D+R International

2015 Annual Report

Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes

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EXECUTIVE SUMMARY

In 2012, the pay television industry, led by the National Cable & Telecommunications Association and the Consumer Technology Association, signed the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes with the goal of increasing the energy efficiency of set-top boxes while protecting rapid innovation and timely introduction of new features. Signatories include major manufacturers of set-top boxes, as well as eleven cable, satellite, and telco service providers serving 91.7 million U.S. video subscribers, accounting for 92.3% of the market in 2015. In 2013, leading energy efficiency advocates joined with the pay television industry in an expanded version of the Voluntary Agreement.

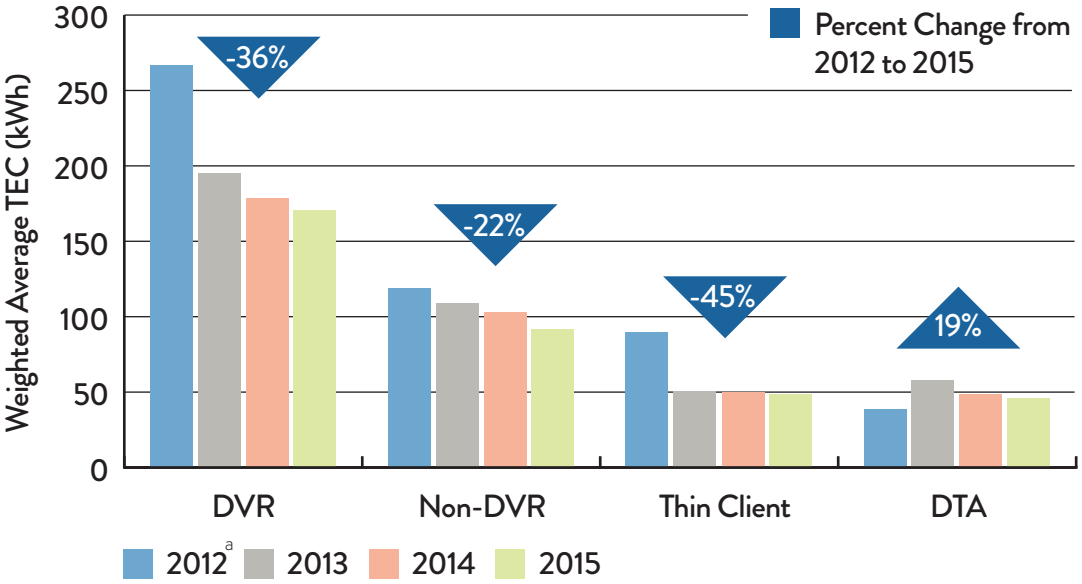
One of the requirements of the Voluntary Agreement is the publication of an annual report. This third annual report provides a summary of developments for the previous calendar year. The first annual report was published on August 15, 2014, and the second annual report was published on July 31, 2015.

Under the Voluntary Agreement, 90% of set-top boxes procured by service providers after December 31, 2013 must meet the efficiency standards established for ENERGY STAR® Version 3.0, referred to as the "Tier 1" standards of the Voluntary Agreement. After December 31, 2016, 90% of set-top boxes procured by participants must meet more-efficient standards (referred to as "Tier 2"). In 2015, 99.5% of service providers' set-top box purchases met the Tier 1 standards, thereby meeting the procurement commitments in the Voluntary Agreement.[1] Service providers also reported early adoption of Tier 2[2] performance levels in 67.6% of set-top boxes procured in 2015, an improvement from the 62.4% reported in 2014.

1 - As set forth below, this calculation is based on 2015 procurement data submitted to D+R International by service providers and corroborated by the results of independent field verification conducted of set-top boxes in consumer homes and by the procurement audit conducted by D+R.
2 - Products indicating Tier 2 performance have been tested using Tier 1 (ENERGY STAR Version 3.0) test procedures. The Voluntary Agreement does not require the use of Tier 2 test procedures until 2017.

The procurement of energy efficient set-top boxes under the Voluntary Agreement has resulted in a substantial decrease in average energy consumption by the major types of set-top boxes, as shown in the following figure:

Figure ES-1: Weighted Total Energy Consumption Average of Set-Top Boxes Purchased 2013-2015



[a] 2012 data represents the baseline estimated per unit energy consumption. It was developed using data from the service providers and energy efficiency advocates.

Note: Data used to create this chart is available in Table 6.

It should be noted that while energy consumption in the DTA category increased since the 2012 estimate, this increase can be explained by the fact that most DTAs purchased from 2013 through 2015 included high definition (HD) and advanced video processing (AVP) capabilities, which increased energy usage. However, DTA energy usage has declined since 2013, and 100% of the models purchased in 2015 met the Tier 1 energy efficiency standards.

Based on the improved energy efficiency of the set-top boxes procured in 2015, it is estimated that the Voluntary Agreement reduced national set-top box annual energy consumption from 32 TWh in 2012 to 26.9 TWh in 2015, a reduction of 15.9%, even as the functionality of set-top boxes increased.[3] This 5.1 TWh reduction represents consumer savings of approximately $646 million[4] and prevention of 3.6 million metric tons of CO2 emissions last year alone.[5] Over the first three years of the Voluntary Agreement, energy consumption has been reduced by an estimated 9.3 TWh, saving consumers approximately $1.18 billion and avoiding 6.5 million metric tons of CO2 emissions.[6] Though the same procurement commitment has been in place over these three

3 - Estimated stock was calculated using the change in subscribership from 2012 to 2015. In 2013, the estimated national set-top box energy consumption was 30.6 TWh, and in 2014 it was 29.2 TWh.

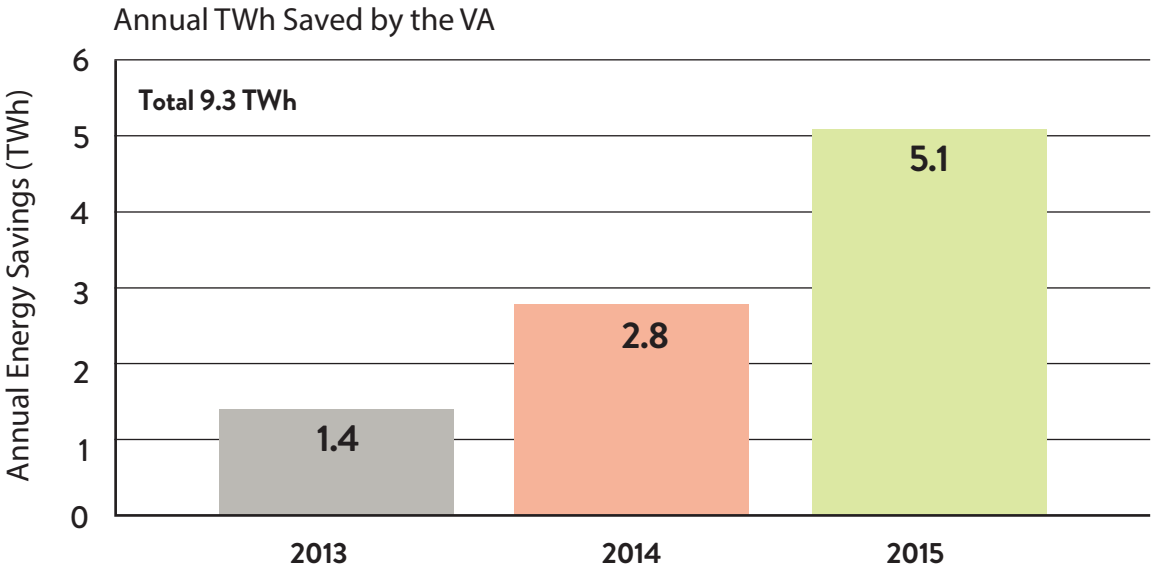
4 - This calculation is based on national average energy cost of $0.1267 per kWh, Electric Power Monthly U.S. Energy Information Administration, available at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3 (viewed August 2, 2016).

5 - Emission reduction estimates in this report are based on the U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator, available at https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

6 - See D+R International, 2014 Annual Report, Voluntary Agreement for the Energy Efficiency of Set-Top Boxes (2014 Annual Report) at 17 (estimating 2.8 TWh reduction in energy usage in 2014 and 1.4 TWh reduction in 2013).

years, energy savings have increased over that time, doubling in 2014 and then increasing by another 82% in 2015. The energy saved over the first three years is the equivalent of the energy used by all of the homes in both Washington, DC, and San Francisco combined, for one year.[7]

Figure ES-2: Energy Saved by the Voluntary Agreement Procurement Commitments



Compared to earlier projections of unabated proliferation of digital video recorders (DVRs) in the absence of the Voluntary Agreement, which represents the second base case assessed, savings were nearly twice that amount, and all of the signatories now employ strategies that reduce consumers' reliance on energy-consuming hardware in the home, such as multi-room DVR functionality and apps.

The Voluntary Agreement also contains additional commitments. A summary of these commitments and the progress made to date on each is presented below.

Light Sleep. The cable operator signatories committed to continuing to deploy software updates enabling light sleep to certain models of deployed DVRs that were placed in service prior to the Effective Date of the Voluntary Agreement. By the end of 2015, approximately 32.5 million cable set-top boxes included light sleep energy efficiency capability.

Automatic Power Down. The satellite signatories committed to including automatic power down (APD) in at least 90% of set-top boxes purchased after January 1, 2013. All set-top boxes purchased by the satellite signatories in 2015 met this requirement.

Whole-Home Systems. Whole-home systems can result in lower overall household set-top box energy use, as homes can receive DVR capabilities on all TVs without requiring a DVR on each one. Instead, a thin client or other set-top box consuming less energy is used on the second and third TVs in the home. The satellite signatories committed to making whole-home systems available to all subscribers in 2013; they both met this commitment. Telco Internet Protocol television (IPTV)

7 - 9.3 TWh is equivalent to the annual energy usage of 690,000 households and the annual electricity usage of 965,000 households. See https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

providers made and met similar commitments to provide whole-home capability for every household with a DVR in 2014. Although not required by the Voluntary Agreement, cable operators have also deployed whole-home solutions.

Next-Generation Set-Top Boxes. The cable operator signatories committed to beginning field tests of set-top boxes that include next-generation power management by December 31, 2014. Next-generation power management allows parts of the device to operate in a reduced-power consumption mode while still functioning with cable system architectures and meeting consumer expectations for quick start-up time and other required functions. Trials began in 2014 and continued in 2015. One signatory has now initiated widespread deployment, and further monitoring will track the operators' progress on this commitment.

Consumer-Facing Energy Efficiency Information. Each service provider committed to providing reasonable access to energy efficiency information for set-top boxes purchased after January 1, 2014, and all service providers met this commitment by posting this information on the web pages listed in Appendix C. These links are also available to consumers at www.energy-efficiency.us.

Annual Procurement Data. All service providers submitted their annual procurement reports to the Independent Administrator on time.

Field Verification. Intertek Testing Services, NA Inc., an internationally recognized energy-testing firm, was retained to conduct field verification as required by the Voluntary Agreement. Testing in both "on" and "standby" modes was performed on a representative group of 115 set-top boxes in 93 homes located in the Tampa, Orlando, Syracuse, Philadelphia, St. Louis, and Los Angeles metropolitan areas in September and October 2015. The test results confirmed that the energy usage of service providers' set-top boxes in the home is consistent with the energy information provided to consumers and is in compliance with the procurement commitments of the Voluntary Agreement, accounting for expected variability for conditions within a home. The overall average total energy consumption (TEC) measured in field verification was 19.9 kWh/year below reported values for the models tested.[8]

Random Audit. The Independent Auditor is required to conduct a random audit of one service provider's procurement figures each year. D+R randomly selected one service provider, and reviewed its raw procurement data, invoice data, purchase order data, product specification sheets, and screenshots from its purchase order systems. After cross-checking these datasets, D+R confirmed the accuracy of its report.

8 - Calculation based on the Field Measured TEC - Reported TEC.

OVERVIEW OF THE VOLUNTARY AGREEMENT

Cable, satellite, and telco service providers offer pay television to approximately 99 million U.S. households using customer premises equipment, often referred to as set-top boxes.[9] Each device contains hardware and software to receive television programming and related services from service providers and process them for home networks, display devices, and recording devices. The underlying delivery network and the types of service provided vary widely among service providers. As a result, set-top boxes operate as highly specialized components, and the devices change frequently as the service providers introduce new services.

All set-top boxes have one thing in common: they require power to operate. In aggregate, set-top boxes consumed an estimated 31 TWh of electricity in 2013, 18% of residential consumer electronics electricity consumption, and 2.2% of all residential electricity consumption.[10] To reduce the amount of energy consumed by set-top boxes while protecting rapid innovation and timely introduction of new features, the pay television industry crafted the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes in 2012. The 15 industry leaders that signed the original Voluntary Agreement represent all of the major service providers, equipment vendors, and industry organizations in the United States. Combined, these companies provided video service to 91.71 million American households in 2015, accounting for 92.3% of all multichannel video consumers.[11] The Voluntary Agreement provides a framework for the pay television industry to deliver market-based energy efficiency gains that keep pace with technological innovation.

After extensive negotiations among the initial signatories and energy efficiency advocates, an expanded Voluntary Agreement that included new signatories was launched in 2013. The U.S. Department of Energy (DOE), the Natural Resources Defense Council (NRDC), the American Council for an Energy-Efficient Economy (ACEEE), the Appliance Standards Awareness Project (ASAP), the Consumer Technology Association (CTA), and the National Cable & Telecommunications Association (NCTA) announced this expansion in December 2013. The revised Voluntary Agreement includes additional energy efficiency commitments, coverage of whole-home multifunction gateway devices, expanded provisions for transparency and accountability, and participation by energy efficiency advocates in the Steering Committee for the Voluntary Agreement.

Voluntary Agreement Objectives

The primary objective of the Voluntary Agreement is to continue improvements in the energy efficiency of set-top boxes without jeopardizing their intended uses and functionalities. Further, energy efficiency improvements are expected to preserve or enhance the customer experience and be sufficiently flexible to adapt to technological innovations and market competition, while also improving functionality, offering service enhancements, and fostering rapid innovation.

9 - Based on data provided by the National Cable & Telecommunications Association and the Consumer Technology Association.
10 - Urban, Bryan; Shmakova, Victoria; Lim, Brian; and Roth, Kurt. Energy Consumption of Consumer Electronics in U.S. Homes in 2013, Final Report to the Consumer Electronics Association (CEA®), Fraunhofer USA Center for Sustainable Energy Systems (2014).
11 - See *supra* note 9.

The signatories have estimated that, once set-top boxes meet the Tier 2 levels, consumers will save at least $1 billion annually in energy costs compared to the set-top boxes in use in 2012. These energy savings are equivalent to almost as much power as that generated by three average power plants (500 MW each) annually and will prevent 5 million metric tons of CO2 emissions per year.

Voluntary Agreement Signatories and Steering Committee

The current signatories to and participants in the Voluntary Agreement are listed below. Each signatory and participant organization marked with an asterisk has one voting member serving on the Steering Committee; each signatory and participant organization marked with a dagger has one representative who participates on the Steering Committee as a non-voting observer

Energy Efficiency Advocates

- American Council for an Energy-Efficient Economy (ACEEE)*
- Appliance Standards Awareness Project (ASAP)†
- Natural Resources Defense Council (NRDC)*

Cable Service Providers

- Comcast*
- Time Warner Cable*
- Cox Communications*
- Charter Communications*
- Cablevision*
- Bright House Networks*

Satellite Service Providers

- DIRECTV*
- DISH Network*

Telco Service Providers

- AT&T*
- Verizon*
- CenturyLink*

Other Organizations

- ARRIS Group*
- Technicolor*
- Pace†
- EchoStar Technologies
- National Cable & Telecommunications Association (NCTA)*
- Consumer Technology Association (CTA)*
- Cable Television Laboratories (CableLabs)

While AT&T and DIRECTV merged in 2015, they retained separate memberships under the Voluntary Agreement pursuant to Section 9.2 and filed separate annual reports.

The composition of the Steering Committee allows the Voluntary Agreement to offer a multi-stakeholder approach, while permitting rapid adjustments as the technology landscape changes.

The Voluntary Agreement obligates the Steering Committee to designate an Independent Administrator and publish an annual report. The Steering Committee designated D+R International, Ltd. as the Independent Administrator and Auditor in 2013. D+R International continued in this role in 2014 and 2015. This report is the third annual report.

In 2015, in accordance with their commitments, representatives of the signatories provided updates to DOE, the U.S. Environmental Protection Agency, state regulatory authorities, state and federal legislators, and other stakeholders regarding the implementation of the Voluntary Agreement.

Additional responsibilities of the Steering Committee include the following:

- Managing the Voluntary Agreement
- Hiring the Independent Administrator, Independent Auditor, and field verification contractor
- Reviewing proposals for energy allowances based on new features, which the Steering Committee can approve, reject, or add to the Voluntary Agreement, as appropriate
- Evaluating the effectiveness of the Voluntary Agreement in achieving its purposes
- Adopting new or revised efficiency measures, courses of action, and amendments to the Voluntary Agreement as technologies advance

In accordance with their obligations under the Voluntary Agreement, CTA and NCTA provided the following two reports to the Independent Administrator for 2015:

- The estimated total number of U.S. residential multichannel video subscribers and the number served by service providers participating in the Voluntary Agreement during the reporting period (due by April 1 of each year, beginning in 2014)
- Information on progress with respect to other energy efficiency commitments (due by May 1 of each year, beginning in 2014)

Service Provider Commitments

The primary service provider commitment is to procure energy efficient set-top boxes. Specifically, at least 90% of set-top boxes purchased after December 31, 2013 shall meet the efficiency standards established for ENERGY STAR Version 3.0, described in the Voluntary Agreement as Tier 1. After December 31, 2016, the Voluntary Agreement designates new, more stringent efficiency levels, designated as Tier 2.[12] The procurement commitment under Tier 2 is also 90%. Progress on these commitments is discussed in Progress on Procurement Commitments, below. Service providers also made commitments relating to light sleep, automatic power down, whole-home systems, field testing of set-top boxes that include next-generation power management, other energy-saving strategies, and public posting of energy efficiency information for consumers. Additional information on these commitments is outlined in Progress on Other Energy Efficiency Commitments, below. All service provider commitments are outlined in Appendix A: Voluntary Agreement Commitments.

Independent Administrator and Auditor Role

The Independent Administrator and Auditor (or Independent Administrator) is a third party appointed and overseen by the Steering Committee. Under the Voluntary Agreement, the

12 - Tier 2 allowances are similar to ENERGY STAR Version 4.1.

Independent Administrator must aggregate and compile confidential procurement data submitted by service providers and provide a draft report to the Steering Committee by May 31 of each year. With the service provider commitments in effect, the Independent Administrator must also assess whether there is substantial compliance with the service provider procurement commitments. If these commitments are not met, the Independent Administrator has the authority to take appropriate action following the procedures set out in the Voluntary Agreement.

The Independent Administrator is required to conduct a random audit of one service provider's procurement figures each year. The final 2015 audit report is presented in Appendix D.

Field Verification

The Steering Committee retained Intertek Testing Services NA, Inc. to perform field verification of the energy usage of selected set-top boxes in 80-100 homes per year to ensure set-top boxes are performing as reported, beginning in 2014. The first round of field verification testing was conducted between August and October 2014, with 94 set-top boxes tested in 85 homes in the New York City, Los Angeles, Washington, DC, and Denver metropolitan areas. The second round of field verification testing was conducted between September and October 2015, with 115 set-top boxes tested in 93 homes in the Tampa, Orlando, Syracuse, Philadelphia, St. Louis, and Los Angeles metropolitan areas. In accordance with the requirement in the Voluntary Agreement, more than 12% of these homes were located in California.

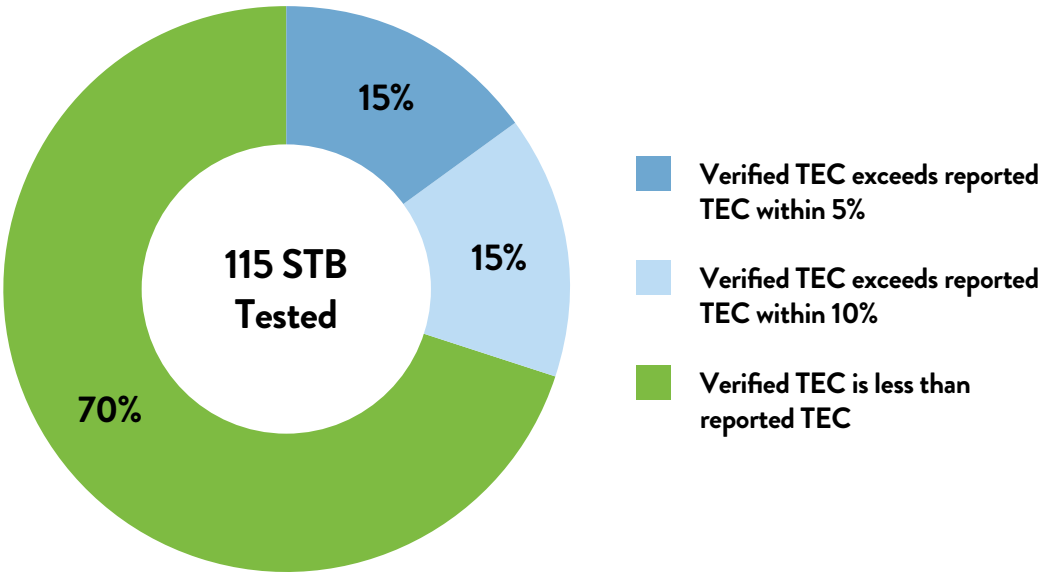
The objective of the field verification testing is to compare observed energy usage in homes to the modal power and annual energy use values reported by the Service Providers to the Independent Administrator and to the energy levels applicable to the procurement commitment. As demonstrated below, the test results submitted by Intertek to D+R confirmed that the energy usage of service providers' set-top boxes in the home is consistent with the energy information provided to consumers and is in substantial compliance with the procurement commitments of the Voluntary Agreement, with allowances for expected variability of conditions within a home.

To account for potential variability of conditions within a home, the Steering Committee adopted tolerance levels by which a set-top box's field test result may exceed a reported or permitted energy level. The adopted tolerance levels are the lower of 10% or 20 kWh/year for set-top boxes with an on-power mode of at least 10 watts, and 10 kWh/year for lower-power devices. Of the 115 set-top boxes tested, 113 met the ENERGY STAR Version 3.0 Tier 1 energy levels with only eight requiring application of the tolerances. The other two models were expected to test in excess of the Tier 1 levels because they had been reported by the service provider to exceed such levels and were not relied upon for the procurement commitments. Seventy percent of the field-tested devices had a verified TEC below the reported TEC without applying the tolerances, and the other 30% exceeded the reported TEC but within the tolerances, as shown in Figure 1. Half of the 30% that exceeded the reported TEC were within five percent of the reported value.

The overall average TEC of the tested devices was 19.9 kWh/year below reported values for those models, without any credit for tolerances, suggesting that the energy savings achieved by the Voluntary Agreement's procurement commitment may be larger than the estimates set forth in this report. The average TEC varied by device type. For DVRs, the average TEC was 30.4 kWh/year

less than the reported values, while for non-DVRs and thin clients the average TEC was, respectively, 12.3 kWh/year and 14.2 kWh/year less than the reported values. The only average TEC higher than the reported value was for DTAs, which were 0.36 kWh/year above, on average.

Figure 1: Summary of Field Verification Test Results



INCREASED ENERGY EFFICIENCY OF SET-TOP BOXES

Table 1 highlights the progress made by the signatories toward increased energy efficiency for each set-top box product category.

Table 1: Weighted Average Typical Electricity Consumption for Major Set-Top Box Categories[13]

Category	TEC (kWh/yr)				Percent Change in Weighted Averaged		
	2012 Base Case	Procurement Data					
	Weighted Average	Weighted Average			2012 to 2015	2013 to 2015	2014 to 2015
		2013	2014	2015			
DVR	267	195.4	179.4	170.6	-36%	-13%	-5%
Non-DVR	119	108.6	103.3	92.4	-22%	-15%	-11%
Thin Client[a]	90	51.4	50.0	49.1	-45%	-4%	-2%
DTA[b]	39	57.6	49.3	46.5	19%	-19%	-6%

[a] The 2013, 2014 and 2015 reports include thin clients from non-cable service providers.

[b] A digital transporter adapter (DTA), is a minimally configured unidirectional set-top box without recording functionality that can receive and decode video content as delivered from a coaxial or hybrid fiber coaxial system. Most DTAs purchased in 2013, 2014, and 2015 likely included HD and advanced video processing (AVP) capabilities, both of which increase TEC. DTAs offered before 2013 were less likely to include these features. At the same time, 91% of DTAs purchased in 2013 and 100% of those purchased in 2014 and 2015 met the Tier 1 (ENERGY STAR Version 3.0) energy efficiency requirements.

13 - Multi-service gateway products were only reported in 2013. There were 232 products, which had a weighted average energy consumption of 219 kWh/year.

PROGRESS ON PROCUREMENT COMMITMENTS

Under the Voluntary Agreement, 90% of set-top boxes procured by participants after December 31, 2013 must meet the efficiency standards established for ENERGY STAR Version 3.0 (Tier 1). This is the third year in which the procurement commitment has been evaluated, and the second in which the procurement commitment is in force. All service providers who signed the Voluntary Agreement submitted procurement data for 2015 on time. These providers are Bright House Networks, LLC; Cablevision Systems Corp.; Charter Communications, Inc.; Comcast Cable Communications, LLC; Cox Communications, Inc.; Time Warner Cable Inc. AT&T Services, Inc.; CenturyTel Broadband Services, LLC (d/b/a CenturyLink); Verizon Communications, Inc.; DIRECTV, LLC; and DISH Network LLC. Details about the set-top boxes purchased by these providers are provided in Appendix B: Set-Top Boxes Purchased by Voluntary Agreement Signatories in 2015. 99.5% of the set-top boxes purchased by services providers met the ENERGY STAR Version 3.0 (Tier 1) commitment, with ten of the eleven service providers meeting the 90% procurement commitment and the eleventh at 85%.

In 2014, one service provider failed to meet its procurement commitment that required 90% of its set-top box purchases to meet the Tier 1 energy standards. Only 48% of the devices it purchased in 2014 met the Tier 1 levels. (The service provider did meet the procurement commitment in 2015, with more than 98% of its set-top box purchases meeting Tier 1 standards.) The service provider proposed a remedial plan to offset the extra energy use from the 2014 deployments and this plan was reviewed and unanimously approved (conditionally, subject to verification) by a three-member "Review Panel" of Steering Committee members that included an energy efficiency advocate. The plan consists of two elements: a) in January 2015, the service provider successfully performed a software download to all of its deployed units of one of the two models that caused it not to meet the commitment, and independent field verification conducted under the auspices of the Agreement confirmed that the model now meets the Tier 1 standards; and b) the service provider committed that 100% of its 2016 purchases will meet the more rigorous Tier 2 standards, a year before those standards become applicable in 2017. In measuring the sufficiency of the proposed remedial plan, the Independent Administrator determined that savings of 8 million kWh/year would be needed (in addition to the savings from the software download) to offset the 2014 devices that exceeded the energy usage permitted under the procurement commitment. The Review Panel required the service provider to submit quarterly reporting of purchases, additional field verification, and a final report in February 2017 to show that it met the plan's commitments and that the plan resulted in the required savings. Should the Review Panel find that sufficient savings were not realized, an additional remedial plan will be required to secure the remaining deficit of energy savings.

A different service provider missed the 2015 procurement commitment, with 85% of its 2015 purchases meeting the Tier 1 standards. The Independent Administrator determined that savings of 570,000 kWh/year would be needed to offset the extra energy usage of the devices that exceeded the quantity permitted under the procurement commitment. The Review Panel unanimously approved (conditionally, subject to verification) a remedial plan that requires the service provider to perform an energy-saving software download to all new deployments of the single model that caused it not to meet the commitment, as well as to a sufficient number

of previously deployed devices to recoup the 570,000 kWh/year. The Review Panel required the service provider to submit to additional field verification to validate the savings and to provide a final report in February 2017 to show that it met the plan's commitments and that the plan resulted in the required savings. Should the Review Panel find that sufficient savings were not realized, an additional remedial plan will be required to secure the remaining deficit of energy savings.

With these two exceptions, both of which are under remediation, the service providers have met their commitments to have at least 90% of purchased units meet the ENERGY STAR Version 3.0 (Tier 1), as shown in Table 2. The overall share of units meeting the ENERGY STAR Version 3.0 (Tier 1) commitment rose from 95% in 2014 to 99.5% in 2015.[14]

Table 2: Voluntary Agreement Signatory Set-Top Box Procurement (2013 - 2015)

Category	Units		Percent Meeting ENERGY STAR Version 3.0 Levels (Tier 1)
	Total Procured	Number Meeting ENERGY STAR Version 3.0 Levels (Tier 1)	
DVR	12,209,976	8,690,001	71%
	12,710,777	11,267,511	89%
	11,671,180	11,513,700	99%
Non-DVR	12,360,006	10,857,191	88%
	18,646,064	17,777,790	95%
	10,977,499	10,950,399	100%
Thin Client	8,994,794	8,994,794	100%
	9,738,163	9,738,163	100%
	8,474,667	8,474,667	100%
DTA	1,334,238	1,217,148	91%
	5,201,332	5,201,332	100%
	9,169,913	9,169,913	100%
U.S. Totals	34,899,246[a]	29,759,134	85%
	46,296,336	43,984,796	95%
	40,293,259	40,108,679	99.5%

2013
2014
2015

[a] In 2013, 232 Multi-Service Gateway devices were reported. These have been included in the total procured number. There were no Multi-Service Gateway devices procured in 2014 or 2015. None of the 232 devices procured in 2013 met the Tier 1 levels.

14 - In 2013, 85% of purchased units met the ENERGY STAR Version 3.0 (Tier 1) commitment.

Service providers committed to meet Tier 2 efficiency levels in 90% of set-top boxes procured after December 31, 2016. Although Tier 2 procurement commitments are not yet in effect, participants have been encouraged to accelerate adoption. Based on the data provided by service providers, an estimated 67.6% of set-top boxes purchased in 2015 meet Tier 2 performance levels, an increase from 62.4% in 2014.[15]

To accommodate the introduction of new set-top box features, the Voluntary Agreement allows service providers to use custom allowances for features or capabilities that are not included in current allowances. The Steering Committee can, at its discretion, propose appropriate allowances based on these requests. In its 2015 annual report, a service provider proposed new allowances for High Efficiency Video Coding (HEVC) and Ultra High-Definition (UHD). The Steering Committee has initiated its review to consider new allowances for these features.

According to Section 10.2.4 of the Voluntary Agreement, "The Signatories agree to review the energy use of Set-Top Boxes that incorporate DOCSIS 3.0 8x4 mode and greater by October 2015 and to modify the Additional Functionality TEC Allowance as appropriate." In the second quarter of 2015, the Steering Committee convened a working group including technical representatives from cable service providers, set-top box manufacturers, and component manufacturers to address this review. The working group concluded that there were not enough set-top boxes with DOCSIS 3.0 Cable Modem configurations greater than 8x4 to propose a new allowance at that time. At its June 11, 2015 meeting, the Steering Committee voted to conclude the review process and to initiate a reassessment of the allowance by the end of 2016.

PROGRESS ON OTHER ENERGY EFFICIENCY COMMITMENTS

The Voluntary Agreement established other energy efficiency commitments, some of which are specific to certain industries or providers.

Light Sleep

Light sleep is the capability to reduce energy consumption of the set-top box during extended periods of inactivity (typically four hours) or at specific times, such as by stopping the hard drive from spinning. In the original Voluntary Agreement signed at the end of 2012, the cable operator signatories made a two-phase commitment to deploy light sleep in capable DVR models. The first phase was to download software updates enabling "light sleep" to certain models of DVRs that were deployed prior to the effective date of the Voluntary Agreement. The commitment applied only to the previously deployed models that could support the download of light sleep capability through commercially reasonable efforts. By the end of 2015, approximately 32.5 million cable set-top boxes included light sleep energy efficiency capability. Most deployments going forward are of models that meet the energy efficiency higher standards established by the Voluntary Agreement. The energy usage of those models in active mode and sleep mode is reported to the public on the cable operators' websites. Therefore, separate reporting of progress toward the now-completed phase one light sleep commitment is no longer necessary. For the phase two commitment, the cable operators continue to deploy DVRs with light sleep capability. Sleep savings for models deployed in 2015 are reported in Appendix A.

15 - Products indicating Tier 2 performance have been tested using Tier 1 (ENERGY STAR Version 3.0) test procedures. The Voluntary Agreement does not require the use of Tier 2 test procedures until 2017.

Of the three telco service providers, only one has been unable to implement light sleep to previously deployed set-top boxes without substantially degrading the consumer experience. It is currently developing next-generation set-top box equipment that will include low-power modes that turn off certain components to save energy after a period of inactivity. Light sleep is not required for these set-top boxes to meet the Tier 1 standards.

Automatic Power Down

Automatic power down (APD) monitors parameters related to viewing and user activity. If the parameters indicate that no user activity or viewing has occurred for a period of time, APD enables the device to transition to an off or sleep mode. The two satellite signatories – DISH and DIRECTV – committed that, effective January 1, 2013, at least 90% of new set-top boxes purchased will include an APD feature with a default value of four hours or less. In 2015, DISH and DIRECTV reported that 100% of the set-top boxes purchased met this requirement.

Whole-Home Systems

Whole-home set-top boxes use home network interfaces (HNI) to share content with other video client devices over a high-bandwidth home network. HNIs enable consumers to receive the following functions while consuming much less energy than required by stand-alone fully featured set-top boxes with built-in tuners and DVRs:

- Shared DVR functionality to set-top boxes without DVR capability
- Transcoding to serve a variety of customer-owned video devices
- Channel tuning capabilities to thin client devices that do not need to connect directly to the service provider's headend

With the installation of whole-home systems, the second, third, and any additional TVs use a non-DVR set-top box or thin client, both of which use considerably less energy than a DVR. Whole-home technology has the potential to save consumers another $1 billion per year in energy bills and prevent the emission of 5 million metric tons of CO2 per year.[16]

The satellite signatories committed to making energy efficient whole-home servers and clients available to all current and new subscribers in 2013, and each met its commitment. Since 2013, DIRECTV and DISH have offered nationwide availability of the DIRECTV "Genie" (www.DIRECTV.com/genie) and DISH "Hopper" and "Joey" (http://www.dish.com/hopper) whole-home DVR servers and clients, and these energy-saving devices have been widely adopted by consumers. DIRECTV's newest HR54 whole-home solution reduces energy consumption by more than one-third relative to the ENERGY STAR certified HR44 predecessor model. DIRECTV estimates that its current whole-home architecture uses 80% less energy to provide high-definition recording functionality to a three-TV home than three of its HD DVRs used ten years ago. DISH's newest whole-home gateway, the Hopper 3, has sixteen tuners so that homes requiring more tuners no longer need multiple gateways.

16 - Assumes 12.67 cents per kWh electricity rate. Savings have the potential to increase if older, less-efficient DVRs are replaced with a thin client.

AT&T and CenturyLink made similar commitments to deploy energy efficient whole-home DVRs. During 2014 and 2015, they provided whole-home DVR capability for all of their DVR subscriber households. More information about AT&T's whole-home DVR service is available at https://www.att.com/shop/u-verse/total-home-dvr.html and details about the CenturyLink whole-home DVR service can be found at http://www.centurylink.com/prismtv. Verizon committed to offering and deploying whole-home service and clients as appropriate and, in April 2014, the company launched the FiOS Quantum whole-home system. Information about this system is available at http://www.verizon.com/home/fiosquantumtv.

Although not required by the Voluntary Agreement, some cable operators have also deployed whole-home solutions. For example, more than 3.7 million Comcast customers have both an X1 DVR and additional Comcast non-DVR set-top boxes, which enables them to use the X1 whole-home capabilities to perform recording and playback functions from their non-DVRs rather than needing additional DVRs. This is an increase of 2 million customers from 2014. Time Warner Cable has equipped millions of its deployed set-top boxes with multimedia over coax (MoCA), which makes them capable of supporting whole-home DVR functionality. Cox also continues to promote whole-home installations.

Consumer-Facing Energy Efficiency Information

All service providers committed to provide subscribers and prospective customers with reasonable access to energy efficiency information for set-top boxes purchased since January 1, 2014. This information makes it easier for consumers to learn about energy efficient set-top boxes and typical set-top box energy consumption. All providers met this commitment, and this information has been posted and is available to consumers as shown in Appendix C. In 2015, service providers worked to enhance the accessibility of such information on their websites, for example by optimizing related terms in their search tools. In 2016, links to this information for each service provider signatory were posted at www.energy-efficiency.us.

Next-Generation Set-Top Boxes

The cable operator signatories committed to begin field tests of set-top boxes that include next-generation power management by December 31, 2014. The Voluntary Agreement states that if tested devices are successful, cable operators "anticipate deployment of such successfully tested Next Generation Set-Top Boxes during 2016." Next-generation power management allows parts of the device to operate in a reduced-power consumption mode while still working with cable system architectures and meeting consumer expectations for quick start-up time and other required functions. Trials commenced in 2014 and continued throughout 2015. One signatory has now initiated widespread deployment. The cable operators have provided the energy efficiency advocates with recurring progress updates, and further reporting is warranted to monitor the operators' progress.

Other Energy-Saving Strategies

In addition to the above commitments, signatories will evaluate other ways to save energy. For example, several service providers are offering cloud-based recording capability that enables customers to enjoy DVR capability without energy-consuming spinning hard-discs in the home. Verizon has implemented a dormant/off mode for selected components when not in use in its whole-home FiOS Quantum system.

VIEWING WITHOUT SET-TOP BOXES

The signatories continue to enable their customers to watch video programming without the use of set-top boxes at all. Consumers have downloaded more than 56 million multichannel video programming distributor (MVPD) apps for viewing MVPD programming on tablets, smartphones, game consoles, PCs, Smart TVs and other devices, all without the use of a set-top box.[17] Year-over-year viewing via MVPD apps more than doubled in 2015, with 40% of MVPD subscribers using apps to view their subscription content.[18] In addition, year-over-year viewing of online TV video rose by 63%, and active TV Everywhere (TVE) viewership (pay-tv subscribers watching TV online) grew by 19%.[19] A 2015 industry report found that approximately 55% of video watched on tablets is long-form content of more than 10 minutes, and mobile and tablets together accounted for 46% of time played, a 170% increase from 2013.[20] Viewing on mobile and tablet devices has become so significant that Nielsen is adjusting its audience measurement methodologies to account for it.[21] DIRECTV, DISH, Time Warner Cable, and Charter have recently launched offerings that enable certain customers to access their video programming without an operator-supplied set-top box,[22] and Comcast recently announced that it will make a similar capability available later in 2016. These trends could result in additional energy savings and the signatories have agreed to discuss possible means of measuring the energy impact of these trends in future reports.[23]

17 - See Federal Communications Commission, Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Seventeenth Report, MB Docket No. 15-158, DA 16-510, 31 FCC Rcd 4472 211 n.714 (FCC 2016), available at https://apps.fcc.gov/edocs_public/attachmatch/DA-16-510A1_Rcd.pdf.

18 - Jeff Baumgartner, TV Everywhere Continues Its Climb, MULTICHANNEL NEWS (Feb. 25, 2016), http://www.multichannel.com/news/content/tv-everywhere-continues-its-climb/402839; Jeff Baumgartner; TV Everywhere Usage Climbs: Study, MULTICHANNEL NEWS (Mar. 25, 2016), http://www.multichannel.com/news/content/tv-everywhere-usage-climbs-study/403575; Adobe Digital Index Q4 2015, subscription service; Digitalsmiths' Q4 2015 Video Trends Report: Consumer Behavior Across Pay-TV, VOD, PPV, OTT, Connected Devices, and Content Discovery, subscription service; FreeWheel, Video Monetization Report Q4 2015, subscription service.

19 - Adobe, U.S. Digital Video Benchmark Report: Adobe Digital Index Q2 2015) at 3, available at https://www.cmo.com/content/dam/CMO_Other/ADI/Video_Benchmark_q2_2015/ADI_Digital_Video_Report_Q2_2015.

20 - Ooyala's Q4 2015 Global Video Index, available at http://go.ooyala.com/rs/447-EQK-225/images/Ooyala-Global-Video-Index-Q4-2015.pdf.

21 - See Op-Ed, Megan Clarken, EVP, Neilson, "Nielsen Calls For Industry To Adopt New Ratings Standards," Media Daily News (Nov. 14, 2014), available at http://www.mediapost.com/publications/article/238149/nielsen-calls-for-industry-to-adopt-new-ratings-st.html (proposing new methods for audience measurement given that "more and more video content is being viewed outside of the [existing measurements] via different devices, including connected TV technologies like Apple TV or Roku boxes, gaming consoles and digital devices, PCs, tablets and smartphones").

22 - Services are delivered as internet protocol "apps," so a home requires a modem, but not a set-top box.

23 - Currently, most consumers still have at least one set-top box in their home that continues to draw power at all times, even if they also use apps to view video programming on tablets, computers or other devices. Accordingly, in some cases the primary energy effect may be a reduction in energy usage by the viewing device, if the tablet or computer uses less energy than their television. However, in other cases, the availability of programming on new devices without a set-top box is reducing consumer demand for additional set-top boxes in the home, which does significantly reduce the overall national energy usage of set-top boxes. Moreover, some signatories have started to support the viewing of programming through apps without any set-top box in the home, which entirely eliminates set-top box energy consumption in that home.

IMPACT ON NATIONAL ENERGY CONSUMPTION

In 2012, service providers began working with energy efficiency advocates to estimate the energy consumption of set-top boxes and the number of units installed in subscriber households. Using service provider and energy efficiency advocate reports and data on product trends, the signatories developed two base case scenarios. These base cases are published in the Voluntary Agreement. The first base case, shown in Table 3, represents the market in 2012.

Table 3: Base Case – 2012 Estimated Energy Consumption

Segment	Category	UEC[a]	Units	TEC[b]	Power Plants
		kWh/yr	Millions	TWh/yr	Rosenfelds
Cable	DVR	282	27	7.5	2.5
	Non-DVR[c]	139	57	7.9	2.6
	Thin Client[d]	90	2	0.1	0.0
	DTA	39	33	1.3	0.4
Satellite	DVR	283	21	5.9	2.0
	Non-DVR	110	58	6.4	2.1
Telco	DVR	140	6	0.8	0.3
	Non-DVR	90	21	1.9	0.6
U.S. Total		—	**225**	**32**	**10.6**

[a] While the base case refers to the annual consumption of a single device as the Unit Energy Consumption (UEC), the ENERGY STAR Version 3.0 specification uses the term typical energy consumption (TEC) when referring to annual consumption of a single device. To remain consistent with the ENERGY STAR specifications, this report refers to the annual consumption of a single device as TEC.

[b] While the base case refers to the aggregate annual consumption of deployed devices as TEC, the ENERGY STAR Version 3.0 specification uses TEC when referring to annual consumption of a single device. To prevent confusion, this report refers to the aggregate annual consumption of deployed devices as national energy consumption.

[c] The originally published base case uses the term "receiver," however, "non-DVR" is more accurate.

[d] Thin clients were only available from cable service providers at the time the 2012 Base Case was being developed, but 2013, 2014, and 2015 procurement reports included thin clients from non-cable service providers as well.

To gauge the Voluntary Agreement's impact on energy consumption at the national level, D+R estimated energy savings over the first base case. To do this, D+R used changes in video subscriber levels across the major segments (presented in Table 4) to estimate changes in set-top box stock levels.

Table 4: Change in Subscribers from 2012 to 2015

Segment	Percent Change[a]		
	2012 to 2013	2013 to 2014	2014 to 2015
Cable	-4.5%	-0.3%	-0.5%
Satellite	1.0%	0.1%	-1.9%
Telco	25.4%	8.2%	-0.9%

[a] Based on data provided by the Steering Committee (for 2012) and service providers (for 2013, 2014, and 2015)

By multiplying the unit data presented in Table 3 by these percentages, D+R arrived at the total 2015 stock levels shown in Table 5. The 2013 and 2014 unit estimates are included as reference points.

Table 5: Estimates of Total Units in the Market in 2013, 2014, and 2015

Category	2013 Units[a]	2014 Units[a]	2015 Units[a]
DVR	54,038,000	54,599,000	53,889,000
Non-DVR	130,343,000	122,650,000	112,668,000
Thin Client	10,561,000	20,299,000	28,773,000
DTA	31,632,000	31,543,000	31,395,000
U.S. Totals	**226,574,000**	**229,091,000**	**226,725,000**

[a] Units are rounded to the nearest thousand for this table, but D+R did not round any figures during the calculation and analysis process.

Under the terms of the Voluntary Agreement, D+R does not collect a census of deployed legacy equipment. The signatories purchased 6 million fewer set-top boxes in 2015 than in 2014. The model described below assumes that newly purchased devices replace existing devices. This assumption reflects a relatively stable number of pay-TV subscribers, retirement of older (less energy efficient) and broken equipment, replacement of older devices to satisfy consumer demand for new devices in a competitive marketplace, and loss of small units like DTAs, which are often not returned when consumers cancel service.[24] The estimate produced by this model serves as a sound basis for reporting overall gains in national energy efficiency, and the

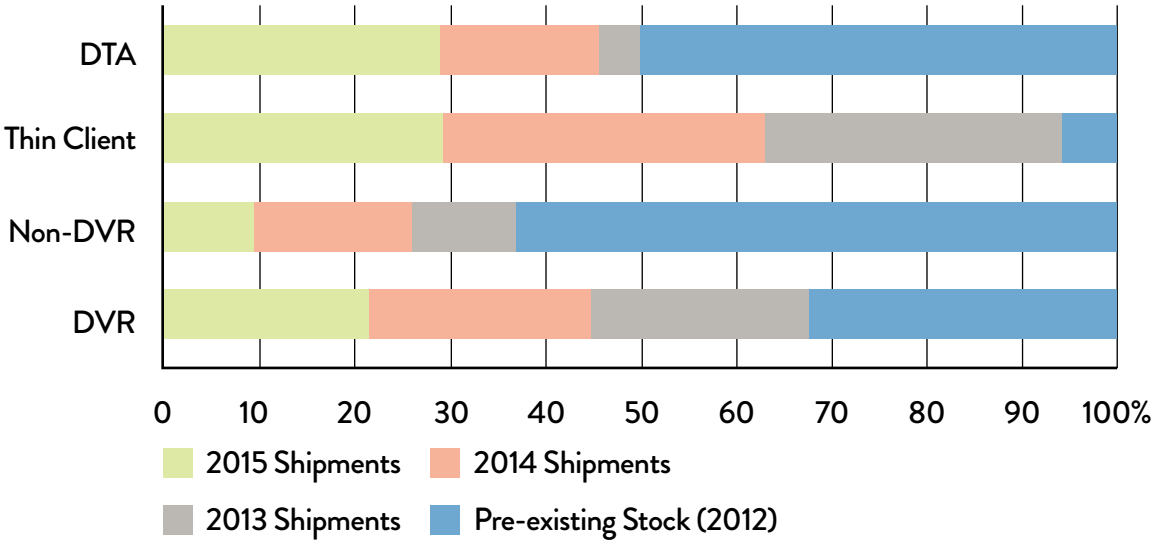
24 The increase in the number of DTAs purchased in 2015 compared to 2013 and 2014 likely reflects a shift by some operators from non-DVRs to DTAs and loss and breakage of DTAs.

signatories will continue to evaluate options for estimating overall stock for future annual reports.

The next step in estimating national energy consumption was to account for products procured in 2015. To arrive at the existing and new stock split, D+R subtracted 2015 set-top box procurements from the total units listed in Table 6. In general, D+R assumed that each new product replaced a product of the same type (i.e., a new DVR replaced an existing DVR). However, satellite thin clients and telco thin clients were not included in the base case scenarios. Thin clients and DTAs do not offer DVR capabilities, so D+R assumed that these product types replaced non-DVRs. These assumptions do not account for households upgrading from a non-DVR to a DVR. D+R also made no assumptions in this calculation about whole-home DVRs eliminating customer demand for additional DVRs. This methodology yielded two sets of stock – existing and new – each with its own TEC values. The weighted average TECs for the existing and new stock are shown in Table 1.

Figure 2 presents the breakdown of new and pre-existing stock for each set-top box category.

Figure 2: Pre-existing Stock Versus New Procurements, 2013-2015 (Percent of Units)



Multiplying the number of units by the TEC produces the estimated national energy consumption shown in Table 6.

Table 6: National Energy Consumption for New and Pre-existing Stock

Category	2012 Units			2012 TEC	New Stock (Units)	Weighted TEC Average Based on Procurement Data (kWh/yr)	National Energy Consumption (TWh/yr)
	Existing Stock in 2013	Existing Stock in 2014	Existing Stock in 2015				
DVR	41,828,000	29,678,000	17,279,000	267	12,210,208	195.4	13.5
					12,710,777	179.4	12.6
					11,671,180	170.6	11.3
Non-DVR	117,866,000	91,644,000	70,684,000	119	12,360,006	108.6	15.3
					18,646,064	103.3	14.2
					10,977,499	92.4	12.7
Thin Client	1,566,000	1,566,000	1,566,000	90	8,994,794	51.4	0.6
					9,738,163	50.0	1.1
					8,474,667	49.1	1.5
DTA	30,299,000	25,007,000	15,690,000	39	1,334,238	57.6	1.3
					5,201,332	49.3	1.3
					9,169,913	46.5	1.4
U.S. Totals	**191,559,000**	**147,895,000**	**105,237,000**	–	**34,899,478**[a]	-	**30.6**
					46,296,336	-	**29.2**
					40,293,259	-	**26.9**

[a] In 2013, 232 Multi-Service Gateway devices were reported. These have been included in the total procured number. There were no Multi-Service Gateway devices procured in 2014 or 2015. None of the 232 devices procured in 2013 met the Tier 1 levels. The average energy consumption of those products was 219 kWh/year.

2013 2014 2015

As Table 6 shows, the improvements in energy efficiency spurred by the Voluntary Agreement have had an increasingly large impact on national energy consumption. The Voluntary Agreement reduced national set-top box energy consumption from 32 TWh/year in 2012, to 30.6 TWh in 2013, to 29.2 TWh/year in 2014, and to 26.9 TWh/year in 2015, a reduction of 15.9%, despite an increase in the number of set-top boxes in the market.[25] This 5.1 TWh reduction represents consumer savings of approximately $646 million[26] and CO2 emission savings of 3.5 million metric tons in 2015 alone.[27] Over the first three years of the Voluntary Agreement, cumulative energy consumption has been reduced by an estimated 9.3 TWh, saving consumers approximately $1.18 billion and avoiding 6.5 million metric tons of CO2 emissions.[28] The energy saved over the first three years is the equivalent of the energy used by all of the residences in both Washington, DC and San Francisco combined, for one year.[29]

25 - See *supra* note 3.
26 - See *supra* note 4.
27 - See *supra* note 5.
28 - See D+R International, 2013 Annual Report, Voluntary Agreement for the Energy Efficiency of Set-Top Boxes (2013 Annual Report) at 14 (estimating 1.4 TWh reduction in energy usage).
29 - 9.3 TWh is equivalent to the annual energy usage of 690,000 households and the annual electricity usage of 965,000 households. See https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

The Voluntary Agreement also requires a comparison to a second base case that assumes a market without the Voluntary Agreement and with unabated DVR proliferation. Using this methodology, national set-top box energy usage in 2016 would have been 36.5 TWh, with the estimated number of DVRs at 149 million (out of 237 million set-top boxes), up from 54 million DVRs (out of 225 million set-top boxes) in 2012.[30] The actual national energy consumption calculated for 2016 based on the 2015 procurement data is 26.9 TWh/year. This means that the signatories to the Voluntary Agreement will have avoided 9.6 TWh in national energy consumption in 2016 that would have occurred with unabated DVR proliferation, saving consumers approximately $1.21 billion[31] and avoiding 6.7 million metric tons of CO2 emissions.[32] The three-year estimated savings using this methodology is 18.3 TWh, which saved consumers approximately $2.3 billion and prevented 12.8 million metric tons of CO2 emissions.[33] This second base case comparison by its nature is not offered as a precise estimate of savings, but illustrates the significance of averting a scenario that the Voluntary Agreement was developed to prevent.

CONCLUSION

Under the Voluntary Agreement, 90% of set-top boxes procured by participants after December 31, 2013 must meet the energy standards of ENERGY STAR Version 3.0, or Tier 1. In 2015, 99.5% of set-top boxes purchased met these standards. Voluntary Agreement participants demonstrated early adoption of the more rigorous Tier 2 performance levels that will become applicable in 2017, with an estimated 67.6% of set-top boxes purchased in 2015 achieving Tier 2 performance levels.

The signatories also satisfied their other commitments under the Voluntary Agreement. The signatories have fulfilled their commitments to deploy light sleep to pre-Agreement set-top boxes, incorporate automatic power down in satellite set-top boxes, make whole-home systems available to subscribers, and provide reasonable access to energy efficiency information for set-top boxes purchased after January 1, 2014. Their reported energy consumption figures were confirmed as accurate by independent field verification. The signatories also are working toward additional savings by field testing set-top boxes that include next-generation power management.

The Voluntary Agreement reduced national energy consumption of set-top boxes from 32 TWh/year in 2013 to 26.9 TWh/year in 2015, a reduction of 15.94%, even as the functionality of set-top boxes increased. Compared to earlier projections of unabated proliferation of digital video recorders (DVRs) in the absence of the Voluntary Agreement, savings were nearly twice that amount.

30 - This base case provides two national energy consumption data points: 32 TWh/year for 2013 and 47 TWh/year for 2023. Because the second base case is based on linear growth trends for DVR units and energy consumption, D+R calculated the annual incremental increase in national energy consumption by dividing the change in national energy consumption (47 TWh/year – 32 TWh/year = 15 TWh/year) by the number of years elapsed (2023 – 2013 =10 years), yielding an increase of 1.5 TWh/year. D+R calculated the national energy consumption for 2016 under the second base by adding the incremental energy consumption increase (1.5 TWh/year) to the 2015 baseline national energy consumption (35 TWh/year).
31 - See *supra* note 4.
32 - See *supra* note 5.
33 - See D+R International, 2014 Annual Report, Voluntary Agreement for the Energy Efficiency of Set-Top Boxes (2014 Annual Report) at 17 (estimating 2.8 TWh reduction in energy usage in 2014 and 1.4 TWh reduction in 2013).

APPENDIX A: VOLUNTARY AGREEMENT COMMITMENTS

Table 7 lists the commitments of the signatories to the Voluntary Agreement along with the status of the signatories' progress toward these commitments.

Table 7: Voluntary Agreement Commitments

Commitments	Group	Status
90% procurement of set-top boxes meeting Tier 1 (ENERGY STAR Version 3.0) after December 31, 2013 (for calendar years 2014, 2015, and 2016).	All Service Providers	99.5% procurement after December 31, 2013. Only one signatory did not meet the commitment in 2015, and it is now implementing a remedial plan expected to offset the additional energy used as a result of its shortfall.
Prepare a confidential annual procurement report for the prior year by April 1 of the following year beginning in 2014.	All Service Providers	100% filed on time with Independent Administrator in 2015.
Provide energy efficiency information to subscribers and potential subscribers no later than January 1, 2014.	All Service Providers	Complete. Energy efficiency information provided by all service providers on time.
Enable light sleep capabilities in certain new models deployed after January 1, 2013, with a default inactivity period of 4 hours where doing so does not degrade customer experience.	Telco (Verizon)	A 2013 regional trial of an APD to light-sleep mode resulted in significant customer dissatisfaction such that the mode was disabled. Verizon is developing next-generation set-top equipment that will include "low power" modes that turn off certain communications or audio/video components to save energy after certain periods of inactivity.
Offer and deploy whole-home servers and clients as appropriate.	Telco (Verizon)	Complete. Verizon launched FiOS Quantum whole-home DVR in April 2014 and continues to offer the service.
90% procurement of set-top boxes with automatic power down feature in 2013.	Satellite	Complete. 100% deployment in 2015.
Make whole-home servers and clients available to all new and existing subscribers in 2013	Satellite	Complete. Offered throughout the United States in 2013, 2014, and 2015
90% procurement of set-top boxes meeting Tier 2 after December 31, 2016 (for calendar year 2017).	All Sevice Providers	67.6% procurement rate of set-top boxes indicating performance at Tier 2 levels after December 31, 2015.
Review the energy use of set-top boxes that incorporate DOCSIS 3.0 8x4 mode and greater by October 2015 and to modify the Additional Functionality TEC Allowance as appropriate.	All Signatories	Completed June 2015. The Steering Committee voted to initiate a re-assessment of the allowance by the end of 2016.
Work with suppliers to develop set-top boxes with next-generation power management, begin field testing of these set-top boxes by December 31, 2014, and begin deploying them in later years under conditions set forth in the Voluntary Agreement.	Cable	Ongoing. Field tests began in December 2014 and continued throughout 2015. One operator has now initiated widespread deployment.

Use reasonable efforts to design and manufacture equipment to enable improved set-top box energy efficiency while meeting the service providers' functional and operational specification.	Equipment Manufacturers	Manufacturers' efforts to date are reflected in the energy savings reported by service providers, and there is ongoing development of next-generation set-top boxes with lower-power silicon solutions.
Pursue reasonable strategies to reduce energy consumption.	Telco (Verizon)	Ongoing. For example, Verizon deployments have transitioned to the FiOS Quantum platform, which has implemented new capabilities (e.g., a dormant/off mode for selected components) that reduce energy consumption without compromising the customer experience.
Continue to deploy set-top boxes with light sleep capabilities.	Telco (IPTV)	Continued deployment in 2015.
Deploy whole-home DVR set-top boxes where possible.	Telco (IPTV)	Deployed throughout the United States in 2014 and 2015.
Evaluate options for further reducing inactive-state energy consumption.	Telco (IPTV)	Ongoing.
Provide periodic updates to government and energy-advocate stakeholders.	Telco (IPTV)	Updates were provided to DOE, state regulators, and energy-advocate stakeholders, and the Steering Committee published its annual report.
Continue the deployment, which began in September 2012, of new set-top boxes with light sleep capabilities and software updates enabling light sleep to certain models of deployed DVRs.	Cable	Complete. Continued deployment and software updates in 2015. More than 32.5 million set-top boxes deployed or upgraded.

APPENDIX B: SET-TOP BOXES PURCHASED BY VOLUNTARY AGREEMENT SIGNATORIES IN 2015

Table 8 lists the reported total energy consumption (TEC) for each model of set-top box purchased by Voluntary Agreement signatories in 2015. These values are reported TEC, rather than calculated TEC (called "measured TEC" in the ENERGY STAR Version 3.0 specification). Under the ENERGY STAR Version 3.0 specification, service providers have the option to publish a "reported TEC" that rounds up calculated TEC values for reporting purposes to account for production variances. Modal power and Reported TEC figures in this Appendix are rounded up to the next one-tenth digit (e.g., 99.11 kWh/year would be rounded up to 99.2 kWh/year). Please note that the same model could have variances in TEC for several reasons, including differences in reported versus calculated TEC, enabling of different product features, and/or deployment of the device by service providers running different software. ENERGY STAR Version 3.0 (Tier 1) calculates maximum allowable TEC for a product using the base-type allowances outlined in Table 9 and the feature allowances outlined in Table 10. Table 10 also includes descriptions of the features abbreviated in Table 9 in the "Claimed Allowances" column. ENERGY STAR Version 3.0 has rules for how to claim feature allowances, so the column for claimed allowances lists only the features used when calculating the maximum allowable TEC for the specific product.

The Excel template used to collect product data used algorithms to calculate maximum allowable TEC according to the ENERGY STAR Version 3.0 rules and the service provider reported features before assessing whether a product met ENERGY STAR Version 3.0 (Tier 1). Service providers had the opportunity to review Table 8 to ensure that the data presented here is accurate. Procurement data submitted by service providers is subject to one random audit per year and the Steering Committee has the option to direct the Independent Administrator to conduct additional audits as necessary. Set-top boxes are subject to field verification of energy performance data. An asterisk indicates units that were evaluated through field verification in 2014 and/or 2015.

Table 8: Set-Top Boxes Procured by Voluntary Agreement Signatories in 2015

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
AT&T	IP	DVR	ARRIS	2250*	AVP. DVR, HD, MR, MS-T/I	17.0	14.5	143.0	Yes
AT&T	IP	DVR	Cisco	7500*	AVP. DVR, HD, MR, MS-T/I	18.2	15.5	145.0	Yes
AT&T	IP	DVR	Pace	8005*	AVP. DVR, HD, MR, MS-T/I	11.1	10.0	87.7	Yes
AT&T	IP	DVR	Pace	8010	AVP. DVR, HD, MR, MS-T/I	11.1	9.9	85.4	Yes
AT&T	IP	DVR	Pace	8110	AVP. DVR, HD, MR, MS-T/I	10.9	9.7	91.1	Yes
AT&T	IP	Non-DVR	ARRIS	2500*	AVP. DVR, HD, HNI, MS-T/I	11.5	11.4	102.0	Yes
AT&T	IP	Non-DVR	Cisco	7005*	AVP. DVR, HD, HNI, MS-T/I	11.6	11.4	101.0	Yes
AT&T	IP	Non-DVR	Cisco	7105*	AVP. DVR, HD, HNI, MS-T/I	11.7	11.7	103.0	Yes

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
BHN	CBL	DVR	ARRIS	DCX3600-M*	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	26.1	24.3	225.0	Yes
BHN	CBL	DVR	Samsung	SMT-H4372*	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	25.5	22.6	220.0	Yes
BHN	CBL	DVR	ARRIS	DCX3510	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.8	18.3	175.0	Yes
BHN	CBL	Non-DVR	ARRIS	DCX3200P3	APD, AVP, CC, DOCSIS, HD, HNI	14.5	11.5	115.0	Yes
BHN	CBL	Non-DVR	Samsung	SMT-H3362*	APD, AVP, CC, DOCSIS, HD, HNI	14.3	13.2	122.0	Yes
BHN	CBL	Non-DVR	Cisco	4742HDC*	APD, AVP, CC, DOCSIS, HD, HNI	19.5	14.7	141.0	Yes
Cablevision	CBL	DVR	Samsung	SMT-5320*	AVP, DOCSIS, HD, DCA, nDVR	18.2	17.2	156.0	Yes
Century Link	IP	DVR	ARRIS	2262*	AVP, DVR, HD, HNI, MR, MS-T/I	11.8	10.6	99.1	Yes
Century Link	IP	Non-DVR	ARRIS	2502*	AVP, HD, HNI, MS-T/I	11.8	11.7	102.7	Yes
Century Link	IP	DVR	Pace	8005*	AVP, DVR, HD, HNI, MR, MS-T/I	11.3	8.2	87.4	Yes
Century Link	IP	DVR	Pace	8010	AVP, DVR, HD, HNI, MR, MS-T/I	11.0	8.1	86.6	Yes
Century Link	IP	Non-DVR	Pace	8000	AVP, HD, HNI, MS-T/I	9.1	7.6	74.2	Yes
Charter	Cable	Non-DVR	ARRIS	3220e p1*	AVP, DOCSIS, HD	11.1	10.9	100.0	Yes
Charter	Cable	Non-DVR	ARRIS	3200-M p3*	AVP, CC, DOCSIS, HD	12.5	12.1	115.0	Yes
Charter	Cable	DVR	ARRIS	3510-M p1*	AVP, CC, DVR, DOCSIS, HD, MS-C/S	22.8	21.1	193.0	Yes
Charter	Cable	DVR	ARRIS	3520e-M p1*	AVP, DVR, DOCSIS, HD, MS-C/S	22.9	22.1	198.0	No
Charter	DTA	DTA	Pace	DC60XUHD	HD	6.4	6.4	58.0	Yes
Charter	DTA	DTA	Cisco	170HD*	HD	4.9	4.8	45.0	Yes
Charter	Cable	Non-DVR	Cisco	4640HDC2*	AVP, CC, DOCSIS, HD	12.6	8.7	100.0	Yes
Charter	Cable	DVR	Cisco	8640HDC2*	APD, AVP, CC, DVR, DOCSIS, HD, MS-C/S	20.3	13.7	140.0	Yes

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
Comcast	CBL	DTA	ARRIS	HD-DTA100u*	HD	4.0	3.8	35.0	Yes
Comcast	DTA	DTA	Evolution	DMS2004UH-DW	HD	6.2	6.2	60.0	Yes
Comcast	CBL	DVR	ARRIS	MX011ANM*	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	27.2	24.0	240.0	Yes
Comcast	CBL	DVR	ARRIS	AX013ANM	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	21.9	21.2	200.0	Yes
Comcast	CBL	DVR	Pace	PX013ANM*	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	23.2	22.0	210.0	Yes
Comcast	CBL	Non-DVR	Pace	PR150BNM*	AVP, CC, DOCSIS, HD, HNI	13.3	12.3	120.0	Yes
Comcast	CBL	Non-DVR	Pace	PX022ANM	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	14.9	13.7	135.0	Yes
Comcast	CBL	Non-DVR	Samsung	SX022ANM	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	14.3	13.0	130.0	Yes
Comcast	IP	Non-DVR	Pace	PX032ANI*	AVP, HD, HNI	5.9	5.3	54.0	Yes
Comcast	CBL	Non-DVR	Cisco	CR150CNC	AVP, CC, DOCSIS, HD, HNI	14.5	12.7	125.0	Yes
Comcast	CBL	Non-DVR	Samsung	SX022ANC	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	15.5	14.1	140.0	Yes
Comcast	CBL	DVR	ARRIS	AX013ANC	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	21.9	20.8	200.0	Yes
Comcast	CBL	DVR	Pace	PX013ANC*	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	23.5	22.3	210.0	Yes
Comcast	CBL	DVR	ARRIS	MX011ANC	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	26.5	23.6	240.0	Yes
Comcast	CBL	Non-DVR	Pace	PR150BNC*	AVP, CC, DOCSIS, HD, HNI	13.4	12.5	120.0	Yes
Comcast	CBL	Non-DVR	Pace	PX022ANC	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	14.9	13.9	135.0	Yes
Comcast	CBL	Non-DVR	Samsung	SR150BNM*	AVP, CC, DOCSIS, HD, HNI	15.2	13.7	130.0	Yes
Comcast	CBL	Non-DVR	ARRIS	DCX3200 MoCA P3*	AVP, CC, DOCSIS, HD, HNI	13.2	13.0	120.0	Yes
Comcast	IP	Non-DVR	Cisco	CXD01ANI	AVP, HD, HNI	5.4	4.4	54.0	Yes

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
Comcast	IP	Non-DVR	Pace	PXD01ANI	AVP, HD, HNI	5.7	5.0	54.0	Yes
Cox	CBL	Non-DVR	Cisco	4642HDC	APD, AVP, CC, DOCSIS, HD, HNI	17.2	12.6	131.0	Yes
Cox	CBL	Non-DVR	Cisco	4742HDC*	APD, AVP, CC, DOCSIS, HD, HNI	18.7	14.1	136.0	Yes
Cox	CBL	DVR	Cisco	8742HDC*	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.7	18.8	175.0	Yes
Cox	CBL	DVR	Cisco	9865HDC*	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	28.1	25.4	230.0	Yes
Cox	CBL	DVR	ARRIS	AX013ANM	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	24.2	23.0	212.0	Yes
Cox	CBL	DVR	ARRIS	AX013ANC	AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	24.7	23.5	217.0	Yes
Cox	CBL	Non-DVR	Pace	PX022ANM	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	15.2	13.8	130.0	Yes
Cox	CBL	Non-DVR	Pace	PX022ANC	AVP, CC, DOCSIS 3.0, HD, MR, MS-C/S	15.7	14.3	137.0	Yes
Cox	IP	Non-DVR	Pace	PXD01ANI	AVP, HD, HNI	5.9	5.1	54.0	Yes
Cox	DTA	DTA	Cisco	DTA250HD	HD	4.9	4.9	45.0	Yes
Cox	DTA	DTA	Evolution	DM-S2444UHDS	HD	6.9	6.9	60.0	Yes
DirectTV	SAT	Non-DVR	DIRECTV	H25-100*	APD, AVP, HD, HNI	10.4	8.5	78.6	Yes
DirectTV	SAT	DVR	DIRECTV	HR44-200*	APD, AVP, DVR, HD, HNI, MR, MS-C/S	19.3	18.1	158.7	Yes
DirectTV	SAT	DVR	DIRECTV	HR44-500*	APD, AVP, DVR, HD, HNI, MR, MS-C/S	19.0	17.9	167.0	Yes
DirectTV	SAT	DVR	DIRECTV	HR44-700*	APD, AVP, DVR, HD, HNI, MR, MS-C/S	18.5	17.5	149.5	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C41-100*	APD, AVP, HD, HNI	5.6	4.2	39.9	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C41-500*	APD, AVP, HD, HNI	5.6	4.1	39.0	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C41-700*	APD, AVP, HD, HNI	5.3	3.7	36.2	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C41W-100*	APD, AVP, HD, HNI	7.2	5.6	52.9	Yes

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C41W-500*	APD, AVP, HD, HNI	7.2	5.8	53.8	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C51-100*	APD, AVP, HD, HNI	6.4	3.8	39.3	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C51-500	APD, AVP, HD, HNI	5.7	3.7	37.2	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C51-700	APD, AVP, HD, HNI	6.1	4.3	41.9	Yes
DirectTV	Thin Client / Remote	Thin Client	DIRECTV	C61K-700	APD, AVP, HD, HNI	9.5	4.1	49.3	Yes
DirectTV	SAT	DVR	DIRECTV	HR54-200	APD, AVP, DVR, HD, HNI, MR, MS-C/S	12.2	11.1	99.9	Yes
DirectTV	SAT	DVR	DIRECTV	HR54-500	APD, AVP, DVR, HD, HNI, MR, MS-C/S	12.7	12.7	110.8	Yes
DirectTV	SAT	DVR	DIRECTV	HR54-700	APD, AVP, DVR, HD, HNI, MR, MS-C/S	12.1	11.1	99.3	Yes
DirectTV	SAT	DVR	DIRECTV	H44-100	APD, AVP, DVR, HD, HNI, MR, MS-C/S	9.8	9.1	93.1	Yes
DirectTV	SAT	DVR	DIRECTV	H44-500	APD, AVP, DVR, HD, HNI, MR, MS-C/S	10.4	9.4	87.9	Yes
DISH	Satellite	Non-DVR	DISH	Solo ViP211z*	APD, AVP, HD	7.4	7.0	62.0	Yes
DISH	Thin Client / Remote	Thin Client	DISH	Joey (HWID = ZBxx)*	APD, AVP, HD, HNI	6.9	6.8	60.0	Yes
DISH	Satellite	DVR	DISH	Hopper with Sling (HWID = Nexx)*	APD, AVP, DVR, HD, HNI, XCD	22.0	21.5	190.0	Yes
DISH	Thin Client / Remote	Thin Client	DISH	Wireless Joey*	APD, AVP, HD, HNI, MIMO-5	7.8	7.5	65.0	Yes
DISH	Satellite	Non-DVR	DISH	Super Joey*	APD, AVP, HD, HNI, MS-C/S	12.0	12.0	106.0	Yes
DISH	Thin Client / Remote	Thin Client	DISH	4k Joey	APD, AVP, HD, HNI, UHD, HEVC	9.6	8.4	77.0	Yes
DISH	Satellite	DVR	DISH	Hopper 3	APD, AVP, DVR, HD, MR, MS-C/S, XCD, UHD, HEVC	23.3	22.2	197.0	Yes
DISH	Satellite	Non-DVR	DISH	Wally	APD, AVP, HD, UHD, HEVC	7.9	7.8	69.0	Yes
TWC	Cable	DVR	ARRIS	DCX3510*	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.8	18.3	175.0	Yes
TWC	Cable	DVR	Cisco	8742HDC*	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	21.8	18.5	175.0	Yes

Service Provider	Base Type	Primary Function	Brand	Model No.	Claimed Allowances	Modal Characteristics (W)		TEC[a] (kWh/yr)	Meets ENERGY STAR Version 3.0 (Tier 1)
						On	Sleep		
TWC	Cable	DVR	Samsung	SMT-H3272*	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	30.3	25.9	240.0	No
TWC	Cable	DVR	ARRIS	DCX3600*	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	26.1	24.3	225.0	Yes
TWC	Cable	DVR	Cisco	9865HDC	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	27.1	27.0	225.0	Yes
TWC	Cable	DVR	Samsung	SMT-H4372	APD, AVP, CC, DVR, DOCSIS 3.0, HD, MR, MS-C/S	25.5	22.6	220.0	Yes
TWC	Cable	Non-DVR	ARRIS	DCX3200 p3*	APD, AVP, CC, DOCSIS, HD, HNI	14.5	11.5	115.0	Yes
TWC	Cable	Non-DVR	Cisco	4742HDC*	APD, AVP, CC, DOCSIS, HD, HNI	19.5	14.7	141.0	Yes
TWC	Cable	Non-DVR	Samsung	SMT-H3362*	APD, AVP, CC, DOCSIS, HD, HNI	14.3	13.2	122.0	Yes
TWC	DTA	DTA	Cisco	DTA 170HD*	HD	5.2	5.2	45.0	Yes
TWC	DTA	DTA	Cisco	DTA 271HD	HD	6.0	5.8	55.0	Yes
Verizon	Cable	DVR	ARRIS	1100*	AVP, CC, DVR, HD, MR, MS-C/S	22.8	22.1	196.6	Yes
Verizon	Internet Protocol (IP)	Thin Client	ARRIS	1100 P2*	AVP, HD, HNI	8.7	8.7	76.2	Yes
Verizon	Cable	Non-DVR	ARRIS	7100 P2*	AVP, CC, HD, HNI	15.6	15.6	136.7	No

[a] These values are reported TEC, rather than calculated TEC (called "measured TEC" in the ENERGY STAR Version 3.0 specification). Under the ENERGY STAR Version 3.0 specification, service providers have the option to round up calculated TEC values for reporting purposes to account for production variances. These values are referred to as reported TEC. The reported TEC and modal power figures in this Appendix are rounded up to the next one-tenth digit (e.g., 99.11 kWh/year would be rounded up to 99.2 kWh/year).

* Indicates models that have been verified through independent field verification in 2014 and/or 2015.

Table 9 presents the base allowances for set-top boxes under ENERGY STAR Version 3.0 (Tier 1).

Table 9: Set-Top Box Allowances

Base Type (Use topmost if multiple apply)	Tier 1 Allowance (kWh/yr)
DTA	35
Cable (CBL)	60
Satellite (SAT)	70
Internet Protocol (IP)	50
Thin Client (TC)	35

Table 10 sets forth the features listed for set-top boxes and outlines the feature allowances under ENERGY STAR Version 3.0 (Tier 1).

Table 10: Set-Top Box Feature Allowances

Feature	Description	ENERGY STAR Version 3.0 (Tier 1) TEC Allowance
AVP	Advanced video processing (AVP) enables set-top box to encode, decode, and/or transcode audio/video signals	12
CC	CableCARD™ gives set-top boxes the capacity to decrypt premium audio/video content and services as well as other network control functions	15
DVR	A digital video recorder (DVR) allows set-top boxes to store digital video files to a rewritable disk or other integrated storage device	45
DOCSIS	Data Over Cable Service Interface Specifications (DOCSIS) enable set-top boxes to distribute data and audio/video content over cable infrastructure (protocol version 2.0)	20
HD	High definition (HD) makes set-top boxes capable of transmitting video signals with resolution greater than or equal to 720p	25
HNI	Home network interfaces (HNIs) allow set-top boxes to interface with external devices via a high-bandwidth local area network	10
MR	Multi-room (MR) functionality enables set-top boxes to provide independent audio/video content to multiple devices within a single household	40
MS-C/S	Multi-stream (MS) for cable and satellite (C/S) is the capability to deliver multiple simultaneous audio/video streams to a single display, thin-client/remote set-top box, or recording device over coax or via satellite	16

MS-T/I	Multi-stream (MS) for terrestrial and Internet protocol (T/I) delivers multiple simultaneous audio/video streams through a LAN or Internet protocol home network	8
RMP	Removable media player (RMP) gives a set-top box the ability to decode digitized audio/video signals on DVD or Blu-ray discs	8
RMR	Removable media player/recorder (RMR) gives a set-top box the ability to decode and record digitized audio/video signals on DVD or Blu-ray discs	10
Tier 2 Allowances that are included as Tier 1 New Feature Allowances		
DOCSIS 3.0	Data Over Cable Service Interface Specifications (DOCSIS) enable set-top boxes to distribute data and audio/video content over cable infrastructure (protocol version 3.0 up to an 8x4 configuration)	50
XCD	Enables STB to change format of video content for playback on additional devices.	13
Wi-Fi-HNI	Home Network Interface (HNI) using Wi-Fi technology to distribute or receive video. MIMO allowances are taken in addition to this allowance.	15
MIMO-5	Multi-Input Multi-Output (MIMO) Wireless HNI that supports more than one spatial stream at 5 GHz to send and receive information.	4 (per spatial stream)
Other Allowances		
DCAS[a]	Downloadable Conditional Access (DCAS)	15
nDVR[b]	Networked DVR	85
UHD[c]	Ultra High Definition (UHD)	5
HEVC[c]	High Efficiency Video Coding (HEVC)	10

[a] The Steering Committee approved a Tier 1 subtraction approach of 15 kWh/yr for a device with downloadable conditional access on June 19, 2014.

[b] The Steering Committee approved a Tier 1 subtraction approach for networked DVR, resulting in multi-room DVR functionality, of 85 kWh/yr (DVR: 45 and Multi-Room: 40) on June 19, 2014.

[c] Proposed new feature allowance by service provider in 2015 annual report. See p. 12 of this report.

APPENDIX C: CONSUMER SET-TOP BOX ENERGY EFFICIENCY INFORMATION

Set-top box energy information for consumers is available at www.energy-efficiency.us, and for each service provider at the links below.

Service Provider	Consumer Information Location	Additional Information
AT&T	https://www.att.com/shop/u-verse/modals/uf/ATT-IP-Set-Top-Box-STB-Energy-Information.html	
Bright House Networks	http://support.brighthouse.com/Article/Converter-Energy-7843/	Redirect to http://energy.cablelabs.com/bright-house-networks/
Cablevision	http://optimum.custhelp.com/app/answers/detail/a_id/2809/kw/energy%20star	Redirect to http://energy.cablelabs.com/cablevision
CenturyLink	http://promotions.centurylink.com/prism/existing/	
Charter Communications	http://charter.net/drenergy	Redirect to http://energy.cablelabs.com/charter/
Comcast	http://corporate.comcast.com/news-information/news-feed/a-commitment-to-creating-the-sustainable-devices-of-tomorrow	Redirect to http://energy.cablelabs.com/comcast
Cox Communications	http://energy.cablelabs.com/cox	
DIRECTV	http://cdns.directv.com/cms3/about/sustainability/DIRECTV_products_Energy_Star.pdf	Redirect to http://www.energystar.gov/productfinder/product/certified-set-top-boxes/
DISH Network	http://www.mydish.com/support/energy-efficiency	
Time Warner Cable	http://www.timewarnercable.com/en/our-company/corporate-responsibility/environment.html	Scroll down to "CableLabs: TWC's Set-Top Box energy information," redirect to http://energy.cablelabs.com/time-warner-cable
Verizon	https://www.verizon.com/Support/Residential/Tv/FiosTv/Receivers/User+Guides/User+Guides.htm#energy	Scroll down to "Verizon STB Energy Information"

D+R International

2015 Annual Report Audit Results

In 2012, the pay television industry signed a voluntary agreement with the goal of increasing the energy efficiency of set-top boxes, while protecting rapid innovation and timely introduction of new features. Signatories of the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes include 11 cable, satellite, and telco service providers, 4 major set-top box manufacturers, energy-efficiency advocates, and other organizations.

The Voluntary Agreement requires the service providers to submit annual procurement data to an independent administrator, who collects and analyzes the data, then publishes the findings in an Annual Report. Data from the individual service providers is aggregated for publication in the Annual Report to protect this highly confidential information. To verify the accuracy of the reported procurement data, the Voluntary Agreement requires a random audit of one service provider each year. In accordance with the confidentiality requirements of the Voluntary Agreement, the name of the service provider is not published.

D+R International conducted an audit of the procurement data provided in 2016, which was used to develop the findings published in the 2015 Annual Report (released July 31, 2016). D+R randomly selected the service provider by creating an Excel spreadsheet and using the "random" function. (The Voluntary Agreement stipulates that the service provider audited in 2016 be eliminated from consideration for next year's random audit.)

D+R requested raw data from the selected service provider to verify the procurement data submitted. Over the course of two months, D+R worked with the service provider to collect additional information and reviewed the submitted data, which included invoice data, test reports, and specification sheets.

D+R, as Independent Administrator, has determined that the service provider selected for the audit is in substantial compliance with the Voluntary Agreement. After cross-checking the information provided by the service provider and comparing it to the procurement data originally provided, D+R concluded that the share of set-top boxes procured by the service provider in 2015 meeting ENERGY STAR Version 3.0 (Tier 1) is above the 90% threshold established by the Voluntary Agreement.

June 22, 2016