying that the IEC clip and recut IEC clip contained the most motion among all of the tested video clips. This is consistent with DOE's observation of the IEC test clip, which is composed of short segments of high motion video stitched together, so that the video content has faster changing scenes compared to most content a user typically would watch. Thus, DOE is seeking feedback on the following questions:

- What is the utility to the user of the dimming of screen luminance based on high levels of motion found in television content? Does this feature adversely impact the typical consumer viewing experience?
- What alternative video content could DOE use in its test procedure to better capture TV performance during a representative average use cycle or period of use?

C. Default Luminance with Motion Detection Functionality

DOE also evaluated how ML and MEC affected the default luminance in the three TV models discussed above, as measured by the DOE test procedure. Because luminance is measured with a static 3-bar image, DOE evaluated whether the ML or MEC feature would have any impact on the luminance of different parts of the screen. Table 6 results show that screen

luminance, as measured by the DOE test procedure, is unchanged whether ML or MEC are enabled or disabled.

Table 6: Measured Screen Luminance and Power for Brand X #1, Brand X #3, and Brand Y #4

TV		Brand X #1		Brand X #3		Brand Y #4	
ML/MEC State		On	Off	On	Off	High	Off
Bottom Luminance	(cd/m^2)	174	172	227	200	186	186
Center Luminance	(cd/m^2)	191	188	255	223	227	227
Top Luminance	(cd/m^2)	158	155	232	203	188	187
Power	(W)	63.1	67.5	108.9	99.4	60.4	60.4

ML and MEC affect the luminance during on-mode testing using a test clip, but this effect is not captured with the luminance test using the static 3-bar image specified in the DOE test procedure. Thus, the luminance test does not necessarily capture and therefore is not necessarily representative of normal use, depending on whether a TV is shipped with a higher or lower luminance setting. DOE is seeking information on the following questions:

- Does the current luminance test capture the impact of ML and/or MEC during a representative average use cycle or period of use?
- What alternative luminance tests, if any, would provide useful information about how a TV performs during a representative average use cycle or period of use?

D. Settings that Impact Motion Detection Functionality

Last, DOE evaluated the preset picture settings that enabled ML and MEC in the tested units. While ML and MEC were always enabled in the default picture setting of the tested units, none of the other preset picture settings had these features enabled. For Brand Y, there were 6

preset picture settings other than the default setting (Vivid, Standard, Cinema, Sports, Game, and Expert), all of which disabled MEC. And in the case of Brand X's ML feature, only the default picture setting left ML enabled, and any change to the brightness or contrast of the TV automatically disabled ML. Based on these findings, DOE seeks feedback on the following questions:

- How does the manufacturer determine if a particular picture setting should have this motion detection feature enabled or disabled?
- How common is it for users to operate TVs in the default setting throughout the lifetime of the TV? Are there any data suggesting that users are encouraged to disable motion detection features or any other special function by the user manual or any other product information?
- DOE found that changes to a television's picture setting and/or adjustments to the brightness or contrast of a TV may automatically disable a special function, such as a motion detection feature, that is part of the default setting. Given this finding, does the television test procedure, which conducts the on-mode power test in the default setting, measure on-mode power in the television configuration that is representative of typical use?

E. Forced Menu

DOE recognizes that picture settings, such as brightness and contrast, and configuration of special functions, such as quick start or energy efficiency modes, have a significant impact on the energy consumption of a TV. DOE received numerous comments and went through several revisions of its test procedure proposals[1] in order to establish the current uniform test method for measuring the power consumption of television sets that provides manufacturers with clear instructions regarding how to configure the picture mode settings for testing the on-mode power

[1] Television Test Procedure Notice of Proposed Rulemaking, 77 FR 2830 (January 19, 2012) and Television Test Procedure Supplemental Notice of Proposed Rulemaking, 78 FR 15807 (March 12, 2013).

draw of a television. As ultimately adopted, the DOE test procedure for televisions requires that on-mode power be measured using the default picture setting. This is the as-shipped preset picture setting that the television enters upon initial set-up. Recognizing that some TVs are designed to automatically display message prompts requiring the user to select configurable options (as opposed to the user proactively entering the settings menu to configure the television), DOE requires in these instances that the most power consumptive option be selected when testing the unit (see section 5.5 of the DOE test procedure). Additionally, the test procedure requires that the home configuration be selected, if prompted, from a forced menu (as opposed to a retail configuration).

Essentially, the selection of the home configuration is the only exception to the requirement that the tester must select the most energy consumptive option when setting up a television for the on-mode test. So, if given a choice between home or retail configurations, the tester should always select the home configuration even if the retail configuration is more consumptive. For any other prompt, whether it is from the initial setup menu or a separate message prompt that appears at another time during the on-mode operation of the TV, the tester must always select the most energy consumptive configuration. DOE's intent is to ensure that manufacturers include energy-saving features as part of the default picture setting (without automatically displaying a message prompt to configure the feature) if they wish for that feature to be enabled when measuring the on-mode power. While DOE is certainly not opposed to manufacturers providing options that make their televisions more efficient than the default settings, DOE intends for the test procedure to capture the power of a TV that is measured using the most commonly used picture setting – which DOE assumed to be the default setting. A TV is only tested with special functions that reduce energy consumption turned on if they are truly part

of the most commonly used settings (currently presumed to be default), and there are no prompts that appear which provide users an option to disable them.

In providing these specifications, DOE attempted to cover all television design scenarios to ensure that the TV was set up in this manner. However, one manufacturer has argued that the current language in the DOE test procedure allows users to select options other than the most consumptive configuration during initial television setup under certain forced menu designs. For example, in the preamble to the TV test procedure final rule, DOE assumed a forced menu would first request selecting either home or retail configuration, and then subsequent message prompts that appear after the initial selection of home or retail would request configuration of other special functions, such as enabling or disabling energy efficient modes. In discussing the configuration of special functions in the preamble to the TV test procedure final rule, DOE discussed the special function configuration criteria in section 5.5 of the DOE Test Procedure assuming that the message prompt requesting configuration of a special function came after the initial selection of the home configuration from a forced menu. While DOE assumed this message prompt would come after the initial selection of the home configuration from a forced menu, DOE's intention is that manufacturers would select the most energy consumptive option if prompted at any time, even if that question came on the initial forced menu before the initial selection of the home configuration. DOE clarified the television configuration requirements by issuing a final guidance document in April 2014[2] that clearly specified the most power consumptive configuration must be selected whenever a message prompt is displayed requesting configuration of a special function, including configurations selected from a forced menu.

[2] See http://www1.eere.energy.gov/guidance/detail_search.aspx?IDQuestion=647&pid=2&spid=1.

However, given the findings discussed in paragraph (d) of this RFI that energy saving features may automatically disable when changing preset picture settings or adjusting television brightness or contrast, DOE requests stakeholder comments on whether testing the television in its default configuration is appropriate.

Given the advancement in television design, the ability of manufacturers to customize the design of their forced menus, and the rationale behind testing televisions in the default configuration, DOE seeks to ensure that the forced menu, special function configurations, and any other requirements related to setting up the television for conducting the on-mode power measurement are clear and representative of an average use cycle.

Hence, DOE is soliciting comment on the following questions:

- Is the regulatory text clear on how to set-up a television for testing? Are there ways for definitions or requirements in the television test procedure regulatory text to be rewritten to ensure that all requirements related to setting up a television for testing are objective and would apply uniformly regardless of television design?
- Should DOE consider measuring on-mode power in picture settings other than the default picture setting? If so, what picture setting(s) should be tested, and how can DOE prescribe picture setting testing requirements that are representative of television settings during a representative average use cycle or period of use, as well as ensure that the requirements are repeatable and reproducible in a laboratory testing environment?

III. Submission of Comments

DOE invites all interested parties to submit in writing by [INSERT DATE **30** DAYS AFTER DATE OF PUBLICATION IN FEDERAL REGISTER], comments and information on matters addressed in this RFI and on other matters relevant to the test procedure for televisions.

After the close of the comment period, DOE will begin collecting data, conducting analyses, and reviewing public comments. These actions will be taken to aid in the revision of the test procedure NOPR for televisions, if DOE determines that revisions are necessary.

DOE considers public participation to be a very important part of the process for developing test procedures. DOE actively encourages the participation and interaction of the public during the comment period. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking may do so at https://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/34.

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