

2013 Annual Report

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

Prepared on behalf of the
Steering Committee by:

D&R International, Ltd.
1300 Spring Street, Suite 500
Silver Spring, MD 20910



D&R International, Ltd.
The Energy Efficiency Market ExpertsSM

August 15, 2014

Table of Contents

Executive Summary	1
Overview of the Voluntary Agreement.....	3
Voluntary Agreement Objectives	3
Voluntary Agreement Signatories and Steering Committee	4
Service Provider Commitments	6
Independent Administrator and Auditor Role	6
Increased Energy Efficiency of Set-Top Boxes.....	6
Progress on Procurement Commitments.....	7
Progress on Other Energy Efficiency Commitments.....	9
Light Sleep	9
Automatic Power Down	10
Whole-Home Systems.....	10
Consumer-Facing Energy Efficiency Information	10
Other Energy Saving Strategies	11
Viewing Without Set-Top Boxes.....	11
Impact on National Energy Consumption	12
Comparison to First Base Case Scenario	13
Comparison to Second Base Case Scenario	15
Conclusion	16
Appendix A: Voluntary Agreement Commitments.....	17
Appendix B: Set-Top Boxes Purchased by Voluntary Agreement Signatories in 2013	19
Appendix C: Consumer Set-top Box Energy Efficiency Information	26

List of Tables

Table 1: Weighted TEC Average for Major Set-Top Box Categories7

Table 2: 2013 Aggregated Voluntary Agreement Participant Set-Top Box Procurement8

Table 3: Base Case – 2012 Estimated Energy Consumption 12

Table 4: Base Case – Estimated Energy Consumption – High-DVR Proliferation 13

Table 5: Percent Change in Subscriber Levels from 2012 to 2013 13

Table 6: Estimates of Total Units in the Market in 2013..... 14

Table 7: National Energy Consumption for New and Existing Stock..... 15

Table 8: Voluntary Agreement Commitments 17

Table 9: Set-Top Boxes Procured by Voluntary Agreement Signatories in 2013 19

Table 10: Set-Top Box Base Allowance 24

Table 11: Set-Top Box Feature Allowances 24

List of Figures

Figure 1: Existing Stock versus New Procurements in 2013 (Percent of Units) 14

Executive Summary

In 2012, the pay television industry signed the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes (<http://www.ncta.com/energyagreement>) with the goal of increasing energy efficiency of set-top boxes while protecting rapid innovation and timely introduction of new features. Signatories include 11 cable, satellite, and telco service providers serving 91.9 million U.S. video subscribers, accounting for 91.3% of the market in 2013. 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 publication of an annual report. This report provides a summary of developments for the last calendar year.

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” requirements 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”).

Although the procurement commitments were not in effect in 2013, 85% of service providers’ set-top box purchases met the ENERGY STAR Version 3.0 or Tier 1 standards, indicating significant early progress toward the Tier 1 goal.¹ Service providers have also reported set-top box purchases that indicate early adoption of Tier 2 performance levels, with approximately 47% of set-top boxes procured in 2013 indicating performance at Tier 2 levels.² Progress toward Tier 2 performance is a positive indicator, however, set-top boxes purchased closer to the Tier 2 effective date in January 2017 will likely have significant increased functionality compared to products reported in 2013. These features will likely consume more energy, making achievement of the Tier 2 requirement challenging.

Based on the improved energy efficiency of the set-top boxes procured in 2013 (summarized in the table below and detailed in Table 1), the Voluntary Agreement reduced national energy consumption from 32 TWh/year to 30.6 TWh/year, a reduction of 4.4% even as deployed stock increased. This 1.4 TWh reduction represents a consumer savings of approximately \$168 million³ and CO₂ savings of 0.8 million metric tons.⁴ These energy savings are even larger when compared to projections based on unabated proliferation of digital video recorders (DVRs) under a business-as-usual scenario. Against those projections, the improved energy efficiency of the set-top boxes procured in 2013 brought national energy consumption down from 33.5 TWh/yr to 30.6 TWh/yr, avoiding 2.9 TWh in national energy consumption in 2014. This 8.7% reduction represents a consumer savings of approximately \$348 million⁵ and CO₂ savings of 1.7 million metric tons.⁶ These savings are accruing before Tier 1 (ENERGY STAR Version 3.0) set-top box procurement commitments take effect.

¹ Based on 2013 procurement data submitted by service providers to D&R International, Ltd.

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.

³ Based on national average energy cost of \$0.12 per kWh (April 22, 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

⁴ Data provided by the Voluntary Agreement Steering Committee.

⁵ Based on national average energy cost of \$0.12 per kWh (April 22, 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

⁶ Data provided by the Voluntary Agreement Steering Committee.

Category	Percent Change in Weighted Average Energy Consumption from 2012 to 2013
DVR	-27%
Non-DVR	-9%
Thin Client	-43%
DTA	+48% *

* The increase in average energy consumption for digital transport adapters (DTAs) purchased in 2013 is likely due to the addition of high-definition and advanced video processing capabilities, however, 91% of DTAs purchased in 2013 met the Tier 1 (ENERGY STAR Version 3.0) requirements.

The Voluntary Agreement also contains additional commitments. Below is a high-level summary of these commitments and the progress made to date on each.

Light Sleep. Cable signatories committed to continuing to deploy software updates enabling light sleep for certain models of set-top boxes already in homes and to deploying new set-top boxes with light sleep capabilities. All met these commitments. Two telco signatories committed to adding a light sleep feature to their DVR set-top boxes and met this commitment. One telco service provider committed to adding light sleep to certain set-top boxes while not degrading the customer experience. It was unable to do so without substantially degrading the customer experience, but light sleep is not required for these set-top boxes to meet the Tier 1 levels.

Automatic Power Down (APD). The satellite signatories committed to including APD in at least 90% of set-top boxes purchased after January 1, 2013, and met this commitment.

Whole-Home Systems. Satellite providers committed to making whole-home systems available to all subscribers in 2013 and met this commitment. Telco Internet protocol television (IPTV) providers made similar commitments and provided whole-home capability for every household with a DVR in 2013. Another telco provider committed to offering whole-home service and launched a system in April 2014.

Next-Generation Set-Top Boxes. Cable providers committed to beginning field testing of set-top boxes with next-generation power management by December 31, 2014, and have scheduled field tests to start in late 2014. Cable providers also committed to deploying these set-top boxes in later years under the conditions set forth in the Voluntary Agreement.

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 met this commitment.

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

Field Verification. Beginning later in 2014, an independent contractor will verify the energy usage of select set-top boxes in 80 to 100 homes per year.

Random Audit. The Independent Administrator is required to conduct a random audit of one service provider's procurement figures each year. This audit is in progress.

Overview of the Voluntary Agreement

Cable, satellite, and telco service providers offer pay television to approximately 100 million U.S. households using customer premises equipment, often referred to as set-top boxes.⁷ 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. To leverage the configuration of the set-top box industry 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 (<http://www.ncta.com/energyagreement>) in 2012. The 15 industry leaders who signed the original Voluntary Agreement represent all of the major service providers, equipment vendors, and industry organizations in the United States. Combined, these companies served 91.9 million American households in 2013, accounting for 91.3% of all multichannel video consumers.⁸ 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 created in 2013. In December 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 Electronics Association (CEA), and the National Cable & Telecommunications Association (NCTA) announced this expansion.⁹ The revised Voluntary Agreement includes additional energy efficiency commitments, coverage of whole-home multi-function 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 objectives of the Voluntary Agreement are to continue improvements in the energy efficiency of set-top boxes and to foster device and service functionality while encouraging innovation and competition. By continuing to increase set-top box energy efficiency, the Voluntary Agreement also aims to further reduce potential environmental impacts and increase benefits to consumers. To ensure that these objectives are met, the Voluntary Agreement states that energy efficiency improvements should not jeopardize the intended uses and functionalities of set-top boxes or create undue burdens or competitive disadvantages compared with other means of distributing video programming or other programming services. Further, energy efficiency improvements are expected to preserve or enhance the customer experience and be sufficiently flexible to adapt to technological options and market competition while also

⁷ Based on data provided by the National Cable & Telecommunications Association and the Consumer Electronics Association.

⁸ Ibid.

⁹ U.S. Energy Department, *Pay-Television Industry and Energy Efficiency Groups Announce Set-Top Box Energy Conservation Agreement; Will Cut Energy Use for 90 Million U.S. Households, Save Consumers Billions* (December 23, 2013). Retrieved on April 28, 2014, from <http://www.energy.gov/articles/us-energy-department-pay-television-industry-and-energy-efficiency-groups-announce-set-top>.

improving functionality, offering service enhancements, and fostering rapid innovation. The signatories also intend the Voluntary Agreement to be a complete and adequate substitute for all federal and state energy efficiency legislative and regulatory solutions related to set-top boxes.

As fully realized, the Voluntary Agreement will result in significant consumer savings in at least three ways:

- By increasing the energy efficiency of set-top boxes. Once current 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 2012.¹⁰ 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.¹¹
- By meeting increasing consumer demand for digital video recorder (DVR) and high-definition (HD) functionality with more energy-efficient set-top boxes. The potential rise in consumer demand for highly featured DVR and HD set-top boxes could lead to the need for five additional power plants, as demonstrated by the difference in energy consumption between the two base cases.¹² Under the Tier 2 efficiency levels of the enhanced Voluntary Agreement, that additional energy consumption is eliminated.
- By offering whole-home configurations that eliminate the need for multiple DVR set-top boxes in the home. Further savings will accrue from the shift away from a DVR for each TV to the use of whole-home set-top boxes that share content with other TVs in the home. 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, the equivalent of three power plants and 5 million metric tons of CO₂ per year.¹³

To achieve these objectives, the Voluntary Agreement establishes commitments for the pay television industry through 2017.

Voluntary Agreement Signatories and Steering Committee

The current signatories 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.

¹⁰ Data provided by the Voluntary Agreement Steering Committee.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

Energy-Efficiency Advocates

- ACEEE*
- ASAP[†]
- NRDC*

Cable Service Providers

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

Satellite Service Providers

- DIRECTV*
- DISH Network*

Telco Service Providers

- AT&T*
- Verizon*
- CenturyLink*

Other Organizations

- Cisco Systems, Inc.*
- ARRIS Group, Inc. (including Motorola, which it recently acquired)*
- Pace plc[†]
- EchoStar Technologies LLC
- NCTA*
- CEA*

The composition of the Steering Committee allows the Voluntary Agreement to offer a multi-stakeholder approach, while permitting rapid adjustments as the technological 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 and, with the publication of this report, has released the first annual report.

The Voluntary Agreement required that the Steering Committee meet at least quarterly in 2013. The Steering Committee met five times in 2013 (February 22, May 17, September 9, September 20, and December 6), and all voting members were represented. The Steering Committee is obligated to meet at least quarterly in 2014, and it is on track to meet that expectation.

The Steering Committee has committed to seeking regular consultation and engagement with the official representatives of DOE, the U.S. Environmental Protection Agency (EPA), appropriate state regulatory authorities, and other stakeholders to provide updates regarding the implementation of the Voluntary Agreement. In 2013, the Steering Committee hosted representatives of DOE and the U.S. Congress. Members of the Steering Committee also consulted regularly with stakeholders and representatives of DOE, EPA, and state regulatory authorities to provide updates regarding the implementation of the Voluntary Agreement. Representatives of the service providers and equipment providers met with policymakers on Capitol Hill and the White House Council on Environmental Quality.

Additional responsibilities of the Steering Committee include the following:

- Managing the Voluntary Agreement
- Hiring and managing 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

CEA and NCTA are required to provide the following two reports to the Independent Administrator, both of which they provided on time in 2014:

- 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, 90% of set-top boxes purchased after December 31, 2013, shall meet the efficiency standards established for ENERGY STAR Version 3.0, or Tier 1. After December 31, 2016, the Voluntary Agreement designates a new, more stringent efficiency level, referred to as Tier 2.¹⁴ The procurement level expected 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, other energy saving strategies, and consumer-facing energy efficiency information. 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 Independent Administrator aggregates and compiles confidential procurement data submitted by service providers and provides a draft report to the Steering Committee by May 31 of each year. The Independent Administrator completed these activities in 2014. Once the service provider procurement commitments have taken effect, the Independent Administrator will also assess substantial compliance with the service provider procurement commitments and take appropriate action under the procedures set out in the Voluntary Agreement.

The Independent Administrator has committed to conducting a random audit of one service provider’s procurement figures each year. The procurement audit process is in progress.

The Steering Committee has selected an independent third party 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. The first round of field verification will begin later this year. The field verification contractor will submit data to the Independent Administrator and selected data to the Steering Committee. The Independent Administrator will review the data provided and, in the following year’s annual report, identify product data that was evaluated through field verification.

Increased Energy Efficiency of Set-Top Boxes

The pay television industry has made impressive gains in improving the energy efficiency of products as a result of the Voluntary Agreement. Table 1 highlights early progress toward increased energy efficiency for each product category.

¹⁴ Tier 2 allowances are similar, but not identical, to ENERGY STAR Version 4.1.

Table 1: Weighted TEC Average for Major Set-Top Box Categories

Category	TEC (kWh/y)				Percent Change in Weighted Average 2012 to 2013
	2012 Base Case			2013 Procurement Data	
	Segment	Average	Weighted Average	Weighted Average	
DVR	Cable	282	267	195.4	-27%
	Satellite	283			
	Telco	140			
Non-DVR	Cable	139	119	108.6	-9%
	Satellite	110			
	Telco	90			
Thin Client	Cable ^a	90	N/A	51.4	-43%
Multi-Service Gateway	N/A	N/A	N/A	219	N/A
DTA ^b	Cable	39	N/A	57.6	+48% ^c

^a Thin Clients were only available from cable service providers at the time of the 2012 Base Case. 2013 reports include Thin Clients from non-cable service providers as well.

^b A digital transport adapter, or 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.

^c DTAs purchased in 2013 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 met the Tier 1 (ENERGY STAR Version 3.0) energy efficiency requirements.

Set-top boxes continue to become more energy efficient while offering improved functionality and a better user experience. In 2012, one service provider introduced a whole-home DVR with typical energy consumption (TEC) of 275 kWh/yr. The second version of this DVR, released in early 2013, added the ability to watch live television on mobile devices such as tablets, smartphones, and PCs, and reduced TEC to 242 kWh/yr. The third version, which is now the only version purchased by the service provider, retains all of the functionality of the second and further reduces TEC to 190 kWh/yr. In only two years, this service provider has increased functionality and performance of its DVRs while decreasing energy consumption by 31%, saving the consumer about \$10 per year in energy costs.

Another service provider recently upgraded its whole-home network DVR (nDVR) to enable customers to simultaneously record up to 15 programs while using significantly less energy than older, two-tuner DVR models. A typical 2002 cable set-top box offered SD video, composite output, S-Video output, a single tuner, and no DVR, yet it used more than 200 kWh/yr. A typical 2013 model uses less power than the 2002 set-top box, and offers HD video at 1080p, a dual tuner, a 500 GB hard drive DVR, multi-room playback of recordings from the main DVR, more memory and sophisticated graphics for interactive applications, remote programming of recordings from mobile phones, remote control from a tablet app, and caller identification on the television.

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). Although compliance with the procurement commitment will not be evaluated until next year, all service providers committed to providing a confidential annual procurement report for 2013

by April 1, 2014. All service providers that signed the Voluntary Agreement submitted procurement data for 2013 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 2013.

Service providers have made significant early progress towards the ENERGY STAR Version 3.0 (Tier 1) commitment, as shown in Table 2.

Table 2: 2013 Aggregated Voluntary Agreement Participant Set-Top Box Procurement

Category	Units		Percentage 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%
Non-DVR	12,360,006	10,857,191	88%
Thin Client	8,994,794	8,994,794	100%
Multi-Service Gateway	232	0	0%
DTA	1,334,238	1,217,148	91%
Totals	34,899,246	29,759,134	85%

Service providers have also committed to 90% procurement of set-top boxes meeting Tier 2 after December 31, 2016. Although Tier 2 procurement commitments are not yet in effect, participants were encouraged to demonstrate early adoption. Based on the data provided by service providers, an estimated 47% of set-top boxes purchased in 2013 demonstrated early adoption of Tier 2 performance levels.¹⁵ Products types included in this percentage are DVRs, digital transport adapters (DTAs), non-DVRs, and thin clients. Progress toward Tier 2 performance is a positive indicator, but it should be balanced against the expectation that set-top boxes purchased closer to the Tier 2 effective date in January 2017 will likely have significant increased functionality over products reported in 2013. For example, new products may include ultra-HD resolutions, more advanced video compression, increased recording capacities, and increased processing power. Such features increase energy demands, making achievement of the Tier 2 requirement challenging.

To accommodate the introduction of new set-top box features, the Voluntary Agreement allows services providers to demonstrate compliance using 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.

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. Additionally, consumers may choose different mixes of boxes and features closer to the Tier 2 effective date of January 1, 2017.

The Independent Administrator forwarded one proposal for an energy allowance to the Steering Committee this year. The proposal was for an nDVR with Open Media Security (OMS) downloadable conditional access. The service provider's request explained that it is the first service provider to deploy nDVR technology. The nDVR offers network-based multi-room DVR functionality by utilizing advanced network services, eliminating the need for local hard disks and Multimedia over Coax Alliance (MoCA) network hardware, and enables DVR and other service upgrades to be activated without a service call. The OMS downloadable conditional access was developed under Federal Communications Commission (FCC) waivers to comply with FCC rules regarding "separable security." The current product, Samsung model SMT-5320, exceeds the Tier 1 energy allowance but when used with the service provider's advanced network services yields net savings. After careful review, the Steering Committee granted Tier 1 compliance for the Samsung Model SMT-5320 and confirmed that OMS downloadable conditional access should receive an incremental allowance of 15 kWh/year. Further, the Steering Committee set a time-limited Tier 2 incentive allowance for nDVR technology. The allowance for nDVR is 65 kWh/yr based on the Tier 2 allowances for DVR (45 kWh/yr) and shared DVR (20 kWh/yr). This allowance will remain available until December 31, 2015, by which time the Steering Committee will re-evaluate the allowance for this technology for Tier 2-compliant performance in 2017.

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, such as by stopping the hard drive from spinning, during extended periods of inactivity (typically four hours) or at specific times. Service provider software updates enabling light sleep allowed set-top boxes purchased in 2013 to realize lower TECs because the set-top boxes enter a lower-power mode when not being used. The resulting energy savings are reflected in the national energy consumption figures provided in "Impact on National Energy Consumption" below.

The cable operator signatories committed to continuing the deployment of software updates enabling light sleep for certain models of deployed set-top boxes that were placed in service prior to the effective date of the Voluntary Agreement, and all met this commitment. Since 2012, cable operators have downloaded light sleep energy efficiency capabilities to approximately 14.3 million set-top boxes that are already in homes. Cable service providers also committed to continuing the deployment of new set-top boxes with light sleep capabilities, and all companies met this commitment as well.

One telco service provider committed to enabling light sleep capabilities in certain new models deployed after January 1, 2013, with a default inactivity period of four hours, where doing so does not degrade customer experience. The provider has not yet identified a solution that does not substantially degrade the customer experience, but light sleep is not required for these set-top boxes to meet the Tier 1 levels. The provider remains committed to pursuing innovative and user-friendly ways to reduce the energy consumption of set-top boxes, particularly when those boxes are not active.

Two telco service providers committed to continuing deployment of set-top boxes with light sleep capabilities, which they did. In addition, these telco signatories added a light sleep feature to their IPTV and DVR set-top boxes.

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 is occurring, APD enables the device to transition to an off or sleep mode. The satellite signatories committed to 90% procurement of set-top boxes with an APD feature after January 1, 2013. Both satellite service providers met this commitment in 2013.

Whole-Home Systems

Whole-home set-top boxes use home network interfaces to share content with other video client devices over a high-bandwidth home network. Whole-home set-top boxes can provide the following functions while consuming a fraction of the energy 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

The satellite signatories committed to making energy-efficient whole-home servers and clients available to all new and existing subscribers in 2013. Throughout 2013, DIRECTV and DISH Network provided nationwide availability of whole-home DVR servers and clients. More information about the DIRECTV "Genie" is available at <http://www.directv.com/genie>. Details about DISH Network's "Hopper" and "Joey" are posted at <http://www.dish.com/hopper>.

AT&T and CenturyLink made similar commitments to deploying energy-efficient whole-home DVRs where possible. During 2013 they provided whole-home DVR capability for every household equipped with a DVR. More information about AT&T's whole-home DVR service is available at <https://www.att.com/shop/u-verse/total-home-dvr.html>; 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, cable operators have also deployed new whole-home solutions. For example, Comcast has widely deployed the energy-efficient X-1 DVR platform, which offers whole-home capabilities to meet the demand for additional recording and playback capabilities without the need for additional DVRs. All of Cablevision's new DVR customers receive nDVRs capable of whole-home functionality. Time Warner Cable has equipped millions of its deployed set-top boxes with MoCA, which makes them capable of supporting whole-home DVR functionality. Cox doubled the number of new whole-home installations in 2013 over 2012.

The national energy consumption figures account for the energy savings resulting from these changes because offering whole-home systems partially decreases DVR procurement by increasing the procurement of energy-efficient thin clients.

Consumer-Facing Energy Efficiency Information

All service providers committed to providing subscribers and potential customers with reasonable access to energy efficiency information for set-top boxes purchased after 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. A list of links to each service provider's set-

top box energy efficiency information is included in “Appendix C: Consumer Set-top Box Energy Efficiency Information.”

Other Energy Saving Strategies

In addition to the above commitments, signatories will evaluate other ways to save energy. For example, Verizon has committed to pursuing reasonable strategies to reduce energy consumption, and the other telco service providers committed to evaluating options for further reducing inactive-state energy consumption. To this end, CenturyLink will be seeking input from vendors on features, including deep sleep and any other energy-saving capabilities, as it selects next-generation set-top boxes for availability to customers. AT&T is continuing to discuss strategies and evaluate options for improving set-top box efficiency with its middleware provider, manufacturers, and chip providers. The company is also exploring the potential for partial shutdowns and slowing processor operation during periods of inactivity, though implementation of these and other energy-efficiency features will depend on preserving the customer experience and other variables.

Cable service providers committed to working with suppliers to develop set-top boxes with next-generation power management and begin field testing those set-top boxes by December 31, 2014. The cable signatories are on track to meet that commitment, with field tests scheduled to begin in late 2014. In later years, cable providers will begin deploying these set-top boxes under the conditions set forth in the Voluntary Agreement.

All signatories have committed to reviewing 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.

Viewing Without Set-Top Boxes

Increasingly, subscribers can watch multichannel video through devices other than set-top boxes, such as tablets, laptops, desktops, smart TVs, smartphones, Microsoft’s Xbox 360, Sony PlayStations, Roku, etc. Time Warner Cable provides subscribers with access to 300 channels plus video-on-demand through all of these devices. Verizon delivers 75 channels and a variety of video-on-demand content to FiOS TV and Internet subscribers without a set-top box via smart TVs, Blu-ray players, Xbox One, and Xbox 360. AT&T U-Verse apps provide U-verse programming to Apple and Android devices, and select TVs are “DIRECTV Ready,” eliminating the need for set-top boxes for DIRECTV subscribers. The DISH “Hopper with Sling” whole-home DVR includes the ability to view all subscribed content on smartphones, tablets, PCs, select smart TVs, and select game consoles without the use of a set-top box. This trend provides additional consumer choice to receive pay television programming on a variety of devices. The energy profile of many of these devices was recently reported in *Energy Consumption of Consumer Electronics in U.S. Homes in 2013*.¹⁶

Service providers now offer TV apps, streaming thousands of movies and TV episodes on-demand (and sometimes live) via mobile, tablet, laptop, and other Internet-connected devices. Verizon’s FiOS Mobile app, which has been downloaded onto more than three million devices, offers tablet and smartphone viewing of video-on-demand plus 92 live TV channels in the home and 35 live TV channels outside the home. All 11 of the service provider signatories offer apps that make programming available on Android and Apple devices.

¹⁶ Fraunhofer, *Energy Consumption of Consumer Electronics in U.S. Homes in 2013*
<http://www.ce.org/CorporateSite/files/e4/e4d65f2d-bbd3-49f5-b3d6-8634268aa055.pdf>

Consumers are increasingly using Internet-ready devices to view programming through devices other than set-top boxes. One industry forecast predicts that by 2017, 65% of households will own tablets on which Americans will watch 58 billion hours of TV and video, about 10% of all current TV and video viewing.¹⁷ Another industry report found that more than half of mobile viewers' time (and 35% of tablet users' time) was spent "watching videos longer than 30 minutes."¹⁸ The precise implications of these trends with respect to the energy use associated with viewing of video programming are unclear at this time.

Impact on National Energy Consumption

In 2012, service providers began working with energy advocates to estimate the energy consumption of set-top boxes and the number of units installed in subscriber households. Using service provider and energy advocate reports and data on product trends, 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
	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 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 procurement reports included thin clients from non-cable service providers as well.

The second base case, shown in Table 4, represents a scenario in which digital video recorder (DVR) growth continues to follow the DVR growth trends leading up to the first base case. In terms of annual energy consumption, the number of set-top boxes without DVR capability versus those with DVR capability deployed in households is significant; DVR set-top boxes consume more energy due to their need for non-volatile storage, such as a hard disk drive. This scenario is meant to reflect the energy consumption of the market in 2023. The second base case is an estimate of national energy use if the energy efficiency commitments defined in the

¹⁷ Jim Barthold, *NPD and TDG Reports Look at Now and Future of Video Consumption*, FierceOnlineVideo (Feb. 1, 2013), <http://www.fierceonlinevideo.com/story/reports-look-now-and-future-video-consumption/2013-02-01>.

¹⁸ Ooyala's Q4 2013 Global Video Index Projects Mobile and Tablets to Account for Half of All Online Viewing by 2016 (March 26, 2014), <http://www.ooyala.com/about/press/ooyala%E2%80%99s-q4-2013-global-video-index-projects-mobile-and-tablets-account-half-all-online>.

Voluntary Agreement are not implemented and DVR proliferation continues unabated following a linear growth pattern.

Table 4: Base Case – Estimated Energy Consumption – High-DVR Proliferation

Segment	Category	TEC	Units	National Energy Consumption	Power Plants
		kWh/yr	Millions	TWh/yr	Rosenfelds
Cable	DVR	282	57	16.1	5.4
	Non-DVR	139	27	3.7	1.2
	Client	90	2	0.1	0.0
	DTA	39	33	1.3	0.4
Satellite	DVR	283	71	20.1	6.7
	Non-DVR	110	21	2.3	0.8
Telco	DVR	140	21	2.9	1.0
	Non-DVR	90	6	0.5	0.2
U.S. Total		-	237	47	15.7

Each base case was developed based on historical data available at the time it was developed. The base cases may not necessarily be reflective of 2013 product procurement splits for various service provider types. Going forward, product mixes may continue to vary from the base case.

Comparison to First Base Case Scenario

To gauge the impact of the Voluntary Agreement at the national level, D&R estimated energy savings over the first base case. To do this, D&R started by using changes in video subscriber levels across the major segments (presented in Table 5) to estimate changes in set-top box stock levels.

Table 5: Percent Change in Subscriber Levels from 2012 to 2013

Segment	Percent Change from 2012 to 2013 ^a
Cable	-4.5%
Satellite	+1.0%
Telco	+25.4%

^a Based on data provided by the Steering Committee (for 2012) and service providers (for 2013).

By multiplying these percentages by the unit data presented in Table 3, D&R arrived at the total 2013 stock levels shown in Table 6.

Table 6: Estimates of Total Units in the Market in 2013

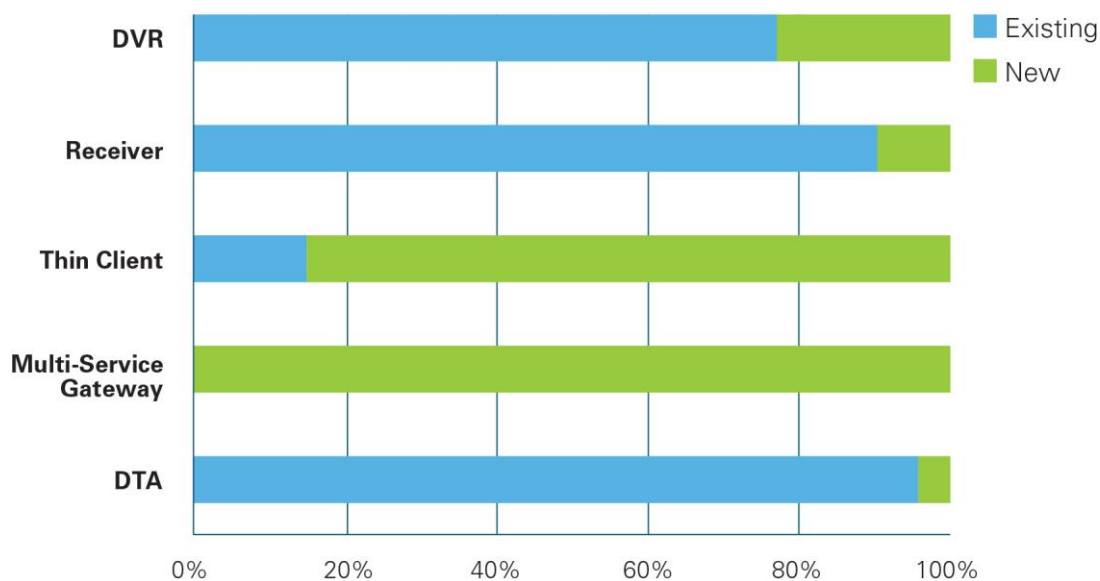
Category	Units ^a
DVR	54,038,000
Non-DVR	139,338,000
Thin Client	1,566,000
DTA	31,516,000

^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.

The next step in estimating national energy consumption was to account for products procured in 2013. To arrive at the existing and new stock split, D&R subtracted 2013 set-top box procurements from the total units listed in Table 6. In general, D&R assumed that each new product would replace a product of the same type (i.e., new DVRs would replace existing DVRs). However, satellite thin clients, telco thin clients, and multi-service gateways were not included in the base case scenarios. Thin clients and DTAs do not offer DVR capabilities, so D&R assumed these product types replaced non-DVRs. Multi-service gateway set-top boxes have greater capabilities than thin clients, so D&R assumed that these products replaced DVRs. While these assumptions do not account for households upgrading from a non-DVR to a DVR, D&R also made no assumptions about whole-home DVRs eliminating the need for additional DVRs. Future reports may include analysis of the potential effects of whole-home DVRs and multi-service gateways on national energy consumption.

Figure 1 presents the breakdown between new and existing stock for each set-top box.

Figure 1: Existing Stock versus New Procurements for 2013 (Percent of Units)



This yielded two sets of stock – new and existing – each with its own TEC values. The weighted average TEC for the existing and new stock are shown in Table 1. Multiplying the number of units by the TEC provides the estimated national energy consumption shown in Table 7.

Table 7: National Energy Consumption for New and Existing Stock

Category	Existing Stock in 2013 (Units) ^a	2012 TEC (kWh/yr)	New Stock in 2013 (Units) ^a	Weighted TEC Average Based on 2013 Procurement Data (kWh/yr)	National Energy Consumption (TWh/yr)
DVR	41,828,000	265 ^b	12,210,000	195.4	13.5
Non-DVR	117,866,000	118 ^b	12,360,000	108.6	15.3
Thin Client	1,566,000	90	8,995,000	51.4	0.6
Multi-Service Gateway	0	N/A	0	219	0.0
DTA	30,299,000	39	1,334,000	57.6	1.3
U.S. Total	191,559,000	-	34,900,000	-	30.6

^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.

^b These values are weighted TEC averages for 2012 based on existing stock in 2013. D&R calculated national energy consumption using 2012 TEC levels for each market segment and 2013 existing stock for each market segment.

As Table 7 shows, the improvements in energy efficiency spurred by the Voluntary Agreement have had a large impact on national energy consumption. Despite an increase in the number of set-top boxes in the market, the Voluntary Agreement reduced national energy consumption from 32 TWh/yr to 30.6 TWh/yr, a reduction of 4.4%. This 1.4 TWh reduction represents consumer savings of approximately \$168 million¹⁹ and CO₂ savings of 842,000 metric tons.²⁰

Comparison to Second Base Case Scenario

The first base case is essentially a snapshot of the market at the end of 2012 and, as such, provides the base case for calculating energy consumption for 2013. The second base case reflects the projected energy consumption of the market in 2023 without the Voluntary Agreement and with unabated DVR proliferation. This provides two national energy consumption data points: 32 TWh/yr for 2013 and 47 TWh/yr for 2023. Because the second base case is based on a linear growth trend 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/yr – 32 TWh/yr = 15 TWh/yr) by the years elapsed (2023 – 2013 = 10 yrs) to arrive at an increase of 1.5 TWh per year.

The 2013 procurement data submitted by service providers represents the stock at the end of 2013 and, therefore, the national energy consumption for 2014. To evaluate progress compared to the second base case, D&R needed to calculate the national energy consumption for 2014 under the second base. To arrive at the 2014 national energy consumption, D&R added the incremental energy consumption increase (1.5 TWh per year) to the 2013 baseline national energy consumption (32 TWh/yr) to arrive at 33.5 TWh/yr. As noted in Table 7, the national energy consumption calculated for 2014 based on the 2013 procurement data is 30.6 TWh/yr. This means the improved energy efficiency of the set-top boxes procured in 2013 avoided 2.9

¹⁹ Based on national average energy cost of \$0.12 per kWh (April 22 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

²⁰ Data provided by the Voluntary Agreement Steering Committee.

TWh in national energy consumption in 2014. This 8.7% reduction represents a consumer savings of approximately \$348 million²¹ and CO₂ savings of 1.7 million metric tons.²²

These savings are more dramatic because the second base case represents a worst-case scenario that the Voluntary Agreement is seeking to avoid. This scenario does not take into account the many changes that are expected to occur in the market between now and 2023, such as increased whole-home viewing.

Conclusion

To achieve its objectives, the Voluntary Agreement establishes commitments for the pay television industry through 2017. In 2013, cable signatories and two of three telco signatories met their commitments with respect to light sleep. Satellite signatories committed to including APD in at least 90% of set-top boxes purchased after January 1, 2013 and met this commitment. They also committed to making whole-home systems available to all subscribers in 2013 and met this commitment. Telco providers made similar commitments, which they met. Each service provider committed to providing reasonable access to energy efficiency information for set-top boxes purchased after January 1, 2014, and met this commitment.

All service providers submitted their annual procurement reports to the Independent Administrator on time. 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. Service providers have made significant early progress toward this commitment, with 85% of 2013 set-top boxes purchases meeting the ENERGY STAR Version 3.0 (Tier 1) standards. Voluntary Agreement participants are also demonstrating early adoption of Tier 2 performance levels, with an estimated 47% of set-top boxes purchased in 2013 achieving Tier 2 performance levels.²³ Service provider procurement data will be subject to audit and field verification later in 2014.

The Voluntary Agreement reduced national energy consumption of set-top boxes from 32 TWh/yr to 30.6 TWh/yr, a reduction of 4.4% even as deployed stock increased. This 1.4 TWh reduction represents a consumer savings of approximately \$168 million²⁴ and CO₂ savings of 0.8 million metric tons.²⁵ These energy savings are even larger when compared to projections based on unabated proliferation of DVRs under a business-as-usual scenario. Against those projections, the improved energy efficiency of the set-top boxes procured in 2013 reduced national energy consumption from 33.5 TWh/yr to 30.6 TWh/yr, avoiding 2.9 TWh in national energy consumption in 2014. This 8.7% reduction represents a consumer savings of approximately \$348 million²⁶ and CO₂ savings of 1.7 million metric tons.²⁷

²¹ Based on national average energy cost of \$0.12 per kWh (April 22 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

²² Data provided by the Voluntary Agreement Steering Committee.

²³ 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.

²⁴ Based on national average energy cost of \$0.12 per kWh (April 22 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

²⁵ Data provided by the Voluntary Agreement Steering Committee.

²⁶ Based on national average energy cost of \$0.12 per kWh (April 22, 2014). *Electric Power Monthly*. Retrieved April 28, 2014, from U.S. Energy Information Administration:

http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_3

²⁷ Data provided by the Voluntary Agreement Steering Committee.

Appendix A: Voluntary Agreement Commitments

Table 8 lists the commitments of the various signatories to the Voluntary Agreement along with the status of the signatories' progress towards that commitment.

Table 8: 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	On track. 85% procurement after December 31, 2012.
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 2014.
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, either through their websites or the CableLabs website.
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)	Verizon has not yet identified a solution that does not substantially degrade the customer experience.
Offer and deploy whole-home servers and clients as appropriate.	Telco (Verizon)	Complete. Verizon launched FiOS Quantum whole-home DVR in April 2014.
90% procurement of set-top boxes with automatic power down feature in 2013.	Satellite	Complete. Greater than 90% deployment in 2013.
Make whole-home servers and clients available to all new and existing subscribers in 2013.	Satellite	Complete. Offered throughout the United States in 2013.
90% procurement of set-top boxes meeting Tier 2 after December 31, 2016 (for calendar year 2017).	All Service Providers	47% procurement rate of set-top boxes indicating performance at Tier 2 levels after December 31, 2012.
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	Not yet due.
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	Not yet due. Field tests scheduled to begin in late 2014.

Commitments	Group	Status
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 Table 1, 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 is investing in technologies that will allow for "smart management" of advanced transcoders in future set-top boxes, reducing their power draw when not in active use. See also descriptions above of previous attempts to reduce energy consumption in legacy set-top boxes with light sleep.
Continue to deploy set-top boxes with light sleep capabilities.	Telco (IPTV)	Continued deployment in 2013.
Deploy whole-home DVR set-top boxes where possible.	Telco (IPTV)	Deployed throughout the United States where possible in 2013.
Evaluate options for further reducing inactive-state energy consumption.	Telco (IPTV)	CenturyLink will seek vendor input on energy-saving capabilities as it selects next-generation set-top boxes. AT&T continues to evaluate many options for improving energy efficiency.
Provide periodic updates to government and energy-advocate stakeholders.	Telco (IPTV)	Telco IPTV representatives met with policymakers on Capitol Hill and the White House Council on Environmental Quality in 2013.
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	Continued deployment and software updates in 2013. More than 14 million set-top boxes deployed or upgraded.

Appendix B: Set-Top Boxes Purchased by Voluntary Agreement Signatories in 2013

Table 9 lists the set-top boxes purchased by Voluntary Agreement signatories in 2013. Please note that the same model could have variances in TEC for several reasons, including differences in reported versus calculated TEC (see note a), 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 10 and the feature allowances outlined in Table 11. Table 11 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 9 multiple times 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 will be subject to field verification of energy performance data beginning in 2014. In future reports, this table will indicate where energy performance was evaluated through field verification.

Table 9: Set-Top Boxes Procured by Voluntary Agreement Signatories in 2013

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	17.7	14.4	142.8	Yes
AT&T	IP	DVR	Cisco	7500	AVP, DVR, HD, MR, MS-T/I	18.0	14.6	145.3	Yes
AT&T	IP	DVR	Pace	8005	AVP, DVR, HD, MR, MS-T/I	11.3	8.2	87.7	Yes
AT&T	IP	DVR	Pace	8010	AVP, DVR, HD, MR, MS-T/I	11.0	8.0	85.4	Yes
AT&T	IP	Non-DVR	ARRIS	2200	AVP, HD, HNI, MS-T/I	11.3	11.2	98.2	Yes
AT&T	IP	Non-DVR	Cisco	7000	AVP, HD, HNI, MS-T/I	11.8	11.9	103.7	Yes
AT&T	IP	Non-DVR	Cisco	7005	AVP, HD, HNI, MS-T/I	11.6	11.4	100.9	Yes
Bright House Networks	CBL	DVR	Motorola	DCX3510-M	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.8	18.3	172	Yes
Bright House Networks	CBL	DVR	Cisco	8742HDC	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	21.7	18.4	170	Yes
Bright House Networks	CBL	DVR	Samsung	SMT-H3272	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	30.3	25.8	239	No

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)	
Bright House Networks	CBL	Non-DVR	Motorola	DCX3200-M	APD, AVP, CC, DOCSIS, HD, HNI	14.3	11.7	110	Yes
Bright House Networks	CBL	Non-DVR	Cisco	4742HDC	APD, AVP, CC, DOCSIS, HD, HNI	18.8	14.1	136	Yes
Bright House Networks	CBL	Non-DVR	Samsung	SMT-H3362	APD, AVP, CC, DOCSIS, HD, HNI	14.7	13.3	120	Yes
Cablevision	CBL	DVR	Samsung	5320	AVP, CC, DVR, DOCSIS, HD, MR	17.6	16.7	151	Yes
CenturyLink	IP	Non-DVR	ARRIS	1200	AVP, HD, HNI, MS-T/I	10.9	10.5	94.0	Yes
CenturyLink	IP	DVR	ARRIS	1232	AVP, DVR, HD, MR, MS-T/I	16.2	12.6	126.9	Yes
CenturyLink	IP	Non-DVR	Cisco	7005	AVP, HD, HNI, MS-T/I	11.6	11.4	100.9	Yes
CenturyLink	IP	DVR	Pace	8005	AVP, DVR, HD, MR, MS-T/I	11.3	8.2	87.5	Yes
Charter	DTA	Cable DTA	Cisco	DTA170HD	HD	4.9	4.8	43	Yes
Charter	DTA	Cable DTA	Pace	DTADC60XuHD	HD	6.4	6.4	57	Yes
Charter	CBL	Non-DVR	Pace	RNG110RHD	AVP, CC, DOCSIS, HD	12.5	11.6	106	Yes
Charter	CBL	Non-DVR	Motorola	DCX3220MHD	AVP, DOCSIS, HD	11.1	10.8	97	Yes
Charter	CBL	Non-DVR	Motorola	DCX3200MHD-P3	AVP, CC, DOCSIS, HD	12.4	12.1	108	Yes
Charter	CBL	Non-DVR	Motorola	DCX3200MRF	AVP, CC, DOCSIS, HD	12.8	12.5	112	Yes
Charter	CBL	Non-DVR	Cisco	EXP4640HDC	AVP, CC, DOCSIS, HD	14.0	13.5	121	Yes
Charter	CBL	Non-DVR	Cisco	EXP4650HDC	AVP, CC, DOCSIS, HD	17.2	16.6	149	No
Charter	CBL	DVR	Pace	RNG200RHD	AVP, CC, DVR, DOCSIS, HD, MS-C/S	16.5	15.6	142	Yes
Charter	CBL	DVR	Cisco	EXP8640HD-DVR	APD, AVP, CC, DVR, DOCSIS, HD, MS-C/S	23.2	18.2	172	Yes
Charter	CBL	DVR	Cisco	EXP8650HD-DVR	APD, AVP, CC, DVR, DOCSIS, HD, MS-C/S	26.9	19.1	188	Yes
Charter	CBL	DVR	Motorola	3510MHD-DVR	AVP, CC, DVR, DOCSIS, HD, MS-C/S	22.8	21.1	193	Yes
Charter	CBL	DVR	Motorola	3520MHD-DVR	AVP, DVR, DOCSIS, HD, MS-C/S	22.9	22.1	198	No
Charter	CBL	DVR	Motorola	3501MHD-DVR	AVP, CC, DVR, DOCSIS, HD, MS-C/S	23.3	22.4	202	No
Comcast	CBL	DVR	Motorola	DCX3501	AVP, CC, DVR, HD, MR, MS-C/S	23.5	22.7	203	Yes
Comcast	CBL	Non-DVR	Motorola	DCX3200 P3	AVP, CC, HD, HNI	14.6	12.1	119	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)	
Comcast	DTA	Cable DTA	Pace	DC60Xu	HD	6.2	6.2	55	Yes
Comcast	DTA	Cable DTA	Technicolor	DCI401COM3	HD	6.8	6.8	60	Yes
Comcast	CBL	DVR	Cisco	200N	AVP, CC, DVR, HD, MR, MS-C/S	25.7	19.3	202	Yes
Comcast	CBL	Non-DVR	Cisco	150N	AVP, CC, HD, HNI	14.4	12.8	121	Yes
Comcast	CBL	Non-DVR	Pace	PR150BNMR	AVP, CC, DOCSIS, HD, HNI	12.7	11.9	109	Yes
Comcast	CBL	Non-DVR	Pace	PR150BNCR	AVP, CC, DOCSIS, HD, HNI	13.2	12.6	114	Yes
Comcast	CBL	DVR	Pace	PCX001ANCD	AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	32.7	30.8	280	No
Comcast	CBL	DVR	Pace	PCX001ANMD	AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	31.7	29.9	272	Yes
Comcast	CBL	Non-DVR	Samsung	SRNG150BNM	AVP, CC, DOCSIS, HD, HNI	15.2	13.9	129	Yes
Comcast	CBL	Non-DVR	Samsung	SRNG150BNC	AVP, CC, DOCSIS, HD, HNI	15.6	14.4	133	Yes
Comcast	CBL	DVR	ARRIS	MX001ANM	AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	25.2	22.8	211	Yes
Cox	CBL	Non-DVR	Cisco	4642HDC	APD, AVP, CC, DOCSIS, HD, HNI	16.9	13.0	124	Yes
Cox	CBL	Non-DVR	Cisco	4742HDC	APD, AVP, CC, DOCSIS, HD, HNI	18.6	14.1	135	Yes
Cox	CBL	DVR	Cisco	8642HDC	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	27.7	23.7	218	Yes
Cox	CBL	DVR	Cisco	8742HDC	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.6	18.7	175	Yes
Cox	CBL	DVR	Cisco	9865HDC	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	28.0	21.7	207	Yes
DIRECTV	TC	Thin Client	DIRECTV	C31-700	APD, AVP, HD, HNI	5.9	4.5	43.2	Yes
DIRECTV	SAT	DVR	DIRECTV	HR24NC-200	APD, AVP, DVR, HD, MR, MS-C/S	23.3	21.3	191.6	Yes
DIRECTV	SAT	DVR	DIRECTV	HR44-500	APD, AVP, DVR, HD, MR, MS-C/S	19.7	18.8	167.0	Yes
DIRECTV	TC	Thin Client	DIRECTV	C41-700	APD, AVP, HD, HNI	5.5	4.2	40.2	Yes
DIRECTV	TC	Thin Client	DIRECTV	C41-100	APD, AVP, HD, HNI	6.0	4.6	43.7	Yes
DIRECTV	TC	Thin Client	DIRECTV	C41W-100	APD, AVP, HD, HNI	7.9	6.3	59.3	Yes
DIRECTV	TC	Thin Client	DIRECTV	C41W-500	APD, AVP, HD, HNI	6.8	5.6	51.8	Yes
DIRECTV	TC	Thin Client	DIRECTV	C41-500	APD, AVP, HD, HNI	5.4	4.1	39.0	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	H25-100	APD, AVP, HD, HNI	10.7	10.1	90.0	Yes
DIRECTV	SAT	DVR	DIRECTV	HR24-100	APD, AVP, DVR, HD, MR, MS-C/S	22.5	22.4	196.2	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)	
DIRECTV	SAT	Non-DVR	DIRECTV	D12-100	APD, AVP, HD, HNI	7.9	6.2	62.9	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	H25-500	APD, AVP, DVR, HD, HNI	12.2	11.0	99.3	Yes
DIRECTV	SAT	DVR	DIRECTV	HR24-500	APD, AVP, DVR, HD, MR, MS-C/S	24.5	22.6	202.7	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	H24-200	APD, AVP, HD, HNI	14.0	11.3	105.9	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	H25-700	APD, AVP, HD, HNI	9.9	9.2	82.1	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	D12-700	APD, AVP, HD, HNI	6.3	5.3	51.5	Yes
DIRECTV	SAT	DVR	DIRECTV	HR24-200	APD, AVP, DVR, HD, MR, MS-C/S	23.0	21.0	189.3	Yes
DIRECTV	SAT	Non-DVR	DIRECTV	H24-700	APD, AVP, HD, HNI	13.7	11.5	106.5	Yes
DIRECTV	SAT	DVR	DIRECTV	HR44-200	APD, AVP, DVR, HD, MR, MS-C/S	18.5	17.5	156.0	Yes
DIRECTV	SAT	DVR	DIRECTV	HR44-700	APD, AVP, DVR, HD, MR, MS-C/S	18.5	17.7	157.2	Yes
DIRECTV	SAT	DVR	DIRECTV	HR34-700	APD, AVP, DVR, HD, MR, MS-C/S	28.5	26.9	239.5	No
DISH Network	SAT	Non-DVR	DISH	Solo VIP211k	APD, AVP, HD	19.3	18.9	167	No
DISH Network	SAT	Non-DVR	DISH	Solo VIP211z	APD, AVP, HD	7.4	7.0	62	Yes
DISH Network	SAT	Non-DVR	DISH	Duo VIP222k	APD, AVP, HD, MR, MS-C/S	26.2	24.5	219	No
DISH Network	SAT	DVR	DISH	DuoDVR VIP722k	APD, AVP, DVR, HD, MR, MS-C/S	33.0	32.0	283	No
DISH Network	SAT	DVR	DISH	DuoDVR VIP922	APD, AVP, DVR, HD, MR, MS-C/S	37.8	36.5	323	No
DISH Network	TC	Thin Client	DISH	Joey (HWID = Zaxx)	APD, AVP, HD, HNI	9.0	8.6	76	Yes
DISH Network	TC	Thin Client	DISH	Joey (HWID = ZBxx)	APD, AVP, HD, HNI	6.9	6.8	60	Yes
DISH Network	SAT	DVR	DISH	Hopper	APD, AVP, DVR, HD, MR, MS-C/S	32.5	30.9	275	No
DISH Network	SAT	DVR	DISH	Hopper with Sling (HWID = NDxx)	APD, AVP, DVR, HD, MR, MS-C/S	28.2	27.3	242	No
Time Warner Cable	CBL	DVR	Motorola	DCX3510-M	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	22.8	18.3	172	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)	
Time Warner Cable	CBL	Non-DVR	Motorola	DCX3200-M	APD, AVP, CC, DOCSIS, HD, HNI	14.3	11.7	110	Yes
Time Warner Cable	CBL	DVR	Cisco	8742HDC	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	21.7	18.4	170	Yes
Time Warner Cable	CBL	Non-DVR	Cisco	4742HDC	APD, AVP, CC, DOCSIS, HD, HNI	18.8	14.1	136	Yes
Time Warner Cable	CBL	DVR	Samsung	SMT-H3272	APD, AVP, CC, DVR, DOCSIS, HD, MR, MS-C/S	30.3	25.8	239	No
Time Warner Cable	CBL	Non-DVR	Samsung	SMT-H3362	APD, AVP, CC, DOCSIS, HD, HNI	14.7	13.3	120	Yes
Verizon	CBL	DVR	Motorola	QIP 7232 P2	APD, AVP, CC, DVR, HD, MR, MS-C/S	22.7	NA	199	Yes
Verizon	CBL	DVR	Cisco	CHS 435HDC	APD, AVP, CC, DVR, HD, MR, MS-C/S	22.5	NA	197	Yes
Verizon	CBL	Non-DVR	Motorola	QIP 7100 P2	APD, AVP, CC, HD, HNI	15.6	NA	137	No
Verizon	CBL	Non-DVR	Cisco	CHS 335HDC	APD, AVP, CC, HD, HNI	16.2	NA	142	No
Verizon	IP	Thin Client	Arris	IPC 1100 P1	APD, AVP, HD, HNI	8.7	NA	76.2	Yes

^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.

Table 10 describes the base allowances for set-top boxes under ENERGY STAR Version 3.0 (Tier 1).

Table 10: Set-Top Box Base Allowance

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

Table 11 describes the features listed for set-top boxes and outlines the feature allowances under ENERGY STAR Version 3.0 (Tier 1).

Table 11: Set-Top Box Feature Allowances

Feature	Description	ENERGY STAR Version 3.0 (Tier 1) TEC Allowance (kWh/yr)
APD	Automatic power down (APD) monitors parameters correlated with user activity or viewing; if the parameters collectively indicate that no user activity or viewing is occurring, the APD feature enables the device to transition to a sleep mode or OFF mode	N/A
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	20
HD	High definition (HD) makes set-top boxes capable of transmitting video signals with resolution greater than or equal to 720p	25

Feature	Description	ENERGY STAR Version 3.0 (Tier 1) TEC Allowance (kWh/yr)
HNI	Home network interfaces (HNIs) allow set-top boxes to interface with external devices via a high-bandwidth local area network	10 (base)
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

Appendix C: Consumer Set-top Box Energy Efficiency Information

Service Provider	Consumer Information Location	Additional Information
AT&T	http://www.att.com/shop/tv.html	Click the "Equipment & Installation" tab, then click "Receiver Energy Efficiency Information"
Bright House Networks	http://support.brighthouse.com/Article/Converter-Energy-7843/	Redirect to http://energy.cablelabs.com/bright-house-networks/
Cablevision (Optimum)	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.com/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://www.cox.com/myconnection/community/conserv.co http://www.cox.com/aboutus/our-story/in-the-community/conserv.co	Redirect to http://energy.cablelabs.com/cox
DIRECTV	http://www.directv.com/technology/hd_dvr_receiver?ACM=false	Go to "Features," then "More Info" Redirect to http://www.energystar.gov/productfinder/product/certified-set-top-boxes/
DISH Network	http://www.mydish.com/support/energy-efficiency	
Time Warner	http://www.timewarnercable.com/content/twc/en/residential-home/support/faqs/our-company/energy-conservation/what-is-twc-doing-to- conserve-energy.html	Redirect to http://energy.cablelabs.com/time-warner-cable
Verizon	http://responsibility.verizon.com/sustainability/2013	Scroll down to "Verizon STB Energy Information"

D&R
INTERNATIONAL

D&R International, Ltd.
1300 Spring Street, Suite 500
Silver Spring, MD 20910
301-588-9387
www.drintl.com