

# 2019 Annual Report

## Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Small Network Equipment

Prepared on behalf of the  
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## EXECUTIVE SUMMARY

In 2015, the largest U.S. residential broadband Internet service providers and manufacturers of small network equipment (SNE), such as modems and routers used by consumers to access such services, led by NCTA — The Internet & Television Association, the Consumer Technology Association (CTA), and CableLabs, signed the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Small Network Equipment. This agreement is modeled after the successful Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes. The primary objective of the agreement is to increase the energy efficiency of SNE while promoting rapid innovation and timely introduction of new and improved features. The service provider signatories served almost 89.2 million residential U.S. Internet subscribers at the end of 2019, accounting for nearly 89% of the market.

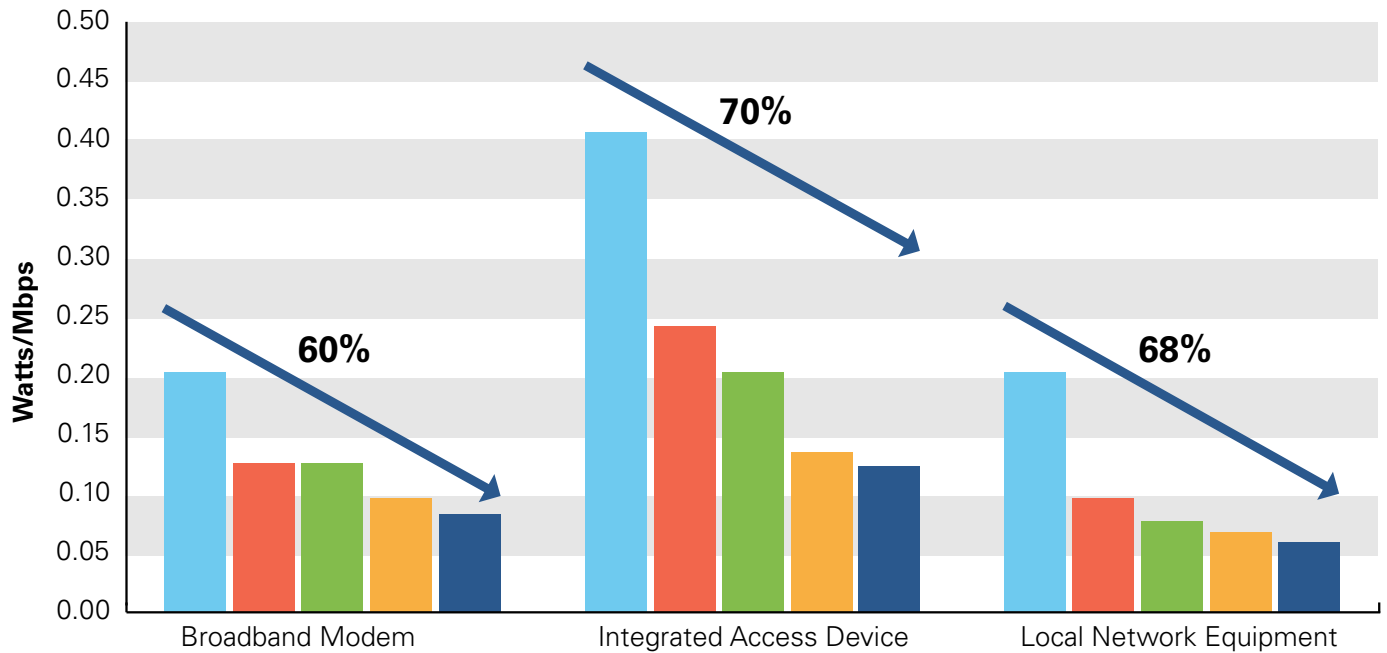
One of the requirements of the Voluntary Agreement is the publication of an annual report that summarizes developments for the previous calendar year. This fifth annual report has been prepared by the Independent Administrator and Auditor, D+R International, Ltd. (D+R).

Under the Voluntary Agreement, signatories commit that at least 90% of all SNE purchased by each service provider or sold by each manufacturer at retail each year, beginning in 2016, will meet the energy-efficiency levels established under the Voluntary Agreement. Overall, in 2019, 99.8% of SNE purchased or sold by the signatories met these levels, an increase from 99.6% reported for 2018. All of the signatories met the 90% commitment individually. Beginning in 2020, the signatories also committed that at least 90% of new SNE would meet more rigorous Tier 2 energy-efficiency levels. This commitment was achieved early, with 98.9% of new devices meeting Tier 2 in 2019. These findings are supported by a successful audit of one randomly selected signatory's records, which D+R found to be consistent with the annual report data submitted by the party.

On average, the SNE models reported in 2019 used slightly more energy than the models reported in 2018. However, this report finds that the signatories are delivering SNE functionalities more efficiently. SNE has evolved to stay ahead of consumer demand for faster broadband services, reduced latency, improved Wi-Fi signal strength, and increased capacity for more devices at higher speeds within the home. Average consumer broadband speeds have more than tripled since the start of the Voluntary Agreement in 2015, and support for these speeds requires more energy for processing, memory and other functions. Moreover, new SNE is designed to be capable of supporting the even greater demands anticipated in the future over the expected lifespan of devices. The massive surge in Internet usage resulting from the COVID-19 pandemic has validated the industry's long-standing strategy to deploy customer equipment capable of transmitting and processing far more capacity than their customers' current service levels. The Voluntary Agreement has enabled this forward-looking approach by allowing additional energy usage to account for new features such as support for new DOCSIS and Wi-Fi technologies that support higher-capacity services.

Lastly, the average weighted power of each category of new SNE relative to broadband speed delivered has decreased by 60-70% and has declined every year under the Voluntary Agreement, as shown in Figure 1.

**Figure 1: Average Energy Usage by Equipment Type, Weighted by Broadband Speed**



These figures were calculated by dividing the average idle power of each equipment type as verified by D+R in this report by the average fixed broadband speed for that year reported by Ookla. Ookla reported that fixed broadband speed increased 19.3% in 2019. *In-Depth Analysis of Changes in World Internet Performance Using the Speedtest Global Index Report*, available at <https://www.speedtest.net/insights/blog/global-index-2019-internet-report>.

To maintain the trend of delivering increasingly robust broadband services while still meeting the commitments of the Voluntary Agreement, the signatories will need to continue to prioritize and invest in energy-efficiency improvements. Consumers and other stakeholders will be able to monitor the parties' progress at [www.energy-efficiency.us](http://www.energy-efficiency.us), which includes links to energy-efficiency information for SNE purchased or sold at retail since January 1, 2015, as well as all previously published annual reports.

## OVERVIEW OF THE VOLUNTARY AGREEMENT

Guided by the objective of improved energy efficiency, the signatories crafted the Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Small Network Equipment in 2015 to reduce energy consumption and environmental impact, save their customers money, increase the reliability of their networks, and preserve flexibility conducive to rapid innovation and timely introduction of new features. The Voluntary Agreement provides a framework for the broadband Internet industry to deliver market-based energy-efficiency gains that keep pace with technological innovation, and is modeled on the successful Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Set-Top Boxes that was signed in 2012.

The Internet service provider signatories provided broadband Internet services to approximately 89.2 million U.S. residential customers, or almost 89% of U.S. broadband households in 2019.<sup>1</sup> The coverage of the Voluntary Agreement has increased since its inception, partly as a result of the addition of Frontier Communications as a signatory in 2017 and the 2019 addition of the Suddenlink cable systems owned by Altice.

The Voluntary Agreement classifies SNE into three categories:

- **Broadband Modems:** Simple network devices that enable high speed data service with a Wide Area Network (WAN) interface to a service provider wired or optical network, and typically a single Local Area Network (LAN) interface for the customer premise network. The Broadband Modem category does not include devices with integrated router or IEEE 802.11 (Wi-Fi) wireless access point functionality.
- **Integrated Access Devices (IAD):** Broadband network devices include a WAN interface to a service provider wired or optical network, and one or more of the following functions on the LAN interface: multiport routing, Wi-Fi wireless access point functionality, and/or Voice over Internet Protocol (VoIP).
- **Local Network Equipment (LNE):** Devices that do not have a direct interface to a service provider wired or optical network. This category consists principally of routers, but includes wireless access points, switches, and network extenders that bridge or extend a LAN beyond its physical limitations.<sup>2</sup>

### Voluntary Agreement Objectives

The objectives of the Voluntary Agreement are to continue improvements in the energy efficiency of SNE and to foster device and service functionality, while encouraging innovation and competition. The Voluntary Agreement aims to achieve these goals through flexible approaches that allow the delivery of high quality, innovative services to consumers.

### Voluntary Agreement Signatories and Steering Committee

The signatories and participants in the Voluntary Agreement are listed below.

#### Service Provider Signatories

- Altice USA, Inc.
- AT&T Services, Inc.
- CenturyTel Broadband Services, LLC d/b/a CenturyLink
- Charter Communications, Inc. d/b/a Spectrum
- Comcast Cable Communications, LLC
- Cox Communications, Inc.
- Frontier Communications Corp.
- Verizon Communications, Inc.

1 - Based on data provided by the signatories, NCTA, and the Consumer Technology Association.

2 - For the full definitions of these categories, see Appendix A of this report or Annex 1 of the Voluntary Agreement.

## Vendor Signatories

- Actiontec Electronics, Inc.
- ASUSTeK Computer Inc. d/b/a ASUS (new for 2020)
- Belkin International, Inc. (new for 2020)
- CommScope Inc. of North Carolina (formerly ARRIS)
- Technicolor Connected Home USA LLC
- Ubee Interactive, Inc.

## Other Organizations

- Consumer Technology Association (CTA)
- NCTA - The Internet & Television Association (NCTA)
- Cable Television Laboratories (CableLabs)

The Voluntary Agreement obligates the Steering Committee to designate an Independent Administrator and publish an annual report. The Steering Committee designated D+R as the Independent Administrator and Auditor in 2015, and D+R has continued in this role for 2019. This report is the fifth annual report.

The Voluntary Agreement requires that the Steering Committee meet at least once each year. The Steering Committee met twice in 2019, on June 11 and July 22, and working groups were active throughout the year. Additional responsibilities of the Steering Committee include the following:

- Managing the Voluntary Agreement
- Hiring the Independent Administrator
- 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 and services change

## Signatory Commitments

The primary commitment is to procure and sell energy-efficient SNE. Specifically, beginning January 1, 2016, the commercial signatories committed that 90% of new SNE purchased by service providers or sold at retail by vendors each year will meet the energy-efficiency levels established in the Voluntary Agreement. These energy levels will become even more rigorous in 2020 under a new Tier 2 of the Voluntary Agreement. The signatories also committed to provide subscribers and prospective customers with reasonable access to energy-efficiency information for SNE, furnish the Independent Administrator with annual data and test results, and participate in third-party lab testing and audits to verify the information in their annual data reports.

## Independent Administrator and Auditor Role

The Independent Administrator is a third party appointed by the Steering Committee. Under the Voluntary Agreement, the Independent Administrator must aggregate and compile confidential procurement and sales data submitted by the signatories. If the Voluntary Agreement procurement or sales commitments are not met, the Independent Administrator is responsible for working with the signatory to develop a remedial plan under procedures set out in the Voluntary Agreement.

The Independent Administrator is charged with conducting an audit of one randomly-selected service provider's procurement figures or one vendor's sales figures each year. The results of the 2019 audit are presented in Appendix C.

### **New Feature Process for Small Network Equipment**

The New Feature Process is intended to encourage innovation and competition by service provider and vendor signatories and to encourage energy efficiency by design. This process provides a path for signatories to innovate and add new features, including features with no assigned allowances and features in the early stages of design, without being treated as being in violation of Voluntary Agreement energy allowances or commitments. If a service provider signatory deploys, or a vendor signatory sells, SNE that includes a new feature with no allowance, and the presence of the feature causes the device to exceed the prescribed allowances, the signatory may set and report an appropriate initial allowance for the power consumption of that feature when it reports the device under the Voluntary Agreement. When such information is reported, the Steering Committee will propose appropriate allowances and effective dates. New allowances established by the Steering Committee for new features are publicly reported.

### **Remediation and Alternative Energy Efficiency Strategies**

A signatory that fails to meet its procurement or sales commitment must either seek advance credits for alternative energy-efficiency measures or must undertake a remedial plan that secures energy savings that offset the incremental energy associated with devices purchased or sold in excess of the commitment. All signatories met all applicable commitments in 2019.



## REPORT ON 2019 PROCUREMENT AND SALES COMMITMENTS

Under the Voluntary Agreement, 90% of SNE purchased or sold at retail each year by commercial signatories after December 31, 2015 must meet specified energy-efficiency levels. The Independent Administrator collected data from the service provider and retail vendor signatories to measure satisfaction of these commitments in 2019.<sup>3</sup> Overall, 99.8% of reported units satisfied the energy-efficiency levels of the Voluntary Agreement in 2019, up from 99.6% in 2018. All of the reporting signatories met the 90% threshold, and seven of those signatories had 100% of their new purchases/sales meet the energy-efficiency levels of the Agreement. The success of the procurement commitment spanned every category of SNE, with at least 99% of every category meeting the levels of the Voluntary Agreement, as shown in Table 1. These results demonstrate that the signatories met their procurement and sales commitments under the Voluntary Agreement in 2019.

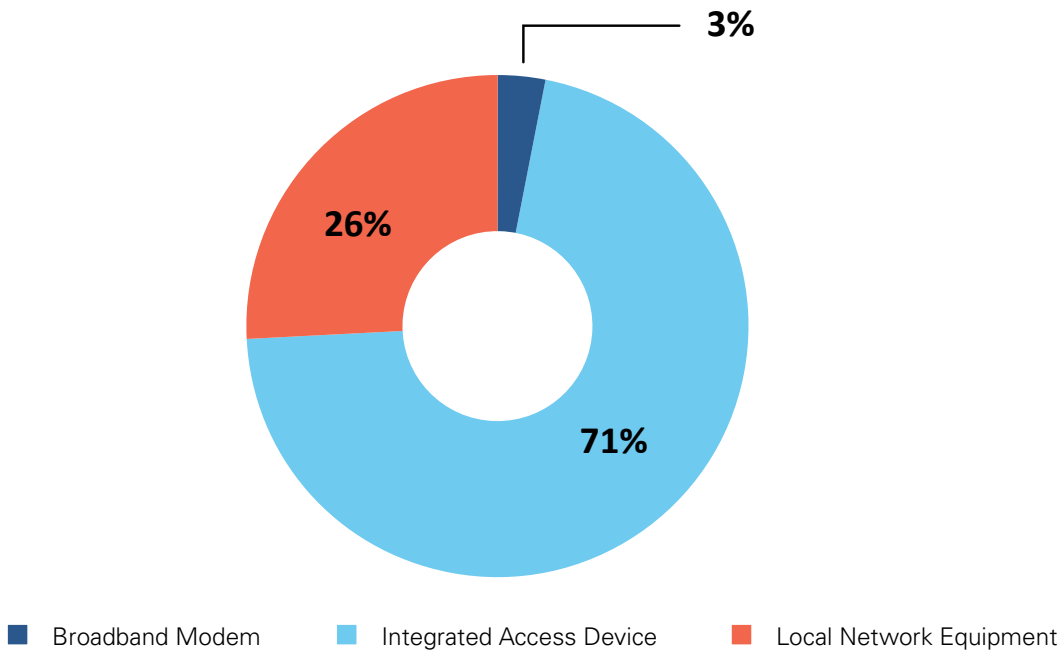
**Table 1: Total Number of Reported Units and Number of Units Meeting Energy-Efficiency Levels, by Equipment Type**

Category	Reported Units	Number Meeting Tier 1 Levels	Percent Meeting Tier 1 Levels
<b>Broadband Modem</b>	727,607	727,607	100.0%
<b>Integrated Access Device</b>	18,089,873	18,035,522	99.7%
<b>Local Network Equipment</b>	6,544,578	6,544,578	100.0%
<b>Total</b>	<b>25,362,058</b>	<b>25,307,707</b>	<b>99.8%</b>

In addition, signatories already surpassed the Tier 2 commitment a year ahead of its effective date, with 98.9% of devices purchased/sold in 2019 meeting Tier 2.

IADs represent 71% of reported products, followed by LNE and broadband modems. Figure 2 shows the category breakdown, by percentage, of the units purchased or sold.

**Figure 2: Small Network Equipment, by Equipment Type**



3 - Two vendor signatories had no retail sales of SNE in 2019, and therefore did not need to submit sales data.

## Energy Efficiency of Small Network Equipment

Details of the SNE purchased or sold by the signatories in 2019 are provided in Appendix A. The energy efficiency of each model is assessed based upon its particular suite of functions and capabilities, which vary widely. The overall trend in the average weighted power of each of the three categories of SNE defined by the Voluntary Agreement is shown in Table 2 below:

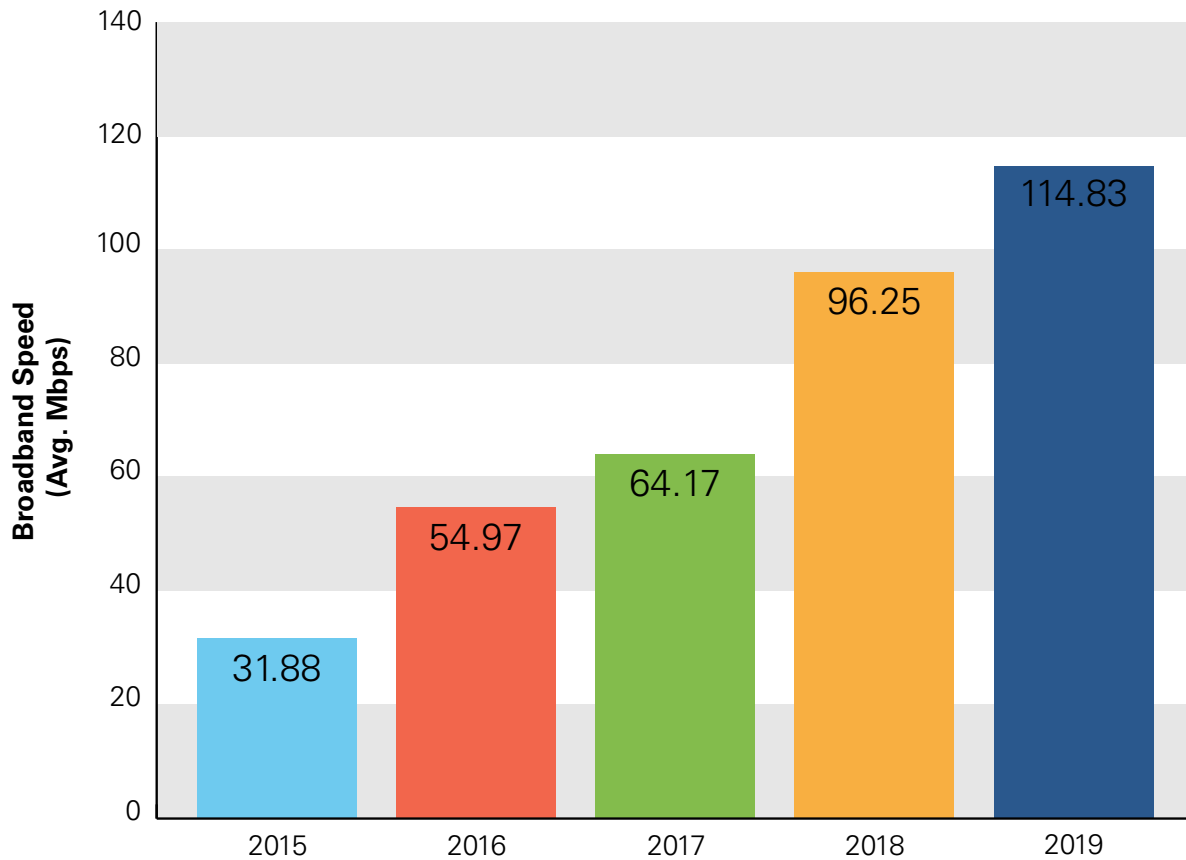
**Table 2: Average Weighted Idle Mode Power Consumption for Small Network Equipment Categories 2015-2019**

SNE Category	Average Weighted Power (in Watts)				
	2015	2016	2017	2018	2019
<b>Broadband Modem</b>	6.67	7.11	8.12	9.36	9.65
<b>Integrated Access Device</b>	13.30	13.53	13.65	13.73	14.49
<b>Local Network Equipment</b>	6.44	5.62	5.28	6.79	7.64
<b>Total Weighted Average</b>	11.36	11.79	11.26	11.55	12.59

It should be noted that each year's total weighted average fluctuates based on changes in the relative quantities of each category purchased and sold each year. In 2019, IAD purchases made up a larger percentage of the overall purchases and LNE purchases were a smaller percentage than in 2018. This could be due to the fact that IADs often include Wi-Fi routing and other functionality provided by LNE.

The increases in nominal power of the SNE categories since 2015, even as percentage of those models meeting Voluntary Agreement levels has increased, can be attributed to the power requirements of supporting much faster broadband speeds and stronger Wi-Fi. Consumers are bringing an increasing number and variety of connected devices into their homes and streaming an increasing amount of video content to mobile devices. In the home, this streamed content is typically delivered through the customer's modem and router. To support these devices and content, the average broadband connection speed for U.S. residential households has nearly quadrupled in just four years, as shown in Figure 3.

**Figure 3: Annual Growth of Broadband Speeds<sup>4</sup>**



To meet consumers' increased demands for higher-speed broadband services and increased Wi-Fi capacity in the home, the design and features of SNE have changed since the Voluntary Agreement was adopted, with new WAN technologies such as DOCSIS 3.1, and higher powered radios with more antennas and MIMO spatial streams, which can require more power.

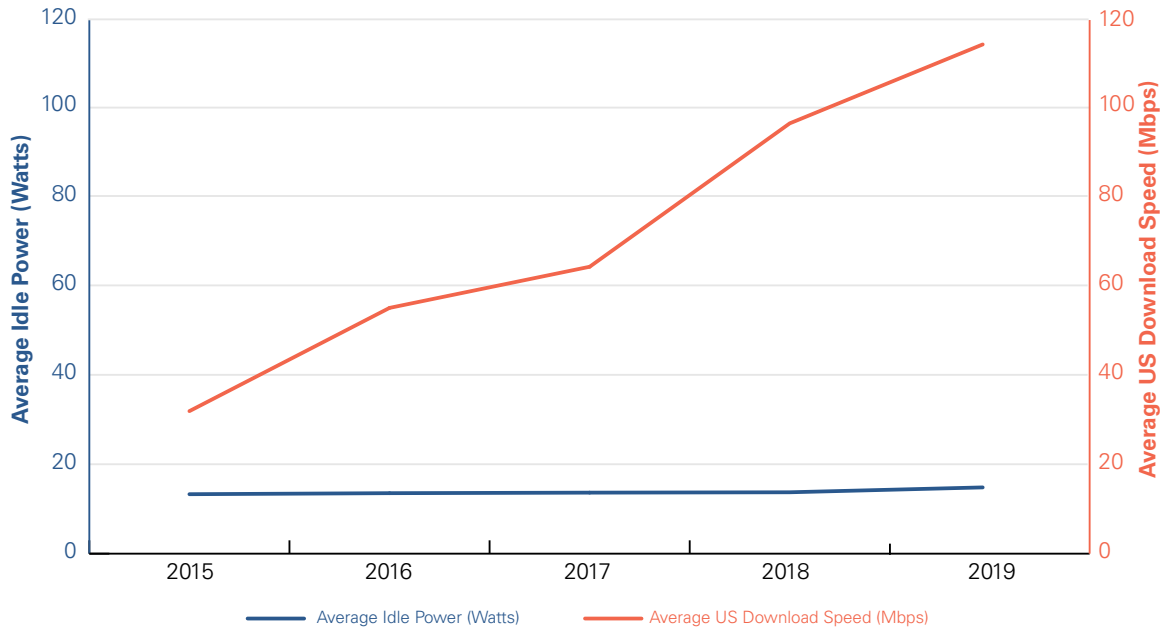
Moreover, for years, the service provider signatories have strived to provide equipment that will be capable of supporting the speeds and services that customers are expected to want over the next several years, not just current demand. Service providers wish to give customers the opportunity to upgrade their Internet service without having to wait for a service provider technician to visit and replace their equipment. In addition, it would be environmentally and economically wasteful to procure new SNE today that would be quickly rendered obsolete by changes in consumer demand. As a result, SNE is designed and manufactured to support more demanding speeds and capabilities prior to their widespread adoption by consumers.

The practice of embedding future expandable capability into deployed Internet equipment has paid large dividends for American society during the COVID-19 pandemic. Service provider networks and the SNE on which they rely were able to support the massive, immediate surge in Internet usage as millions of Americans worked, attended school, engaged in telehealth, and sought to remain connected and entertained from home. Service providers were generally able to increase speeds and lift data caps for consumers without having to enter customer homes to upgrade their SNE.

4 - Ookla, Speedtest<sup>®</sup> Market Reports 2016, 2017, 2018 (August 3, 2016; September 7, 2017; December 12, 2018), available at <https://www.speedtest.net/reports>. MCKETTA, ISLA. *In-Depth Analysis of Changes in World Internet Performance Using the Speedtest Global Index 2019* (September 4, 2019), available at <https://www.speedtest.net/insights/blog/global-index-2019-internet-report/>.

SNE energy usage is accordingly evaluated relative to its capabilities. The signatories reduced average energy relative to broadband speed from 2018 to 2019, as it has each year under the Voluntary Agreement as shown in Figure 1 of the Executive Summary of this report. Figure 4 below illustrates the contrast between the relative stability of the weighted average idle power consumption of reported SNE and the rapid increase in average download speeds during the five years of the Voluntary Agreement. The signatories' ability to support these higher-speed services without a significant overall increase in power consumption demonstrates that their SNE devices are delivering services more efficiently and are thereby accomplishing the core objectives of the Voluntary Agreement.

**Figure 4: Average Idle Power of SNE Devices vs. Download Speed 2015-2019**



The Voluntary Agreement is expected to continue to drive purchase and retail decisions, increasing the efficiency of equipment on the market and in consumers' homes. The fact that more than 98.9% of devices met Tier 2 levels in 2019 does not mean that challenges and work do not lie ahead. To continue to meet these levels in 2020 and beyond, the signatories will need to offer devices with greater functionality than those offered today, while still meeting the commitments of the Voluntary Agreement.

The data support the finding that the Voluntary Agreement is continuing to be successful in improving the energy efficiency of SNE.

### Lab Verification Testing

Per the Voluntary Agreement, the Independent Administrator is tasked with randomly selecting one model from each commercial signatory for lab verification testing. Lab verification testing is conducted in third-party laboratories approved by the Steering Committee or under a supervised vendor or service provider testing program with an accredited independent observer approved by the Steering Committee. Test results are compared to the reported value as well as the maximum idle power consumption under the applicable allowances for that device.

The lab verification testing is typically conducted in the spring following the reporting period. Unfortunately, COVID-19 brought about travel and resource restrictions that impacted the ability for this testing to be conducted. As a result, lab verification testing was suspended for the 2019 reporting period.

### Consumer Access to Energy Efficiency Information

All signatories committed to provide subscribers and prospective customers with reasonable access to energy-efficiency information for SNE purchased or sold at retail since January 1, 2015. This information makes it easy for consumers to learn about energy-efficient SNE and typical energy consumption. Links to the information are shown in Appendix B and posted at [www.energy-efficiency.us](http://www.energy-efficiency.us).

## CONCLUSION

The Voluntary Agreement continues to be successful in improving the energy efficiency of SNE used by American consumers with broadband Internet access service. 99.8% of reported units satisfied the energy-efficiency levels of the Agreement despite increased consumer demands for robust capabilities that consume power. All of the service provider and retail vendor signatories met the 90% threshold, and seven signatories had 100% of their new sales and purchases meet the energy-efficiency levels. The average weighted power of each category of new SNE relative to broadband speed delivered has decreased by 60-70% and has declined every year under the Voluntary Agreement. As the signatories continue to employ even greater functionality in their devices while still meeting the more rigorous Tier 2 energy-efficiency levels of the Agreement, the Voluntary Agreement can be expected to continue to promote both product innovation and energy efficiency.

## APPENDIX A: SMALL NETWORK EQUIPMENT PURCHASED OR SOLD BY VOLUNTARY AGREEMENT SIGNATORIES IN 2019

Appendix A lists the SNE reported by the signatories as purchased or sold in 2019. Please note that the same model could have variances in reported power for several reasons, including differences in reported versus measured power, enabling of different product features, and/or different software deployed on the device by different signatories. Modal power figures in this Appendix are rounded up to the next one-hundredth digit (e.g., 5.126 watts would be rounded up to 5.13 watts).

Vendor reports include only the models that were sold via retail channels. Models sold to Service Providers are reported by the Service Providers.

The Voluntary Agreement establishes the following categories of SNE subject to the Agreement:

- **Broadband Modem.** A simple network device that enables high speed data service with a Wide Area Network (WAN) interface to a service provider wired or optical network, and typically a single Local Area Network (LAN) interface for the customer premise network. The Broadband Modem category does not include devices with integrated router or IEEE 802.11 (Wi-Fi) wireless access point functionality.
- **Integrated Access Device (IAD).** A network device that enables high speed data service with a WAN interface to a service provider wired or optical network and one or more of the following functions on the LAN interface: multiport routing, IEEE 802.11 (Wi-Fi) wireless access point functionality, and/or VoIP.
- **Local Network Equipment (LNE).** The following local network devices that do not have a direct interface to a Service Provider wired or optical network:
  - **Wireless Access Point:** A device that typically includes one or more Ethernet interfaces, and that provides IEEE 802.11 (Wi-Fi) wireless network connectivity to multiple clients as its primary function.
  - **Router:** A network device that forwards packets from one network interface to another based on network layer information (typically IP destination address). Devices fitting this definition may provide both wired and wireless network connectivity.
  - **Switch:** A network device that filters and forwards frames based on the Ethernet destination MAC address of each frame as its primary function.
  - **Network Extender:** A device that bridges or extends a local area network beyond its physical limitations using one or more transmission media such as twisted pair, coax, Wi-Fi, or powerline.

**Table 3: Small Network Equipment Purchased/Sold by Voluntary Agreement Signatories in 2019**

Signatory	Brand	Model Number	Base Type	Claimed Allowances	Reported Idle Power (W)	Meets VA Levels
Actiontec	Actiontec	GT784WNV	IAD ADSL2+	Fast E LAN(4), Wi-Fi (n) LP, USB 2	6.06	No
Actiontec	Actiontec	ECB6200	Basic LNE	GigE LAN, MoCA	2.28	Yes
Actiontec	Actiontec	WEB6000Q	Advanced LNE	GigE LAN(2), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(2)	6.69	Yes
Altice	Sagemcom	F@st 5260CV	Advanced LNE	GigE LAN(5), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(2), USB 2, PCIe(2)	7.00	Yes
Altice	ARRIS	TM1602AP2	IAD D3.0	D3 above 4x4(5), GigE LAN, FXS(2)	9.00	Yes
Altice	ARRIS	TM1602G	IAD D3.0	D3 above 4x4(5), GigE LAN, FXS(2), BATTERY	10.50	Yes
Altice	Ubee	UBC1322	IAD D3.1	GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(3), FXS(2)	11.00	Yes
Altice	AlticeLabs	GR240BG	IAD SFP GPON	GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(4), 802.11n 256 QAM, FXS(2), USB 2	11.00	Yes
AT&T	ARRIS	BGW210-700	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), Wi-Fi (n) HP, Wi-Fi above 2x2 HP, 802.11n 256 QAM, FXS(2), USB 2(2), PCIe, AP 5K-10K DMIPS	14.50	Yes
AT&T	Airties	4920	Advanced LNE	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP, PCIe(2)	7.70	Yes
AT&T	Airties	4921	Advanced LNE	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP, PCIe(2)	7.70	Yes
CenturyLink	Actiontec	C1900A	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (n) HP, USB 2	11.64	Yes
CenturyLink	Actiontec	C3000A	IAD VDSL2	VDSL2 Simul WAN, GigE LAN(5), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(3), USB 2, PCIe(2)	13.00	Yes
CenturyLink	Technicolor	C1100T	IAD VDSL2	GigE Backup WAN, GigE LAN(4), Wi-Fi (n) LP, USB 2	6.44	Yes
CenturyLink	Zyxel	C1100Z	IAD VDSL2	GigE Backup WAN, GigE LAN(4), Wi-Fi (n) HP, USB 2	7.47	Yes
CenturyLink	Zyxel	C3000Z	IAD VDSL2 (30a)	GigE Backup WAN, GigE LAN(4), Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), Wi-Fi (n) HP, Wi-Fi above 2x2 HP, USB 2	10.40	Yes
Charter	Sagemcom	F@st5280	Advanced LNE	GigE LAN(5), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(4), 802.11n 256 QAM, USB 3, PCIe(2), AP 5K-10K DMIPS	9.50	Yes
Charter	Askey	RT4230W-D187	Advanced LNE	GigE LAN(5), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(4), 802.11n 256 QAM, USB 3, PCIe(2), AP 5K-10K DMIPS	8.50	Yes
Charter	Technicolor	DPC3216C	IAD D3.0	D3 above 4x4(3), GigE LAN, FXS(2), BATTERY	8.00	Yes
Charter	ARRIS	TM1602G	IAD D3.0	D3 above 4x4(5), GigE LAN, FXS(2), BATTERY	10.50	Yes
Charter	Technicolor	E31T2V1	IAD D3.1	GigE LAN, FXS(2)	9.00	Yes
Charter	Hitron	E31N2V1	IAD D3.1	GigE LAN, FXS(2)	10.50	Yes
Charter	Ubee	E31U2V1	IAD D3.1	GigE LAN, FXS(2)	8.00	Yes
Comcast	ARRIS	TG3482G P2	IAD D3.1	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(6), 802.11n 256 QAM, MoCA, FXS(2), Blue-tooth, ZigBee, PCIe(2), AP 5K-10K DMIPS	25.50	Yes
Comcast	Technicolor	CGM4140COM	IAD D3.1	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(6), 802.11n 256 QAM, MoCA, FXS(2), Blue-tooth, ZigBee, Z-wave, PCIe(2), AP 5K-10K DMIPS	24.00	Yes
Comcast	Technicolor	CGM4331COM	IAD D3.1	GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(2), 802.11n 256 QAM, MoCA, FXS(2), Blue-tooth, ZigBee, PCIe(3), AP 5K-10K DMIPS	17.50	Yes
Comcast	ARRIS	X5001	IAD 10G EPON	GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), MoCA, FXS(2), USB 2, PCIe(2)	20.50	Yes
Comcast	Sagemcom	A1A	Basic LNE	GigE LAN, Wi-Fi (n) LP, Wi-Fi (ac) LP, Blue-tooth	3.50	Yes
CommScope	ARRIS	SB6141	Basic D3.0	D3 above 4x4, GigE LAN	5.45	Yes
CommScope	ARRIS	SB6183	Basic D3.0	D3 above 4x4(3), GigE LAN	8.45	Yes

**Table 3: Small Network Equipment Purchased/Sold by Voluntary Agreement Signatories in 2019 (cont.)**

Signatory	Brand	Model Number	Base Type	Claimed Allowances	Reported Idle Power (W)	Meets VA Levels
CommScope	ARRIS	SB6190	Basic D3.0	D3 above 4x4(7), GigE LAN	8.60	Yes
CommScope	ARRIS	SB8200	Basic D3.1	GigE LAN(2)	10.80	Yes
CommScope	ARRIS	SBG10	IAD D3.0	D3 above 4x4(3), GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP	10.60	Yes
CommScope	ARRIS	SBG6700-AC	IAD D3.0	D3 above 4x4, GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP	10.00	Yes
CommScope	ARRIS	SBG6900-AC	IAD D3.0	D3 above 4x4(3), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), USB 2(2)	14.10	Yes
CommScope	ARRIS	SBG6950AC2	IAD D3.0	D3 above 4x4(3), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), USB 2	11.10	Yes
CommScope	ARRIS	SBG7400AC2	IAD D3.0	D3 above 4x4(5), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(3), USB 2	13.20	Yes
CommScope	ARRIS	SBG7580-AC	IAD D3.0	D3 above 4x4(7), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), USB 2	14.00	Yes
CommScope	ARRIS	SBG7600AC2	IAD D3.0	D3 above 4x4(7), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(3), USB 2, PCIe(2), AP 5K-10K DMIPS	14.20	Yes
CommScope	ARRIS	SBG8300	IAD D3.1	GigE LAN(4), Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), Wi-Fi (n) HP, Wi-Fi above 2x2 HP, AP 5K-10K DMIPS	18.20	Yes
CommScope	ARRIS	SVG2482AC	IAD D3.0	D3 above 4x4(5), GigE LAN(4), Wi-Fi (n) LP, Wi-Fi above 2x2 LP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP, MoCA, FXS(2), USB 2(2)	14.30	Yes
CommScope	ARRIS	SBV2402	IAD D3.0	D3 above 4x4(5), GigE LAN, FXS(2)	7.80	Yes
CommScope	ARRIS	SBV3202	IAD D3.0	D3 above 4x4(7), GigE LAN, FXS(2)	9.20	Yes
CommScope	ARRIS	TG862G	IAD D3.0	D3 above 4x4, GigE LAN(4), Wi-Fi (n) LP, FXS(2), USB 2, BATTERY	8.40	Yes
CommScope	ARRIS	TM822G	IAD D3.0	D3 above 4x4, GigE LAN, FXS(2)	5.70	Yes
CommScope	ARRIS	TM822R	IAD D3.0	D3 above 4x4, GigE LAN, FXS(2)	5.70	Yes
CommScope	ARRIS	TM1602AP2	IAD D3.0	D3 above 4x4(3), GigE LAN, FXS(2)	8.00	Yes
CommScope	ARRIS	TM1602G	IAD D3.0	D3 above 4x4(3), GigE LAN, FXS(2)	9.10	Yes
CommScope	ARRIS	T25	IAD D3.1	GigE LAN(2), FXS(2)	9.40	Yes
CommScope	ARRIS	W30	Advanced LNE	GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP(2), Wi-Fi above 2x2 HP(2), PCIe(3)	10.80	Yes
CommScope	ARRIS	W31	Advanced LNE	GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP(2), Wi-Fi above 2x2 HP(6), PCIe(3)	11.00	Yes
Cox	ARRIS	CM8200A/P2	Basic D3.1	GigE LAN(2)	12.00	Yes
Cox	ARRIS	TM3402A	IAD D3.1	GigE LAN(4), FXS(2)	11.60	Yes
Cox	Technicolor	CGM4141	IAD D3.1	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(6), 802.11n 256 QAM, MoCA, FXS(2), Blue-tooth, ZigBee, Z-wave, PCIe(2), AP 5K-10K DMIPS	24.00	Yes
Cox	Sagemcom	A1A	Basic LNE	GigE LAN, Wi-Fi (n) LP, Wi-Fi (ac) LP	3.00	Yes
Frontier	ARRIS	NVG468 MQ	IAD GigE	GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(3), MoCA, FXS(2), USB 3, PCIe, AP 5K-10K DMIPS	12.70	Yes
Frontier	ARRIS	NVG448 BQ	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(3), FXS(2), USB 3, PCIe, AP 5K-10K DMIPS	13.80	Yes
Frontier	ARRIS	NVG448 BQ	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(3), FXS(2), USB 3, PCIe, AP 5K-10K DMIPS	13.80	Yes
Frontier	ARRIS	NVG448 B	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP, FXS(2), USB 3, PCIe(2), AP 5K-10K DMIPS	12.60	Yes
Frontier	ARRIS	NVG443 B	IAD VDSL2	GigE Backup WAN, VDSL2 Simul WAN, GigE LAN(4), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP, USB 3, PCIe(2), AP 5K-10K DMIPS	12.60	Yes



**Table 3: Small Network Equipment Purchased/Sold by Voluntary Agreement Signatories in 2019 (cont.)**

Signatory	Brand	Model Number	Base Type	Claimed Allowances	Reported Idle Power (W)	Meets VA Levels
Frontier	NETGEAR	D2200D	IAD ADSL2+	Fast E LAN(4), Wi-Fi (n) LP, PCIe	4.20	Yes
Frontier	ARRIS	AM525	Advanced LNE	GigE LAN(2), Wi-Fi (n) LP, Wi-Fi (ac) LP, Wi-Fi above 2x2 LP(2), MoCA	9.00	Yes
Frontier	ARRIS	FST1305	G.fast	VDSL2 Backup WAN, GigE LAN	4.50	Yes
Verizon	Actiontec	GT784WNV	IAD ADSL2+	Fast E LAN(4), Wi-Fi (n) LP, USB 2	6.09	No
Verizon	Dlink	DSL-2750B	IAD ADSL2+	Fast E LAN(4), Wi-Fi (n) LP, USB 2	5.05	Yes
Verizon	Dlink	DGS-1005G	Basic LNE	GigE LAN(5)	1.56	Yes
Verizon	Actiontec	WCB6200Q	Advanced LNE	GigE LAN(2), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(2), MoCA	9.21	Yes
Verizon	Verizon	FiOS-G1100	IAD MoCA	GigE Backup WAN, GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP, Wi-Fi above 2x2 HP(2), MoCA, USB 2(2), Z-wave	10.43	Yes
Verizon	Actiontec	ECB5240	Advanced LNE	GigE LAN(4), MoCA	4.91	Yes
Verizon	Arcadyan	Fios Home Router	IAD MoCA	GigE Backup WAN, GigE LAN(4), Wi-Fi (n) HP, Wi-Fi (ac) HP(2), Wi-Fi above 2x2 HP(6), 802.11n 256 QAM, MoCA, USB 3, Blue-tooth, PCIe(3), AP 5K-10K DMIPS	11.78	Yes
Verizon	Arcadyan	Fios Home Wi-Fi Extender	Advanced LNE	GigE LAN(2), Wi-Fi (n) HP, Wi-Fi (ac) HP(2), Wi-Fi above 2x2 HP(6), 802.11n 256 QAM, MoCA, PCIe(3), AP 5K-10K DMIPS	10.12	Yes

Table 4 describes feature allowances established by the Voluntary Agreement.

**Table 4: Voluntary Agreement Allowance Descriptions**

Description	Descriptor	Allowance
<b>Base Allowance: IAD Devices (by WAN interface) (watts)</b>		
ADSL2plus	IAD ADSL2+	3.9
DOCSIS 3.0 basic configuration (4x4)	IAD D3.0	6.2
DOCSIS 3.1 No FDX	IAD D3.1	16.7
SFP with GPON	IAD SFP GPON	5
VDSL2 (8, 12a, 17a, but not 30a)	IAD VDSL2	4.7
VDSL2 (all above profiles including 30a)	IAD VDSL2 (30a)	6.2
10G EPON	IAD 10G EPON	13
Gigabit Ethernet	IAD GigE	4
MoCA 1.1/2.0	IAD MoCA	5.7
<b>Base Allowance: Broadband Modems (by WAN Interface) (watts)</b>		
DOCSIS 3.0 basic configuration (4x4)	Basic D3.0	4.7
DOCSIS 3.1 No FDX	Basic D3.1	15.2
G.fast	G.fast	4.2
<b>Base Allowance: LNE (watts)</b>		
LNE other than Advanced LNE	Basic LNE	2.0
Advanced LNE	Advanced LNE	3.75
<b>Adders for Additional Backup WAN Interface</b>		
Gigabit Ethernet WAN	GigE Backup WAN	0.7
VDSL2 (8, 12a, 17a, but not 30a)	VDSL2 Backup WAN	1.0
<b>Adders for Simultaneous Additional WAN Interface</b>		
VDSL2 (8, 12a, 17a, but not 30a)	VDSL2 Simul WAN	3.2
DOCSIS 3.0 additional power allowance for each additional 4 downstream channels	D3 above 4x4	1.5
<b>Adders for LAN interfaces and Additional Functionality</b>		
1 Fast Ethernet port	Fast E LAN	0.2
1 Gigabit Ethernet port	GigE LAN	0.25
Wi-Fi IEEE 802.11n radio at 2.4 GHz or at 5.0 GHz with a conducted output power less than 200 mW per chain (up to 2x2, i.e. 400 mW)	Wi-Fi (n) LP	1.0
Wi-Fi, IEEE 802.11ac radio at 5 GHz with a conducted output power less than 200 mW per chain (up to 2x2, i.e. 400 mW)	Wi-Fi (ac) LP	2.1
Additional allowance per RF chain above a 2x2 MIMO configuration (e.g., for 3x3 and 4x4) with a conducted output power less than 200 mW per chain	Wi-Fi above 2x2 LP	0.3
Wi-Fi IEEE 802.11n radio at 2.4 GHz or at 5.0 GHz with a conducted output power greater than or equal to 200 mW per chain (up to 2x2, i.e. 400 mW)	Wi-Fi (n) HP	1.2
Wi-Fi, IEEE 802.11ac radio at 5 GHz with a conducted output power greater than or equal to 200 mW per chain (up to 2x2, i.e. 400 mW)	Wi-Fi (ac) HP	2.5
Additional allowance per RF chain above a 2x2 MIMO configuration (e.g., for 3x3 and 4x4) with a conducted output power greater than 200 mW per chain	Wi-Fi above 2x2 HP	0.4
Wi-Fi IEEE 802.11n at 2.4GHz supporting 256-QAM	802.11n 256 QAM	0.5
MoCA 1.1/2.0 Single Channel	MoCA	2.5
FXS	FXS	0.3
USB 2.0 - no load connected	USB 2	0.1
USB 3.0 - no load connected	USB 3	0.2
Built-in back-up battery	BATTERY	0.4
Bluetooth	Bluetooth	0.1
ZigBee	ZigBee	0.1
Z-wave	Z-wave	0.1
PCIe Interface (Connected)	PCIe	0.2
Application Processor 5K-10K DMIPS	AP 5K-10K DMIPS	1.0

## APPENDIX B: CONSUMER-FACING SMALL NETWORK EQUIPMENT ENERGY-EFFICIENCY INFORMATION

SNE energy information for consumers is available at [www.energy-efficiency.us](http://www.energy-efficiency.us), and for each service provider and retail vendor at the links below.

**Table 5: Consumer-Facing Small Network Equipment Energy-Efficiency Information**

Signatory	Consumer information Location	Additional Information
<b>Service Providers</b>		
<b>Altice</b>	<a href="https://energy.cablelabs.com/cablevision-sne/">https://energy.cablelabs.com/cablevision-sne/</a>	
<b>AT&amp;T</b>	<a href="https://www.att.com/ecms/dam/att/consumer/help/tv/pdf/ATT-Small-Network-Equipment-Energy-Information-2020.pdf">https://www.att.com/ecms/dam/att/consumer/help/tv/pdf/ATT-Small-Network-Equipment-Energy-Information-2020.pdf</a>	
<b>CenturyLink</b>	<a href="https://www.centurylink.com/home/help/internet/modems-and-routers/modem-energy-efficiency.html">https://www.centurylink.com/home/help/internet/modems-and-routers/modem-energy-efficiency.html</a>	
<b>Charter</b>	<a href="https://energy.cablelabs.com/charter-sne/">https://energy.cablelabs.com/charter-sne/</a>	
<b>Comcast</b>	<a href="https://energy.cablelabs.com/comcast-sne/">https://energy.cablelabs.com/comcast-sne/</a>	
<b>Cox</b>	<a href="https://energy.cablelabs.com/cox-sne/">https://energy.cablelabs.com/cox-sne/</a>	
<b>Frontier</b>	<a href="https://frontier.com/-/media/HelpCenter/Documents/tv/fios/small-network-equipment-efficiency.ashx">https://frontier.com/-/media/HelpCenter/Documents/tv/fios/small-network-equipment-efficiency.ashx</a>	
<b>Verizon</b>	<a href="https://www.verizon.com/support/residential/tv/equipment/stb-dvr#sne">https://www.verizon.com/support/residential/tv/equipment/stb-dvr#sne</a>	Scroll down to “Learn about Verizon’s Small Network Equipment (SNE) Energy Information” and click the plus sign next to it.
<b>Vendors</b>		
<b>Actiontec Electronics</b>	<a href="http://support.actiontec.com/doc_files/actiontec_broadband_equipment_energy_information_sne_v1.pdf">http://support.actiontec.com/doc_files/actiontec_broadband_equipment_energy_information_sne_v1.pdf</a>	
<b>CommScope (ARRIS)</b>	<a href="https://www.commscope.com/globalassets/digizuite/330860-commscope-sne-public-report.pdf">https://www.commscope.com/globalassets/digizuite/330860-commscope-sne-public-report.pdf</a>	
<b>Technicolor</b>	No Retail Products	
<b>Ubee Interactive</b>	No Retail Products	



# 2019 Annual Report Audit Results

The Voluntary Agreement requires the service provider and retail vendor signatories to submit annual procurement and sales figures to an independent administrator, who collects and analyzes the amounts, then publishes the findings in an annual report. The administrator aggregates the submissions from the individual signatories for publication in the annual report to protect this highly confidential information. To verify the accuracy of the reported data, the Voluntary Agreement requires an audit of one randomly-selected commercial signatory each year. In accordance with the confidentiality requirements of the Voluntary Agreement, the name of the audited party is not published.

D+R conducted an audit of the 2019 report data provided in 2020, which was used to develop the 2019 Annual Report. D+R randomly selected the party by creating an Excel spreadsheet and using the “random” function.

D+R reviewed raw data from the selected party to verify the quantities provided in the original submission. These included invoice records and specification sheets.

D+R, as the Independent Administrator, has determined that the data submitted by the signatory for the audit is consistent with the annual report submitted by that party.

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