**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | |
| Promoting Investment in the 3550-3700 MHz Band | ) | GN Docket No. 17-258 |
| | ) | |

# REPORT AND ORDER

**Adopted: October 23, 2018** **Released: October 24, 2018**

By the Commission: Chairman Pai, Commissioners O'Rielly and Carr approving. Commissioner Rosenworcel dissenting. Chairman Pai, Commissioners O'Rielly, Carr, and Rosenworcel issuing separate statements.

## TABLE OF CONTENTS



## I. INTRODUCTION

1. Since the Commission established service rules for the 3550-3700 MHz band (3.5 GHz band) in 2015,[1] it has become clear that the band will be an essential part of next generation wireless network deployments, including 5G, throughout the world. The international community has moved

[1] *See generally Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959 (2015) (*2015 Report and Order* and *2015 FNPRM*, respectively).

forward with policies that would make this band available for 5G,[2] and global bodies have developed standards for next generation devices in the band.[3] Given the importance of the 3.5 GHz band for 5G deployment internationally and the need for more flexible-use mid-band spectrum to support next generation wireless networks, including 5G, it is important to ensure that the policies we adopt for the band ensure its potential use for 5G as well as other high-speed broadband technologies.

2. With this Report and Order, we adopt limited changes to the rules governing Priority Access Licenses (PALs) that will be issued in the 3.5 GHz band—including larger license areas, longer license terms, renewability, and performance requirements—as well as changes to the competitive bidding rules for the issuance of PALs and to the ability to partition and disaggregate areas within PALs.[4] These changes are consistent with the rules that helped foster the development of 4G and LTE services in the United States, and we anticipate that adopting similar rules in this band will help promote additional investment in the next generation of wireless services. We also adopt changes to the technical rules to facilitate transmissions over wider bandwidth channels without significant power reduction and changes to the information security requirements to better safeguard commercially sensitive information and protect critical infrastructure. We anticipate that the targeted changes described herein will spur additional investment and broader deployment in the band, promote robust and efficient spectrum use, and help ensure the rapid deployment of advanced wireless technologies—including 5G—in the United States.

## II. BACKGROUND

3. In 2015, the Commission adopted rules for shared commercial use of the 3.5 GHz band.[5] It created a three-tiered access and authorization framework to coordinate shared federal and non-federal use of the band. Incumbents comprise the first tier (Incumbent Access) and receive protection from all other users, followed by PALs, the second tier (Priority Access), and General Authorized Access (GAA), the third tier.[6] Over half of the band—a minimum of 80 megahertz—is reserved for GAA use.[7] PALs receive protection from GAA operations but must protect and accept interference from Incumbent Access

[2] *See, e.g.*, David Abecassis et al., Analysys Mason, *Global Race to 5G – Spectrum and Infrastructure Plans and Priorities*, Apr. 2018, 1-3 (*Analysys Mason April 2018 Report*) (examining developments in Canada, China, France, Germany, Japan, Russia, Singapore, South Korea, and the United Kingdom, and noting that there was a significant market shift in 5G readiness in 2017 and early 2018); GSM Association Reply, GN Docket No. 12-354 et al., at 1-3 (filed Aug. 8, 2017) (detailing international initiatives to make spectrum in the 3 GHz band available for 5G in Australia, China, Japan, Singapore, the United Kingdom, Ireland, Italy, and Germany).

[3] *See* 3rd Generation Partnership Project (3GPP) TR 36.744 v14.0.0, *Citizens Broadband Radio Service (CBRS) 3.5 GHz band for LTE in the United States (Release 14)*; *see also Analysys Mason April 2018 Report*, sec. 3.3 (discussing 5G specification phases).

[4] *See generally Promoting Investment in the 3500-3700 MHz Band et al.*, GN Docket No. 17-258 et al., Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8071 (2017) (*2017 NPRM* and *Termination Order*, respectively).

[5] *See generally 2015 Report and Order*, 30 FCC Rcd 3959.

[6] Incumbent users include federal radiolocation users, Fixed Satellite Service (FSS) earth stations, and, for a finite period, certain grandfathered terrestrial wireless licensees in the 3650-3700 MHz band. *See 2015 Report and Order*, 30 FCC Rcd at 3964-3967, paras. 15-22 (detailing incumbent use of the band); *id.* at 4075-4080, paras. 400-412 (adopting protections for grandfathered terrestrial wireless operations for five years or until the end of the license term, whichever is longer). The Commission coordinated with the National Telecommunications and Information Administration (NTIA) on protections for Department of Defense (DoD) radar systems. Non-federal incumbents must register the parameters of their operations with the Commission and/or an SAS to receive interference protection. *See* 47 CFR §§ 96.15, 96.17, 96.21.

[7] *See 2015 Report and Order*, 30 FCC Rcd at 3962, para. 4; *id.* at 3981, para. 64.

tier users.[8] GAA is licensed-by-rule and must avoid causing harmful interference to higher tier users and accept interference from all other users, including other GAA users.[9] GAA users can operate throughout the entire 150 megahertz of the 3.5 GHz band on any frequencies not in use by PALs.[10] Automated frequency coordinators, known as Spectrum Access Systems (SASs), will coordinate operations between and among users in different access tiers. The Commission adopted service and technical rules governing the 3.5 GHz band as the new Part 96 of its rules.[11]

4. In June 2017, CTIA and T-Mobile filed petitions for rulemaking, which asked the Commission to reexamine several of the Part 96 rules related to PALs.[12] CTIA proposed several changes to the PAL licensing rules, including much larger license areas, longer license terms, and renewability.[13] T-Mobile supported CTIA's proposals and made additional proposals, including changes to the amount of spectrum available for PALs and to the technical rules governing the 3.5 GHz band. Both petitioners argued that these requested changes were necessary to promote additional investment to facilitate 5G network deployment in the band.[14] On June 22, 2017, the Wireless Telecommunications Bureau and Office of Engineering and Technology sought comment on the Petitions and on related issues raised in *ex parte* communications, and they received comments and reply comments from more than 120 parties.[15]

5. On October 24, 2017, the Commission issued a Notice of Proposed Rulemaking seeking comment on potential changes to the PAL rules, including significantly larger geographic license areas, longer license terms, PAL renewability, and changes to the way in which PALs are assigned and auctioned.[16] The Commission also sought comment on relaxing the emissions limits for Citizens Broadband Radio Service Devices (CBSDs) and/or End User Devices to allow operation over wider bandwidths without power reduction.[17] The Commission simultaneously adopted an Order Terminating the Petitions, in which it declined to seek comment on discrete proposals from T-Mobile's Petition that would have fundamentally altered the sharing framework of the band, including its proposal to

[8] *See 2015 Report and Order*, 30 FCC Rcd at 3962, para. 4. PALs will be assigned in up to 70 megahertz of the 3550-3650 MHz portion of the band. *See id.* at 3982, para. 67 (reserving 70 megahertz—i.e., seven ten megahertz channels—for PALs in a given license area).

[9] *See id.* at 4009, para. 155.

[10] *See id.* at 3981, para. 64. GAA users may use only certified, Commission-approved devices and must register with the SAS. *Id.* at 4012, para. 162.

[11] *See* 47 CFR, Part 96. While the Commission adopted a complete set of rules and policies for commercial use of the 3.5 GHz band in the *2015 Report and Order*, it also determined that a few focused issues required further record development, and simultaneously released the *2015 FNPRM.* The Commission resolved these issues in its *2016 Report and Order*. At the same time, the Commission addressed multiple petitions for reconsideration of the *2015 Report and Order* in a simultaneously released *Order on Reconsideration. See generally Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Order on Reconsideration and Second Report and Order, 31 FCC Rcd 5011 (2016) (*2016 Order on Reconsideration* and *2016 Report and Order*, respectively).

[12] Petition of CTIA for Rulemaking to Amend the Commission's Rule Regarding the Citizens Broadband Radio Service in the 3550-3700 MHz Band, GN Docket No. 12-354, at 4 (filed June 16, 2017) (CTIA Petition); Petition of T-Mobile USA, Inc. for Rulemaking to Maximize Deployment of 5G Technologies in the Citizens Broadband Radio Service, GN Docket No. 12-354 (filed June 19, 2017) (T-Mobile Petition) (together, the Petitions).

[13] *See* CTIA Petition at 3-10.

[14] *See id.* at 3-6; T-Mobile Petition at 5-9.

[15] *Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on Petitions for Rulemaking Regarding the Citizens Broadband Radio Service*, GN Docket No. 12-354, RM-11788, RM-11789, Public Notice, 32 FCC Rcd 5055 (WTB/OET 2017).

[16] *See generally 2017 NPRM*, 32 FCC Rcd 8071.

[17] *See id.* at 8090-8092, paras. 54-58.

reapportion the amount of spectrum available for GAA versus PAL use and designating the entire band for PAL use.[18] The Commission reiterated that "the current apportionment of the band continues to be in the public interest because it provides a stable sharing mechanism between PAL and GAA and ensures that GAA has a certain level of guaranteed access to the band to provide a wide range of services."[19]

6. We received nearly 200 comments and 40 reply comments in response to the *2017 NPRM*, including from mobile wireless service providers, Wireless Internet Service Providers (WISPs) and other fixed wireless service providers, cable providers, Internet of Things (IoT) providers, energy and utility associations, and consumer groups.[20] Many of these stakeholders have been engaged in ongoing *ex parte* meetings and filings since the comment cycle closed. These meetings and filings have largely focused on the size of the geographic license area, but our approach to that issue also affects our analysis of the other PAL rule changes. We have considered carefully input from the various stakeholders to inform our assessment of an approach that we believe strikes an improved balance among the different use cases for the band.

## III. DISCUSSION

7. In reassessing the rules governing the Priority Access tier of the 3.5 GHz band, we considered—and balanced—a variety of different policy objectives and statutory requirements to determine what, if any, changes to the rules would advance the public interest. Notably, Section 309(j) of the Communications Act asks us to weigh a number of statutory objectives advancing competition, diversity, and the avoidance of excessive concentration of licenses.[21] In doing so, the Commission must "decide how much precedence particular policies will be granted when several are implicated in a single decision."[22] Bearing this in mind, we find that the public interest will be advanced by the totality of the decisions we make today, namely: increasing the size of the PAL license area to counties; extending the license term to 10 years and providing opportunity for renewal; adopting performance requirements for PALs; allowing PALs to be partitioned and disaggregated on the secondary market; eliminating the "N-1" approach for offering PALs at auction and adopting bidding credits for small and rural entities; safeguarding sensitive CBSD registration data; and ensuring that our emissions mask for End User Devices supports operations over wider bandwidths.[23] As such, we revise the rules governing PALs to more effectively promote competition and ensure the development and rapid deployment of new technologies to consumers, including to those in rural areas,[24] disseminate licenses among a wide variety of applicants,[25] and encourage efficient and intensive use of the spectrum.[26] We anticipate that these

[18] *Termination Order*, 32 FCC Rcd at 8092-95, paras. 59-62. First, the *Termination Order* denied T-Mobile's Petition with respect to T-Mobile's request to allow PAL use in the entire 150 megahertz of the 3.5 GHz band and eliminate the maximum of 70 megahertz reserved for PAL use in any given license area. *Id.* at 8092-93, para. 60. Second, the *Termination Order* denied the Petition with respect to T-Mobile's request that the Commission raise the power limits for CBSDs. *Id.* at 8093-94, para. 61.

[19] *Id.* at 8093, para. 60.

[20] For the list of commenters, *see* Appendix C.

[21] 47 U.S.C. § 309(j); *see Fresno Mobile Radio v. FCC*, 165 F.3d 965, 971 (D.C. Cir. 1999); *Rural Cellular Association v. FCC*, 588 F.3d 1095, 1103 (D. C. Cir. 2009).

[22] *Melcher v. FCC*, 134 F.3d 1143, 1154 (D.C. Cir. 1998) (internal quotations omitted).

[23] For example, investment in a mobile 5G use case may be better supported with larger, county-sized licenses, ten-year license terms, and renewability, whereas investment in a fixed use case may be better supported with licenses that are smaller than the PEAs proposed by petitioners, allowances for partitioning and disaggregating county-sized licenses into smaller areas, and bidding credits for small and rural entities.

[24] 47 U.S.C. § 309(j)(3)(A).

[25] *Id.* § 309(j)(3)(B).

changes, taken as a whole, will facilitate more robust investment and broader deployment in the band by a wider array of users than we could have anticipated under the rules adopted in 2015.

8. Our findings are reinforced by the changes that have occurred both in the United States and abroad since the Commission's 2015 Order. Since then, there has been increased demand for mid-band spectrum—and the 3.5 GHz band in particular—both here and globally for next generation flexible wireless deployments, including 5G.[27] Like other nations,[28] the Commission itself has made mid-band spectrum a top priority, including by recently proposing rules for the 3.7-4.2 GHz band[29] and the 2.5 GHz band,[30] and it has become clear that these bands will play a key role in future mobile networks, including 5G.[31] Recognizing that 5G uses will require a combination of low-, mid-, and high-band spectrum, the Commission has likewise finalized rules for the 28 GHz band, with an auction scheduled to begin in November 2018,[32] and made further inroads toward making the 37, 39, and 47 GHz bands available for

(Continued from previous page)

[26] *Id.* § 309(j)(3)(D).

[27] *See, e.g.*, Mobile Future Reply at 2-3 (stating that "mid-band spectrum like the 3.5 GHz band is particularly well-suited for next-generation wireless services" due to its favorable propagation characteristics and wider channel bandwidth, which provide a "unique combination of capacity and coverage that is expected to enable robust network deployments," and that "because the 3.5 GHz band is contiguous to other 5G bands, the potential of combining PALs with the nearby 3.7 to 4.2 GHz band for mobile services may permit limitless opportunities for manufacturers and wireless providers, to the benefit of American consumers." (internal quotations omitted)); Verizon Reply at 5 (arguing that the 3.5 GHz band is at the core of industry 5G deployment plans as the only large swath of mid-band spectrum available); Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-2 & Attach. (David Abecassis et al., Analysys Mason, *Mid-band spectrum geographical licensing approaches*, July 2018) (filed July 9, 2018) (CTIA July 9, 2018 *Ex Parte* and *Analysys Mason July 2018 Report*, respectively) (examining geographical licensing approaches to mid-band spectrum in 12 other countries); Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed Apr. 17, 2018) (CTIA Apr. 17, 2018 *Ex Parte*) (arguing that, based on a recent study, China is leading in 5G-readiness (citing attachment *Analysys Mason April 2018 Report*)); *see also* Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Oct. 12, 2018) (CTIA Oct. 12, 2018 *Ex Parte*) (arguing that the Report and Order's reforms will "better align the licensing framework for this band with international developments and will facilitate both targeted use cases and wide-area networks for the provisioning of 5G").

[28] *See* CTIA July 9, 2018 *Ex Parte* at 1-2 & Attach. (*Analysys Mason July 2018 Report*); *Analysys Mason April 2018 Report* at 5, 12, 17-18 (attached to CTIA Apr. 17, 2018 *Ex Parte*).

[29] *See Expanding Flexible Use of the 3.7 to 4.2 GHz Band et al.*, GN Docket No. 18-122 et al., Order and Notice of Proposed Rulemaking, FCC 18-91, 2018 WL 3435167 (rel. Jul. 13, 2018) (*3.7-4.2 GHz NPRM*).

[30] *See Transforming the 2.5 GHz Band et al.*, WT Docket No. 18-120 et al., Notice of Proposed Rulemaking, FCC 18-59 (rel. May 10, 2018).

[31] *See, e.g.*, Letter from Steve B. Sharkey, Vice President, Government Affairs, Technology and Engineering Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 4 (filed Apr. 23, 2018) (T-Mobile Apr. 23, 2018 *Ex Parte*) (arguing that both the 3.5 GHz band and the 3.7-4.2 GHz band will be important for 5G operations); Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Oct. 17, 2018) (noting that "mid-band spectrum such as the 3.5 GHz band is a key building block for 5G"); Letter from W. Allen Gillum, CEO, East Kentucky Network, LCC d/b/a Appalachian Wireless et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed Oct. 12, 2018) (Non-Nationwide Carrier CEOs *Ex Parte*) (arguing that it is "vital that policymakers continue to focus on freeing up spectrum at low-, mid-, and high-band frequencies to ensure carriers have an adequate portfolio for deployment").

[32] *See Auctions of Upper Microwave Flexible Use Licenses for Next-Generation Wireless Services; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auctions 101 (28 GHz) and 102 (24 GHz)*, AU Docket No. 18-85, Public Notice, FCC 18-109 (rel. Aug. 3, 2018).

mobile use.[33] Additionally, in 2015, the Commission assumed the 3.5 GHz band would be focused on small cell deployments and LTE technology.[34] We continue to believe that these technologies and network deployment strategies will be an important part of the wireless ecosystem in the 3.5 GHz band, and we acknowledge the significant investments that have been made in these technologies by a wide variety of potential licensees.[35] However, the revised rules are designed to increase flexibility so that licensees can efficiently deploy these next generation 5G networks in addition to—not in lieu of—the technologies that the Commission contemplated in 2015. Our actions herein will promote investment in next generation networks, support a greater variety of technologies and uses cases, and facilitate international spectrum harmonization. We expect that these rules changes will increase the benefit society derives from this spectrum band while also reducing the operating costs incurred by license holders.

## A. PAL Licensing Rules

### 1. Geographic Licensing Area

#### a. Background

9. In the *2015 Report and Order*, the Commission defined the geographic license area for each PAL as one census tract.[36] In their 2017 Petitions, CTIA and T-Mobile urged the Commission to increase the size from census tracts to PEAs to simplify the licensing scheme, reduce spectrum management complexities, and mitigate interference risks at border areas.[37] Petitioners argued that PEAs would be flexible enough to enable targeted network deployments, while reducing interference risks and administrative burdens for the Commission, SASs, and licensees.[38] In the *2017 NPRM*, the Commission proposed to increase the geographic license area to "stimulate additional investment, promote innovation, and encourage efficient use of spectrum resources."[39] The Commission sought comment on petitioners' specific request to increase the license size to PEAs, asking whether the larger size and the ability to combine and partition licenses would strike the right balance between supporting targeted deployments and incentivizing additional investment in the band.[40] Noting concerns in the record about whether PEAs would incent diverse auction participants, differing technologies, and rural deployments, the Commission also sought comment on alternative or hybrid approaches, such as licensing PEAs in urban areas and census tracts in rural areas, or offering PALs of different sizes in each market.[41] Among other questions, the Commission asked how increasing the size of the PAL license area would affect investment in PALs and diversity of PAL uses and users.[42] The Commission also sought comment on how changes to the license area could affect auction complexity.[43] We received a diverse record in response to our proposal to increase the size of the PAL licensing area, and the record has continued to evolve since close of the

[33] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Fourth Further Notice of Proposed Rulemaking, FCC 18-110 (rel. Aug. 3, 2018).

[34] *See, e.g.*, *2015 Report and Order*, 30 FCC Rcd at 3992-93, para. 100.

[35] *See infra* Section III.A.1.b (discussing investment in the 3.5 GHz band).

[36] *2015 Report and Order*, 30 FCC Rcd at 3991, para. 96; *see* 47 CFR § 96.3.

[37] *See* CTIA Petition at 9-11; T-Mobile Petition at 16-18.

[38] *See* CTIA Petition at 10; T-Mobile Petition at 16-17.

[39] *2017 NPRM*, 32 FCC Rcd at 8080, para. 23.

[40] *Id.* at 8080, para. 24.

[41] *Id.* at 8081, para. 25.

[42] *Id.* at 8080, para. 24.

[43] *Id.* at 8081, para. 26.

comment cycle, as interested stakeholders worked to refine their proposals and put forth compromise and alternative solutions.[44]

10. *PEAs.* There are 416 PEAs nationwide (as compared to 74,000 census tracts, roughly 3,200 counties, and 734 Cellular Market Areas (CMAs)).[45] AT&T, CTIA, Mobile Future, TIA, T-Mobile, USCC, and Verizon support increasing the PAL license area significantly, from census tracts to PEAs, as a way to simplify the auction process, reduce interference risks and coordination complications at border areas, and encourage investment by all providers.[46] Some of these commenters came to support a hybrid proposal put forward by CTIA and the Competitive Carriers Association (CCA), pursuant to which PALs would be licensed using a combination of CMAs (which are smaller than PEAs) and counties.[47] Other commenters like Baicells, DSA, WISPA, and Vivint contend that PEAs would be too large and expensive for all but the largest nationwide wireless providers.[48]

11. *Census Tracts.* Nationwide, there are roughly 74,000 census tracts. Commenters including DSA, GE, Google, Microsoft, Ruckus, Southern Linc, Starry, OTI/PK, WISPA,[49] and many individual WISPs[50] argue that the Commission should retain census tracts as the geographic licensing unit for PALs. They argue that using census tracts would increase the likelihood of localized services

[44] Some parties made multiple filings with different proposals related to PAL license area size during and after the comment period. For consistency, all comments and other filings are referred to in the present tense.

[45] *See 2017 NPRM*, 32 FCC Rcd at 8080, para. 24 (noting that like census tracts, counties nest into PEAs, which nest into Economic Areas (EAs)). The 734 CMAs are divided into 306 Metropolitan Statistical Areas (MSAs) and 428 Rural Service Areas (RSAs). *See Common Carrier Public Mobile Services Information; Cellular MSA/RSA Markets and Counties*, Public Notice, 6 FCC Rcd 742 (CCB 1992) (*MSA/RSA Public Notice*).

[46] *See, e.g.*, AT&T Comments at 5-7; CTIA Comments at 9; CTIA Reply at 14-17; CTIA Reply at 16 & Attach. A at 10 (quoting Professor Michelle Connolly's economic analysis that the optimal market size for a PAL is likely much closer to the size of a PEA than a census tract); Mobile Future Comments at 7-9; T-Mobile Comments at 9-11; T-Mobile Reply at 18-31; TIA Comments at 3; USCC Comments at 4-6; Verizon Comments at 8-9; *see also* R Street Reply at 8.

[47] CMAs are divided into 306 Metropolitan Statistical Areas (MSAs) and 428 Rural Service Areas (RSAs).

[48] *See, e.g.*, Bernhardt Comments at 1, 2; Baicells Comments at 4; DSA Comments at 5; DSA Reply at 11; Google Reply at 4; Vivint Comments at 4.

[49] *See, e.g.*, ATN Comments at 3-7; Baicells Comments at 3-4; Bernhardt Comments at 1, 2; Cambium Comments at 4-5; Cantor Comments at 7-9; CenturyLink Reply at 2-3; City of LA Reply at 4; City of NY Comments at 2-3; DSA Comments at 12-15; EWA Comments at 4-5; GE Comments at 1, 17-18; Google Comments at 5-7; Microsoft Comments at 5; NCC Comments at 5; OTI/PK Comments at 19; Port of LA Comments at 2; Rajant Comments at 2; Ruckus Comments at 4; Select Comments at 1; Southern Linc Comments at 13; Starry Comments at 4; Telrad Reply at 2; Texas Carriers Comments at 5; Union Pacific Comments at 8; UTC Comments at 4-5; Vivint Comments at 5; William Lehr Comments at 11; WISPA Comments at 24-26.

[50] More than 130 individual WISPs filed comments, the majority of which express their support for census tracts and opposition to PEAs. *See, e.g.*, Aeronet Wireless Comments at 1; BDA Wireless Comments at 2-5; Cal.net Comments at 2-5; Cloud Alliance Comments at 2; EBTX Wireless Comments at 2-4; e-vergent Comments at 2-4; Fourway Comments at 1; GigaBeam Networks Comments at 2; Hexis Comments at 1-2; HighSpeedLink.net Comments at 6-10; InfoWest Comments at 2; MVC Comments at 1; NWNC Comments at 2-4; Rapid Systems Comments at 1; Rise Broadband Comments at 2; Vertical Broadband Comments at 4-5; Wonderlink Comments at 1-2, apps. A-D. In July 2018, 182 WISPs collectively reiterated support for census tract licensing in the wake of various compromise proposals, arguing in the alternative that, should the Commission change its rules, it should maintain census tract licensing for at least two PAL channels in rural areas. *See* Letter from Galen Manners, President, Wave Wireless, LLC et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-2 (filed July 23, 2018) (Joint WISP Letter).

reaching rural and underserved areas,[51] and open up PAL auctions to a wider variety of potential users and uses.[52] WISPA, GE, and several commenters supportive of census tracts also support, in the alternative, a hybrid approach of licensing both county- and census tract-sized PALs in both urban and rural areas, discussed below. Some individual WISPs, however, continue to argue for solely census tract licensing.[53]

12. *Counties.* Charter, Comcast, and NCTA support using county-sized PALs as a compromise between census tracts and PEAs,[54] as do Midcontinent Communications (Midco) and GeoLinks.[55] They argue that counties strike a balance between enabling efficient deployment of services and remaining small enough to ensure economic viability for a variety of businesses and technical plans.[56] Charter, Cox, and NCTA alternatively support a compromise proposal using both CMAs and counties for PAL licensing, but disagree with CTIA and CCA as to whether counties or CMAs should be used in the largest metropolitan areas.[57] Some commenters, like CenturyLink, Frontier, and WISPA, maintain that counties are still too large for rural America and for targeted use cases.[58]

13. *Hybrid approaches.* Some commenters suggest that we rely on a hybrid approach and to adopt multiple, different-sized PAL license areas. For example, several commenters support licensing smaller-sized PALs in rural areas and larger-sized PALs in urban areas.[59] Alternatively, other commenters argue in favor of employing different-sized license areas for different spectrum blocks within the 3.5 GHz band—i.e., approaches where some PALs would cover a larger geographic area, while others would be licensed using smaller areas within the larger geographic area. Blooston, for example, asks us to use census tracts for two of the seven available PALs (i.e., 20 megahertz) and counties for the

[51] *See, e.g.*, ATN Comments at 3-4; CenturyLink Reply at 2-3; DSA Comments at 13-15; DSA Reply at 12; Google Comments at 7; NCC Comments at 6; OTI/PK Comments at 21-22; OTI/PK Reply at 5, 17-18; Peoples Comments at 2; WISPA Comments at 26.

[52] *See, e.g.*, GE Comments at 17; GE Reply at 20-21; Google Comments at 7, 8-9; Google Reply at 10; OTI/PK Reply at 10; Port of LA Reply at 2; WISPA Comments at 26.

[53] *See, e.g.*, Letter from Laurence Brett Glass, d/b/a LARIAT, to Marlene Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-2 (filed July 23, 2018).

[54] *See* Charter Comments at 1-4; Comcast Comments at 5-7; Comcast Reply at 3-4; NCTA Comments at 4-6.

[55] *See* Letter from Nicole Tupman, Corporate Counsel, Midcontinent Communications, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 2 (filed Aug. 29, 2018) (Midco Aug. 29, 2018 *Ex Parte*); GeoLinks Reply at 2.

[56] *See, e.g.*, Comcast Comments at 5; NCTA Comments at 4.

[57] *See infra* note 66 and accompanying text (discussing compromise proposals); *see also* Letter from Elizabeth Andrion, Senior Vice President, Regulatory Affairs, Charter, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Apr. 20, 2018) (Charter Apr. 20, 2018 *Ex Parte*); Letter from Danielle J. Piñeres, Vice President and Associate General Counsel, NCTA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-2 (filed Apr. 25, 2018) (NCTA Apr. 25, 2018 *Ex Parte*).

[58] *See, e.g.*, Letter from John E. (Jeb) Benedict, Vice President – Federal Regulatory Affairs & Regulatory Counsel, CenturyLink, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed June 8, 2018) (CenturyLink June 8, 2018 *Ex Parte*); Frontier Comments at 9-10; WISPA Comments at 28; CenturyLink Reply at 3-4.

[59] *See, e.g.*, Frontier Comments at 6, 7 (arguing that, even if the Commission adopts a larger license size for urban areas, it should retain a smaller license size for rural areas); R Street Reply at 6-7 (proposing the use of PEAs for PALs in urban and suburban areas, and census tracts in rural areas); Sacred Wind Comments at 6 (encouraging the Commission to license PALs using Metropolitan Statistical Areas (MSAs) in urban areas and census tracts in rural areas); RWA Reply at 5 (supporting Sacred Wind proposal). AT&T, T-Mobile, and Verizon support, as an alternative to PEA licensing, licensing PALs on a PEA basis in urban areas and a county basis in rural areas. *See, e.g.*, AT&T Reply at 7; Letter from Steve B. Sharkey, Vice President, Government Affairs, Technology and Engineering Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 2 (filed Feb. 14, 2018) (T-Mobile Feb. 14, 2018 *Ex Parte*). AT&T, T-Mobile, and Verizon also support, in the context of seeking a compromise approach, the CTIA/CCA Proposal which relies on a hybrid of MSA and county licensing.

remaining five PALs (i.e., 50 megahertz),[60] while Transit and CenturyLink each suggest that we license four PALs (i.e., 40 megahertz) using census tracts and three PALs (i.e., 30 megahertz) using something larger.[61]

14. Since the comment cycle closed, many stakeholders have worked to find a hybrid solution for the size of the PAL license area. These efforts have led to several proposals, involving a variety of different stakeholders from different industry segments. Some parties have signed on to multiple proposals.

15. CTIA and CCA propose that we license PALs by CMA in the top 306 markets (which are known as Metropolitan Statistical Area (MSAs)) and by county in the remaining 428 Rural Service Areas (RSAs).[62] T-Mobile and AT&T support this approach,[63] as do a group of rural carriers,[64] and several U.S. Senators representing rural states.[65] Charter and NCTA offer a variation on the CTIA/CCA proposal, asking us to license the top 30 MSAs—in addition to the 428 RSAs—by county.[66]

16. WISPA, GE, and several other parties representing energy, rural, and IoT interests—which refer to themselves collectively as the CBRS Coalition—oppose the CTIA/CCA proposal, and instead support a hybrid licensing solution in which 20 megahertz of PAL spectrum would always be licensed by census tract nationwide, and the remaining 50 megahertz would be licensed by county nationwide.[67]

---

[60] *See* Blooston Comments at 4, 5-7; *see also* NTCA Comments at 7 (the Commission should license a mix of census tracts and counties); NRTC/NRECA Comments at 6 (suggesting that the Commission use county boundaries for five PALs and census tracts boundaries for two PALs); CenturyLink Reply at 4 (supporting hybrid approach with at least four of the seven PALs in a given geographic area available at the census tract level); NRTC, NRECA, and NTCA Feb. 22, 2018 *Ex Parte*, Attach. at 10 (reiterating support for county boundaries for five PALs and census tracts boundaries for two PALs).

[61] *See* Transit Comments at 2; CenturyLink June 8, 2018 *Ex Parte* at 1-2.

[62] *See* Letter from Rebecca Murphy Thompson, Executive Vice President and General Counsel, CCA, and Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Apr. 20, 2018) (CTIA/CCA Proposal). CMAs are comprised of 306 MSAs and 428 RSAs.

[63] *See* Letter from Steve B. Sharkey, Vice President, Government Affairs, Technology and Engineering Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 1-2 (filed June 1, 2018); Letter from Stacey G. Black, Assistant Vice President, Federal Regulatory – Spectrum, AT&T, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 5 (filed Apr. 26, 2018) (AT&T Apr. 26, 2018 *Ex Parte*) ("AT&T believes, instead, that the compromise proposal recently advanced by [CCA] and CTIA better balances rational network investment with the need to promote licensing among a variety of stakeholders.").

[64] Letter from Kirby J. Underberg, General Manager, Missouri RSA No. 5 Partnership d/b/a Chariton Valley, et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-3 (filed May 29, 2018) (Rural Carriers *Ex Parte*).

[65] Senators Steve Daines, John Barrasso, and Dan Sullivan—of Montana, Wyoming, and Alaska, respectively—argue that use of MSAs and counties for licensing PALs "is a path forward to balance the needs of highly populated areas with those of our rural communities." Letter from Hons. Steve Daines, John Barrasso, M.D., and Dan Sullivan, U.S. Senate, to Chairman Pai et al., FCC, at 1 (Apr. 16, 2018) (Rural Senators Letter).

[66] *See* Charter Apr. 20, 2018 *Ex Parte* at 1.

[67] Letter from Barry J. Ohlson, Vice President, Regulatory Affairs, Cox Enterprises et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-2 (filed May 9, 2018) (CBRS Coalition *Ex Parte*). The CBRS Coalition includes Cox; EEI; EWA; Exelon Corp.; FedEx Corporate Services, Inc.; Frontier; GE; Motorola, Inc.; NRECA; NRTC; NTCA; pdvWireless, Inc.; Port of LA; RWA; Southern Linc; Transit; Union Pacific; UTC; Windstream; and WISPA. *See also* Stephen E. Coran, Lerman Senter PLLC, Counsel for WISPA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 2 (filed Oct. 17, 2018) (WISPA Oct. 17, 2018 *Ex Parte*); Letter from Laurence Brett Glass, d/b/a LARIAT, to Marlene [H.] Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 1-2 (filed Oct. 10, 2018); Letter from Access Humboldt et al., to Hon. Ajit Pai, Chairman, FCC, GN Docket

17. A group of stakeholders, including members of the CBRS Coalition, and other parties, including Charter, Google, and NCTA, present a variation on the CBRS Coalition's proposal.[68] They ask us to license two PALs by census tract nationwide, but recommend that the remaining five PALs be licensed on a county basis in MSAs 1-30, on an MSA basis in MSAs 31-306, and on a county basis in the 428 remaining RSAs.

18. OTI, Public Knowledge, Consumers Union, and the National Hispanic Media Coalition, among others—which refer to themselves collectively as The Public Interest Spectrum Coalition—oppose the various compromise proposals in favor of maintaining census tract-based licensing in all markets. In the alternative, they argue that the Commission should maintain at least four census tract PALs nationwide and should not issue any PALs with license areas larger than a county.[69]

**b. Discussion**

19. In the *2017 NPRM*, the Commission proposed to increase the size of the geographic license area for PALs to stimulate additional investment, promote innovation, and encourage efficient use of spectrum resources.[70] After review of the extensive record on this issue and in light of the changed circumstances since the Commission adopted its 2015 rules, we find that increasing the size of the PAL license area to counties will better serve the public interest.[71]

20. In 2015, the Commission determined that larger license areas were inconsistent with its desire to promote innovative, low power uses in the band, such as small cells, which align well with small, targeted geographic areas, and that census tracts would permit intensive use of the band and support a variety of use cases.[72] We reassess these determinations today in the wake of the changed technological landscape, with efforts here and abroad to prioritize mid-band spectrum as part of the spectrum portfolio that will support next generation wireless networks, including 5G. While the decision to use census tracts may well support the deployment of targeted use cases—particularly fixed uses—as discussed below, the record shows that census tracts could disadvantage flexible mobile use, including 5G, and other wide-area network deployments, which in turn would decrease investment in the band. Increasing the PAL license area slightly from census tracts to counties strikes a more appropriate balance and will more effectively support next generation mobile network deployments, while still retaining the ability to support small, targeted uses, included fixed uses. In contrast, we find that increasing the PAL

(Continued from previous page)
No. 17-258; at 2 (filed Oct. 11, 2018) (Access Humboldt et al. *Ex Parte*) (each arguing for some PALs to be licensed at the census tract level).

[68] Letter from Marissa Mitrovich, Vice President, Federal Legislative Affairs, Frontier et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 3-4 (filed June 8, 2018) (Multi-Stakeholder June 8, 2018 *Ex Parte*). This iteration is supported by Charter, Cox, EEI, EWA, Exelon, Fed Ex, Frontier, GE, Google, Motorola, NRECA, NRTC, NCTA, pdvWireless, Port of LA, Ruckus, RWA, Southern Linc, Transit, Union Pacific, UTC, Windstream, and WISPA.

[69] Letter from OTI et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1-6 (filed May 30, 2018) (PISC May 30, 2018 *Ex Parte*). The Public Interest Spectrum Coalition stresses that the Commission should preserve the current allocation of 80 megahertz for GAA use and 70 megahertz for PAL use. *PISC Letter* at 2-3; Letter from Michael Calabrese, Director, Wireless Future Project, OTI et al., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed June 13, 2018) (PISC June 13, 2018 *Ex Parte*); *see also* Letter from David D. Rines, Lerman Senter PLLC, Counsel for Southern Linc, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-248, at 1-2 (filed Sept. 13, 2018) (arguing that the Commission should retain at least some census tract-based PALs in every market); Letter from Phillip Berenbroick, Senior Policy Counsel, Public Knowledge, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 1-2 (filed Oct. 15, 2018) (PISC Oct. 15, 2018 *Ex Parte*).

[70] *2017 NPRM*, 32 FCC Rcd at 8080, para. 23.

[71] For the 3.5 GHz band, counties will be defined using the United States Census Bureau's data reflecting county legal boundaries and names valid through January 1, 2017. *See* Appendix A, Final Rules.

[72] *See 2015 Report and Order*, 30 FCC Rcd at 3992-93, para. 100-101.

license area size further (i.e., from 3,200 counties to 416 PEAs) could disproportionately favor mobile use cases and hinder investment in innovative fixed networks and localized deployments. As many commenters note, the 3.5 GHz band will be the first mid-band spectrum suited for 5G uses that will be made available domestically,[73] and, the band will play a key role as part of the low-, mid-, and high-band spectrum toolkit for 5G uses.[74] While census tracts seemed like an appropriate "middle ground" in 2015,[75] we find that, since that time, the balance has shifted.

21. *First*, as stated above, given the increasing importance of mid-band spectrum for 5G—and the importance of maximizing auction participation to ensure this band is put to its highest and best use—we believe it is important for the size of PAL license areas not to preclude a mobile 5G use case. As discussed below, the record in this proceeding now demonstrates that retaining census tracts as the size of the PAL license areas would cause significant difficulties in deployment of large-scale networks for mobile 5G use. In light of this, we find it necessary to reassess the Commission's decision in the *2015 Report and Order* that census tract-sized PALs were large enough to support a variety of use cases.[76] After reviewing the record, we find that increasing the size of PAL license areas to counties is more likely to ensure that mobile 5G deployments are feasible in the 3.5 GHz band.

22. We agree with arguments that licensing PALs using census tracts could raise "insurmountable technical issues" in urban areas.[77] Commenters stress that the number of PALs under a census tract regime—and the number of license borders in particular—will cause unnecessarily challenging border coordination issues and create network deployment complexities.[78] In New York City,

[73] *See, e.g.*, CTIA July 9, 2018 *Ex Parte* at 1 ("In the United States, the 3.5 GHz band is the mid-band spectrum that will become available in the near term."); T-Mobile Comments at 3 ("[A]s the only mid-band spectrum now available for 5G in the U.S., the 3.5 GHz band is critically important to the introduction of 5G technologies."); Verizon Reply at 5 ("The 3.5 GHz band is at the core of industry plans for 5G deployments, offering the only large swath of spectrum currently available in the mid-band range.").

[74] *See, e.g.*, Verizon Comments at 9 ("[T]he Commission and the industry have integrated the 3.5 GHz band into plans for larger, multi-band, 5G deployments.").

[75] *See 2015 Report and Order*, 30 FCC Rcd at 3991-3993, paras. 97-101 (finding census tracts to be a middle ground between even smaller units, like census block groups, and larger units, like EAs or CMAs).

[76] *See id.* at 3993, para. 101.

[77] *See* Letter from Steve B. Sharkey, Vice President, Government Affairs, Technology and Engineering Policy, and John Hunter, Senior Director, Government Affairs, Technology and Engineering Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed Apr. 25, 2018) (T-Mobile Apr. 25, 2018 *Ex Parte*); Letter from Steve B. Sharkey, Vice President, Government Affairs, Technology and Engineering Policy, T-Mobile, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 3-4 (filed Oct. 16, 2018) (T-Mobile Oct. 16, 2018 *Ex Parte*); *see also* Non-Nationwide Carrier CEOs *Ex Parte* at 2 (arguing that it is critical that the Commission "adopt geographic license sizes that adequately balance the need to protect against technological interference while providing for robust participation in a spectrum auction" and supporting the use of counties to "reduce spectrum management complexities, and mitigate interference risks at border areas" (internal quotations omitted)).

[78] *See* Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-158, at 4-5 (filed June 15, 2018) (CTIA June 15, 2018 *Ex Parte*) (arguing that census tracts would create significant administrative complexity); Verizon Reply at 7; T-Mobile Apr. 25 *Ex Parte* at 2-6; AT&T Apr. 26 *Ex Parte* at 5 (discussing "boundary problems that would arise in over 56,500 Census Tracts in the top 306 CMAs"). As R Street writes: "A first problem with census tract PALs is their sheer number. This attribute increases the complexity and transaction costs associated with auctioning small PALs, relative to larger areas. More importantly, licensing PALs based on census tracts creates many more boundaries at which harmful interference becomes a concern. Operators in these license areas will either reduce their power levels to avoid crossing the border of their license area or risk harmful interference with a neighbor. Either outcome reduces the productivity of the 3.5 GHz band. While these sorts of boundary issues would still exist with larger license areas, they are multiplied by the more numerous borders that census tract PAL license areas necessitate." R Street Reply at 7-8 (footnotes omitted).

for example, there are 2,168 census tracts, spanning an average of less than one-sixth of a square mile.[79] This appears to be far smaller than the area necessary for a single CBSD to operate in its coverage area on at least 20 megahertz of PAL spectrum. AT&T's modeling, for example, shows that its small cells at 47 dBm/10 megahertz "would need to be 2–4 km [approximately 1.2-2.5 miles] from the market area boundaries to comply with [PAL Protection Area] requirements."[80] AT&T similarly argues that there are "engineering and cost challenges" to using census tracts, and stresses that, in order to cover the border areas of census tracts, Priority Access Licensees will need to "severely limit their power and deploy many more CBSDs than what may be actually needed."[81] AT&T and CommScope have submitted a study that "demonstrates that the small license areas will create significant deployment issues" due to "near-border impacts" that require power reduction.[82] T-Mobile argues that TDD-LTE technology requires coordination among co-channel and adjacent channel systems at the border, and that synchronization of uplink and downlink operations with neighbors "would be almost impossible to implement" in census tracts in large urban areas.[83]

23. Further, as T-Mobile explains, the smaller the license area, the more the interference protection requirements will limit a licensee's ability to use its assigned spectrum throughout its service area because "there is a much higher likelihood that when a licensee seeks to deploy a CBSD, there will be a nearby [PAL Protection Area] that requires protection, forcing the licensee to reduce power . . . or take other steps to protect the transmitter deployed in the adjacent geographic area."[84] Verizon argues that licensing PALs by census tract will "add[] tremendous administrative overhead to the process of acquiring PALs and building networks to align with areas where licensees actually want to operate . . . ."[85] In the same vein, commenters also express concern over the cost of designing and deploying networks under a census tract licensing regime.[86] CTIA stresses that such costs would "increase significantly" in a census tract licensing regime, limiting a licensee's ability to deploy CBSDs in an efficient manner,[87] and leading to both spectral and economic inefficiencies.[88] We find this evidence credible that census-tract based licensing risks intractable interference problems at PAL borders, potentially precluding the use of this spectrum for mobile 5G services. WISPA argues that these border interference concerns are overstated, because a licensee can operate within its entire PAL Protection Area (PPA), which may consist of several aggregated PAL licenses areas,[89] and because "the signals from CBSDs whose service

[79] New York City Census FactFinder (NYC CFF) FAQs, https://www1.nyc.gov/assets/planning/download/pdf/data-maps/maps-geography/census-factfinder/cff-faq.pdf (stating that in New York City, census tracts have an average land area of 90 acres); *see also* CTIA June 15, 2018 *Ex Parte* at 4 (noting that New York City has 2,168 separate census tracts); T-Mobile Apr. 25, 2018 *Ex Parte* at 5 (noting that some of the New York CMA census tracts are "as small as a single building"); Verizon Reply at n.14 ("[I]n New York City, each census tract only covers a few city blocks.").

[80] *See* AT&T Apr. 26, 2018 *Ex Parte* at n.6.

[81] *See* Letter from Stacey Black, Assistant Vice President, Federal Regulatory – Spectrum, AT&T, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Apr. 5, 2018) (AT&T Apr. 5, 2018 *Ex Parte*).

[82] AT&T Apr. 5, 2018 *Ex Parte*, Attach. at 1; *see also* T-Mobile Feb. 14, 2018 *Ex Parte*, Attach. at 4-8 (providing data suggesting that, with smaller license areas, RF is difficult to control at the border, and that effects are magnified within dense urban environments like New York City).

[83] *See* T-Mobile Apr. 25, 2018 *Ex Parte* at 2; T-Mobile Oct. 16, 2018 *Ex Parte* at 4.

[84] *See* T-Mobile Apr. 25, 2018 *Ex Parte* at 2; T-Mobile Oct. 16, 2018 *Ex Parte* at 4.

[85] Verizon Reply at 7.

[86] *See, e.g.*, CTIA June 15, 2018 *Ex Parte* at 8.

[87] *Id.*

[88] *Id.*

[89] *See* Letter from Stephen E. Coran, Lerman Senter PLLC, Counsel for WISPA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed Apr. 23, 2018) (WISPA Apr. 23, 2018 *Ex Parte*) ("A fundamental concept

contours form the PPA would be treated as [GAA] outside of the PAL area . . . ."[90] We are unconvinced that these factors fully mitigate the problem. For instance, AT&T and T-Mobile describe scenarios illustrating that there is no guarantee that a licensee will have a common channel assignment in adjacent markets.[91] And with respect to potentially extending a licensee's service contours outside of its license area on a GAA basis, AT&T states that it "cannot make network deployment decisions that are premised on not having to protect adjacent operations because they *might* not be deployed" and "will need to assume that adjacent markets are robustly utilized by PAL (or GAA) licensees to the fullest extent possible."[92]

24. Nor are we persuaded by the argument of the American Petroleum Institute and others that the Commission need not worry about these interference concerns because they will not affect a licensee with "a geographically targeted LTE deployment, such as within a hotel, convention center, or business campus."[93] But that misses the point. If relying on census tracts precludes wide-area use of the 3.5 GHz band (and thus prevents its use for 5G or rural broadband deployments), we would be improperly tipping the scales towards one use case over others rather than allowing a neutral market mechanism—an auction—to ensure that this valuable spectrum is put to its highest and best use.

25. We further find that the requirement that the SAS assign geographically contiguous PALs held by the same Priority Access Licensee to the same channel block in each geographic area does not mitigate these concerns.[94] As AT&T points out, this requirement applies only "to the extent feasible,"[95] and doing so may not be feasible when, for example, multiple licensees want common channels across overlapping aggregate PAL Protection Areas.[96] The smaller the license area, the greater the likelihood of

(Continued from previous page)
of the Part 96 rules is the difference between the area licensed to PALs and the PAL Protection Area ('PPA')."). The PAL Protection Area is defined as "[t]he area within the Priority Access Licensee's default protection contour, as calculated by the SAS in accordance with §96.25 (or smaller, self-reported protection contour). This area will be protected from interference in accordance with §§96.25 and 96.41(d)." 47 CFR § 96.3. The service area is defined as "[o]ne or more contiguous License Areas held by the same Priority Access Licensee." *Id.*

[90] WISPA Apr. 23, 2018 *Ex Parte* at 3; *see id.* at 2-3 ("A second feature differentiating PALs from traditional geographic-area licenses is that there is no obligation to prevent signals from leaving one's PAL area. A PAL area boundary (which, again, may consist of many contiguous PALs) only creates a limit to the size of a PPA, which is formed by the SAS based on calculated -96 dBm signal contours from one or more devices authorized to operate inside the PAL area. If a licensee were to have a [CBSD] operating near the edge of its licensed PAL area, such that the signal contour extended outside of the PAL area, the signals from CBSDs whose service contours form the PPA would be treated as [GAA] outside of the PAL area, and are not protected there. But like any GAA, they are still allowed to extend into another licensee's PAL area, so long as the aggregate signal level does not exceed interference margins within the other PPA (not simply within the other's PAL area).").

[91] *See, e.g.*, AT&T Apr. 26, 2018 *Ex Parte* at 2-5.

[92] *Id.* at 4 (emphasis in original); *see also* Letter from W.A. Gillum, CEO/General Manager, East Kentucky Network, LLC d/b/a Appalachian Wireless, GN Docket No. 17-258, at 1 (filed Oct. 12, 2018) (EKN Oct. 12, 2018 *Ex Parte*) (arguing that an increase in the size of the license area from census tracts to counties "will support network continuity concerns").

[93] Letter from James Crandall, American Petroleum Institute et al., to Marlene [H.] Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed Apr. 25, 2018) (*Joint CBRS Ex Parte*).

[94] *See* 47 CFR § 96.25(b)(1)(i).

[95] *Id.*

[96] *See* AT&T Apr. 26, 2018 *Ex Parte* at 1-2. As a simplified example of where overlapping requests may preclude compliance with the requirement, let *A*, *B*, and *C* be adjacent areas each with two 10 megahertz blocks of 3.5 GHz band spectrum. If *Company 1* has one block in *A* and *B*, *Company 2* has one block in *A* and *C*, and *Company 3* has one block in *B* and *C*, there is no way to assign all three companies contiguous blocks of spectrum in all areas. Although WISPA argues that the limitation of the SAS to assign contiguous channels "to the extent feasible" is based solely on the availability of channels that are not encumbered by Incumbent users, *see* Letter from Stephen E. Coran, Lerman Senter PLLC, Counsel for WISPA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258,

such conflicts occurring. As T-Mobile explains, a carrier seeking to offer 5G mobile broadband throughout the New York area "would be required to bid on 28,000 licenses and be the auction winner 4,000 times in a single geographic area;" this would increase dramatically the likelihood that, "instead of taking advantage of the contiguous-area rule, an auction winner with a checkerboard of census tract-based licenses would be able to use none of them."[97] Michelle Connolly echoes that census tract-licensing puts wide-area network deployment at risk if providers intending to acquire PALs across a wide metropolitan area are outbid in just one census tract.[98] Further, even if some form of package or combinatorial bidding could mitigate such risks, as some commenters suggest,[99] licensees would still face potentially discontiguous channel assignments. Although WISPA and Google, disputing these claims, stress the legal obligation of the SAS to protect a licensee's PAL Protection Area,[100] neither persuasively refutes AT&T's and T-Mobile's demonstration that the use of census tracts is likely in practice to increase dramatically the number of potential border conflicts and related engineering and coordination challenges, potentially precluding next generation mobile services, including 5G, in the 3.5 GHz band. As the Commission recognized in 2015, licensees may have a legitimate need to coordinate with holders of both geographically and spectrally adjacent licenses in order to maximize the utility of the band and facilitate efficient network planning.[101] The record presents serious concerns that, for large scale deployments, such coordination could involve a prohibitive number of co-channel and adjacent channel licensees.[102]

26. *Second*, county-based licensing will allow Priority Access Licensees to take advantage of economies of scale, which will reduce deployment costs. Economist Michelle Connolly argues that the population of a census tract is likely not sufficiently large to take advantage of possible economies of scale for many of the potential uses of the band, particularly for the deployment of 5G.[103] Counties—in contrast—are large enough for network deployers to achieve scale economies for both fixed and mobile services.[104] Indeed, counties cover a large enough geographic footprint to incentivize investment in wider

(Continued from previous page)
at 2 (filed May 2, 2018) (WISPA May 2, 2018 *Ex Parte*), we do not read our use of the word "feasible" to require the assignment of contiguous blocks when no such assignment is possible for other reasons.

[97] T-Mobile Apr. 25, 2018 *Ex Parte* at 5.

[98] *See* CTIA Reply, Attach. at 5-6 (discussing exposure risk).

[99] WISPA May 2, 2018 *Ex Parte* at 6; Frontier Comments at 7.

[100] *See, e.g.*, WISPA Reply at 16-17; Comments of Google and Alphabet Access, GN Docket No. 12-354 et al., at 24-25 (July 24, 2017) ("SAS administration focuses on managing interference among users at particular locations. . . . [T]he claimed actual service area, which is based on calculations of CBSD coverage area, is the area the SAS protects."); WISPA Apr. 23, 2018 *Ex Parte* at 2 (arguing that the SAS's contiguous channel requirement means that PAL Protection Areas "are not constrained by the boundaries of the PAL [license] area" and that "other than as required for incumbent protection, PALs must be given the same channel by the SAS across any large contiguous set of PALs that a licensee may acquire, regardless of the size or shape of a single geographic license").

[101] *See 2015 Report and Order*, 30 FCC Rcd at 4022, para. 197.

[102] *See* T-Mobile Apr. 25, 2018 *Ex Parte* at 2. WISPA argues that neighboring PAL holders are permitted to enter into private contracts to address issues, *see* WISPA April 23, 2018 *Ex Parte* at 3, but fails to take into account that such contracting may come with significant transaction costs and that the use of census tracts could increase the scale of such transaction costs substantially.

[103] *See* CTIA Reply, Attach. at 5; USCC Comments at 6 (larger license area will "facilitate economies of scale and scope for providers planning to provide service on a larger geographic scale."); *see also* Letter from Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 4 (filed Oct. 16, 2018) (CTIA Oct. 16, 2018 *Ex Parte*) (arguing that modestly increasing the geographic license areas for PALs, combined with longer, renewable license terms, will allow U.S. wireless providers to take advantage of economies of scale).

[104] *See, e.g.*, Comcast Comments at 5, 11-12 (agreeing with the argument that a larger license area will help to provide licensees with economies of scale, and supporting counties as striking the right balance between achieving

area geographic deployments that take full advantage of the CBSD power limits in the 3.5 GHz band, a particularly important issue for 5G networks.[105]

27. *Third*, we find that counties will service the needs of rural communities and will allow new and innovative services to reach underserved and unserved communities, consistent with the Act's objectives.[106] County-sized PALs will "provide small, rural providers with a reasonable opportunity to obtain spectrum and . . . promote more effective use of spectrum for actual service delivery in rural areas."[107] Senators Steve Daines, John Barrasso, and Dan Sullivan—of Montana, Wyoming, and Alaska, respectively—argue that use of counties for licensing PALs in rural areas would serve the needs of "our rural communities" because it will "provide small carriers with an opportunity to access PALs that best fit their targeted service at a price that fits their budget."[108] Several small, rural carriers, echoing these arguments, note that census tract licensing would "render the spectrum useless for many small carriers in rural areas,"[109] and Midco amplifies them, arguing that county-sized licenses will "make logical sense" in rural communities.[110] And many commenters support using counties to license at least some PALs, particularly in rural communities.[111] We agree with this ample record that county-based license areas will enable a wide variety of use cases needed to ensure deployment of the 3.5 GHz band in rural areas.[112]

(Continued from previous page)
the efficiency of larger areas and keeping areas "small enough to ensure economic viability for a variety of business and technical plans and encourage robust participation in auctions").

[105] *See supra* notes 54-56 and accompanying text.

[106] Among other objectives, Section 309(j) directs the Commission to encourage the "disseminat[ion of] licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women" and "development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas" in this band. 47 U.S.C. § 309(J)(3)(A), (B).

[107] *See* Letter from Jill Canfield, Vice President of Legal & Industry, Assistant General Counsel, NTCA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed June 19, 2018) (arguing in favor of a hybrid approach with both county and census tract PALs); EKN Oct. 12, 2018 *Ex Parte* at 1 (arguing that an increase in the PAL license area to counties "will enable rural, wireless carriers such as EKN to better serve their customers").

[108] Rural Senators Letter at 1-2 (arguing for counties in rural areas and MSAs in urban areas); *see also* Letter from Courtney Neville, Associate General Counsel, CCA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 1 (filed Oct. 16, 2018) (arguing that county-based licensing will "help to ensure all providers, especially those serving rural and remote areas, can use this slice of mid-band spectrum to effectively deploy next-generation technologies and 5G services"); Non-Nationwide Carrier CEOs *Ex Parte* at 2 ("County license sizes provide competitive carriers, especially those that serve rural areas, with a meaningful opportunity to bid on and acquire spectrum to provide these areas with the latest broadband services."); Letter from Caressa D. Bennet, General Counsel, RWA, to Chairman Pai et al., GN Docket No. 17-258, at 1 (filed Oct. 9, 2018) (RWA Oct. 9, 2018 *Ex Parte*) ("RWA . . . believes that the use of county-based license sizes will allow rural providers to participate in the 3.5 GHz auction for [PALs] and further deploy rural broadband service.").

[109] Rural Carriers *Ex Parte* at 1-2 (noting that "in many cases, small carriers may not be able to aggregate all the census tracts within their service areas").

[110] Midco Aug. 29, 2018 *Ex Parte* at 4 (noting that rural counties vary less in size and shape than census tracts); *see also* RWA Oct. 9, 2018 *Ex Parte* at 1 ("The choice of counties plus the inclusion of a 15 percent rural service provider bidding credit acknowledges the needs and realities of wireless broadband customers in rural America and will ensure that PALs remain affordable and accessible to the small, rural providers that directly serve these customers.").

[111] *See, e.g.*, API Reply to Comcast at 2; Charter Reply at 2-4; Comcast Reply at 3-4; NCTA Reply at 2-4; GeoLinks Reply at 3; Blooston Comments at 4; Sacred Wind Comments at 6 ("Alternatively, Sacred Wind would not oppose geographic designation of PALs on a county basis.").

[112] CenturyLink argues that county-wide PALs "render rural use uneconomic," arguing that a given county may include both rural areas for which census tract PALs would permit targeted coverage with a fixed wireless service, and non-rural areas where it would not make economic sense to deploy that service. CenturyLink June 8, 2018 *Ex*

28. *Fourth*, we find that counties will serve a variety of innovative use cases for urban, suburban, and rural deployments, including IoT deployments and those by new entrants. Several parties stress the importance of access to PALs for IoT and other innovative spectrum uses in suburban and urban areas, and they note that 5G will be replete with these type of targeted uses cases regardless of whether the community is urban or more rural.[113] Blooston notes that counties are "suited for a wide variety of business models . . . ."[114] NCTA argues that counties will better open urban markets to competition and "could make all the difference in facilitating new entry and innovation in urban, as well as rural, markets."[115] Charter notes that counties "accommodate a variety of business models and nest into larger geographic service areas," and that they provide opportunities for many different potential users to "secure licenses that are suited to their existing business models and footprints."[116] Comcast argues that counties strike a balance between enabling efficient deployment of services and remaining small enough to ensure economic viability for a variety of businesses and technical plans.[117] NCTA argues that counties are large enough to attract investment by typical mobile participants, but small enough not to price out or exclude new entrants.[118] Several other commenters also note that while they may prefer other license sizes, counties would nonetheless be compatible with their business cases.[119] We agree that the Priority Access licensing structure should be flexible enough to support and encourage next-generation applications like 5G and IoT and we believe that county-based licensing will help to accomplish this goal. Licensing PALs by county will help foster flexible and innovative use of the 3.5 GHz band in all areas by providing a consistent, relatively small license size appropriate for a wide range of possible network deployments.[120] Indeed, the Commission adopted county-size PALs for the 28 GHz band for these same

(Continued from previous page)
*Parte* at 2; *see also* Frontier Comments at 9-10 (arguing counties are "a step in the right direction" as compared to PEAs, but are still too large to promote rural buildout); WISPA Oct. 17, 2018 *Ex Parte* at 2 (arguing that rural areas surrounding urban centers within a county will be left unserved). We disagree. A number of fixed wireless broadband providers, including WISPA itself, argue that fixed wireless services can be economically deployed to urban areas, *see, e.g.*, WISPA Comments, Appx. C at 6 (stating that "given the favorable economics of fixed wireless, many [broadband wireless access] providers are expanding into urban markets"), and our partitioning and disaggregation rules would allow companies desiring to target the rural part of county to do so while spinning off the non-rural portions to others interested in deploying next-generation wireless services to non-rural areas.

[113] *See, e.g.*, Letter from Stephen J. Berman, Lawler, Metzger, Keeney & Logan, LLC, Counsel for GE, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2 (filed June 7, 2018); Letter from Stephen J. Berman, Lawler, Metzger, Keeney & Logan, LLC, Counsel for GE, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 2-3 (filed Mar. 7, 2018) (GE Mar. 7, 2018 *Ex Parte*); *Joint CBRS Ex Parte* at 7.

[114] *See* Blooston Comments at 4 (arguing for a hybrid approach of counties and census tracts).

[115] *See* NCTA Apr. 25, 2018 *Ex Parte* at 1-2.

[116] Charter Reply at 4. The Commission also acknowledged this point the *2017 NPRM* and elsewhere. *See supra* note 45 and *infra* note 123.

[117] *See* Comcast Comments at 5; Comcast Reply at 3-4; *see also* API Reply to Comcast at 2; Charter Reply at 4; NCTA Reply at 2.

[118] *See* NCTA Comments at 4.

[119] *See, e.g.*, GeoLinks Reply at 2-3 (moving away from its initial support of census tracts to support county-sized licenses); RWA Comments at 4 (as an alternative to census tracts or a hybrid approach, supports adoption of county-based licenses); Peoples Comments at 4 ("[I]n the very least, Peoples requests that the Commission not increase the licensing size to anything larger than counties."); Sacred Wind Comments at 6 (stating that it does not oppose adoption of county licensing); Texas Carriers Comments at 6 (requesting licensing size no larger than counties).

[120] Although WISPA argues that counties vary greatly in size and population, WISPA Reply at 24, it does not argue that the Commission should devise (nor does it suggest how we could devise) some license area with consistent land mass and population throughout the country. Instead, it suggests substituting one imperfect license area (counties) with another (census tracts). We do not find that the fact of such variances warrants the treatment WISPA seems to suggest.

reasons, which likewise will be an important part of the next generation wireless ecosystem, including 5G and IoT applications. In that proceeding, the Commission found that "a county-based license affords a licensee the flexibility to develop localized services, allows for targeted deployments based on market forces and customer demand, and facilitates access by both smaller and larger carriers."[121] As in that context, we anticipate that this approach in the 3.5 GHz band will support diverse network deployments and business models and will fulfill the Act's objectives by fostering "the development and rapid deployment of new technologies," "promoting economic opportunity and competition," and "disseminating licenses among a wide variety of applicants."[122]

29. Counties are sufficiently small to support the small cell deployments and localized types of service we anticipate will be an important part of this band. They are also small enough to allow licensees to target their deployments where they need capacity. At the same time, as the Commission and commenters have recognized, counties are the basic "building blocks" of many geographic areas,[123] making them suitable for aggregation for licensees that wish to operate over larger areas. This flexibility makes counties an appropriate middle ground for this band, given that the characteristics of 3.5 GHz band spectrum are favorable to support both localized and wide-area deployments, and thus to entities wanting to provide a variety of innovative services—some more targeted than others—to the public.[124]

30. *Fifth*, we find that licensing PALs on a county basis will simplify the licensing regime in a way that minimizes burdens imposed on licensees, and that promotes administrative and spectral efficiency consistent with our statutory objectives including speeding the "development and rapid deployment of new technologies, products, and services" and "efficient and intensive use" of the spectrum.[125] With just 3,200 counties nationwide (compared to about 74,000 census tracts), we can reduce the administrative burden more than 20-fold by using counties as the PAL license area. We anticipate that this reduction, in turn, will reduce network design complexity and minimize border coordination issues.

31. We also anticipate that fewer license areas and fewer overall biddable items available through the PAL auction will reduce auction complexity[126] and will enable us to move forward more

---

[121] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8029, para. 35 (2016) (*Spectrum Frontiers Report and Order*). We note that the 28 GHz county licenses will be defined by 1990 county boundaries in order to align with incumbent 28 GHz licenses, which were issued as BTAs that were based on 1990 county boundaries. *See Auctions of Upper Microwave Flexible Use Licenses for Next-Generation Wireless Services; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auctions 101 (28 GHz) and 102 (24 GHz)*, AU Docket No. 18-85, Public Notice, FCC 18-109, 2018 WL 3703315, para.6, n.15 (rel. Aug. 3, 2018). For the 3.5 GHz band, we plan to rely on 2017 county boundaries, the most recent boundaries currently available through the Census Bureau. *See* Appendix A, Final Rules.

[122] 47 U.S.C. § 309(j)(3)(A), (B).

[123] *See, e.g.*, *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8028, para. 33; *2017 NPRM*, 32 FCC Rcd at 8080, para 24; NTCA Comments at 8.

[124] *Compare Joint CBRS Ex Parte* at 1-2, Nokia Comments at 4, Motorola Comments at 2, Port of LA Reply at 1-2, GE Reply at 3-4, and Google Comments at 2-3 (discussing use of 3.5 GHz spectrum for IIoT, hospitality, healthcare, stadium operations, critical infrastructure, shipping, and manufacturing uses) *with* USCC Comments at 5, and AT&T Reply at 4-5 (discussing use of 3.5 GHz band as part of the spectrum that will be used for 5G network deployments); *see also* CTIA Oct. 12, 2018 *Ex Parte* at 1 (arguing the county sized PALs, along with the other reforms in this Report and Order, "will facilitate both targeted use cases and wide-area networks for the provisioning of 5G").

[125] 47 U.S.C. § 309(j)(3)(A) and (D).

[126] *See* USCC Reply at 4 (noting that "even small and regional carriers potentially would be seeking to acquire thousands, if not tens of thousands, of PALs"); R Street Reply at 7; CTIA June 15, 2018 *Ex Parte* at 4-5, 14-15. As USCC points out, regardless of whether an automated system could manage all the PALs, "bidders need to continuously make decisions with respect to each PAL they hope to acquire as prices increase throughout an

quickly to offer all available PALs in one multiple round auction conferring significant benefits to the public.[127] Historically, the Commission has preferred to use a specific simultaneous multiple round (SMR) auction format for offering spectrum licenses.[128] In the forward auction portion of the broadcast incentive auction (Auction 1002), the Commission used a clock auction format which, like the SMR, also offers all items simultaneously in multiple bidding rounds.[129] These auction formats allow bidders to engage in price discovery and pursue backup strategies as prices ascend, which, for many license inventories, are important benefits for bidders.[130] The Commission's current bidding systems for multiple round spectrum auctions were designed so as to offer these bidder advantages given historically typical inventories of geographic areas.[131] While a county-based geographic license area gives us an inventory with the largest number of areas that the Commission has ever auctioned or licensed,[132] it is a far smaller number than an inventory based on 74,000 census tracts. Accordingly, licensing PALs on the basis of counties will enable us to use an auction system that offers bidders important benefits, as well as allow us

(Continued from previous page)
auction." USCC Reply at 4; *see also* EKN Oct. 12, 2018 *Ex Parte* at 1 (arguing that increasing the size of the PAL license area to counties "will allow for a more efficient auction process").

[127] 47 U.S.C. § 309(j). *See, e.g.*, CTIA June 15, 2018 *Ex Parte* at 1 (advocating for a promptly held auction of PALs); Letter from Jeffrey Marks, Government Relations, Nokia, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 1 (filed May 22, 2018).

[128] *See* Auctions Summary, https://www.fcc.gov/wireless/auctions/auctions-summary (last visited Sept. 21, 2018).

[129] *See Broadcast Incentive Auction Scheduled to Begin on March 29, 2016; Procedures for Competitive Bidding in Auction 1000, Including Initial Clearing Target Determination, Qualifying to Bid, and Bidding in Auctions 1001 (Reverse) and 1002 (Forward)*, Public Notice, 30 FCC Rcd 8975, 9042, para. 132 (2015).

[130] The appropriate auction format for a particular inventory of licenses will depend, among other things, on the characteristics of the items to be offered at bidding and the estimated bidding activity. *See, e.g.*, *Auctions of Upper Microwave Flexible Use Licenses for Next-Generation Wireless Services; Comment Sought on Competitive Bidding Procedures for Auctions 101 (28 GHz) and 102 (24 GHz); Bidding in Auction 101 Scheduled to Begin November 14, 2018*, Public Notice, FCC 18-43, at 24, para. 83 (rel. Apr. 17, 2018) (*Auctions 101/102 Procedures Public Notice*) ("Given the number of licenses being offered in Auction 102 and the generic nature of the licenses, we believe that the time savings of a clock auction relative to an SMR auction will offer significant benefits to bidders and the Commission, and enable the 24 GHz band spectrum to be put to effective use more quickly."); *see also Closed Auction of Licenses for Cellular Unserved Service Areas Scheduled for June 17, 2008; Comment Sought on Competitive Bidding Procedures for Auction 77,* Public Notice, 23 FCC Rcd 4492, 4493-94, para. 6 (WTB 2008) ("Because a bidder can only bid on a single cellular unserved area, bidders do not need the information afforded by a simultaneous multiple-round auction to consider valuations, alternative business plans, or backup strategies.").

[131] For example, the typical SMR auction has offered licenses based on up to 734 Cellular Market Areas and Auction 1002 offered up to three categories of generic blocks in 416 Partial Economic Areas. We note that while the reverse auction for Connect America Fund Phase II support (Auction 903) offered support for over 30,000 census block groups, because bidders were bidding for a share of the budget (of up to $1.98 billion over 10 years), the bidding system could use one clock to resolve the competition for that budget. In contrast, in a clock auction for spectrum licenses, there is a separate clock for each category of generic blocks in each geographic area, and competition is resolved separately for each category/area combination. Therefore, a multiple round bidding system for tens of thousands of geographic areas would have to enable bidders to manage the complicated dynamic interactions among those numerous areas during the bidding.

[132] The upcoming 28 GHz auction (Auction 101) will be the first time the Commission conducts an auction of county-sized licenses. *See Spectrum Frontiers Report and Order*, 32 FCC Rcd at 8029, paras. 35-36 (moving from BTAs to counties for 28 GHz band, noting that counties are the "base unit that make up common commercial wireless license sizes, including EAs and [PEAs]"). In auction 101, two license blocks are available in each of less than half of the total counties because of incumbent license holders in the other counties.

to auction them more quickly with a bidding system that is manageable for bidders.[133]

32. Relatedly, if providers with larger-area needs have to turn to the secondary market to aggregate additional licenses, the smaller the license area used, the larger the number of transactions that would be required, thus increasing transaction costs.[134] We believe that this balance will not only promote Section 309's goal of "efficient and intensive use of the electromagnetic spectrum,"[135] but also encourage investment by a wider array of users than under the census tract regime by removing unnecessary administrative hurdles and associated costs.

33. Several parties, including those representing small and rural interests, also agree that counties will minimize administrative burdens imposed on licensees, while still being small enough to support rural deployment, reduce barriers of entry, and encourage localized use cases.[136] For example, GeoLinks—a WISP in California—argues that, as compared to census tracts, counties will "simplify license management burdens and border coordination issues" and still support rural deployment.[137] Similarly, Cellcom, a small provider in the Midwest, argues that counties "strike a balance between preserving low barriers to entry and minimizing administrative burdens."[138]

34. *Sixth*, international developments confirm the importance of creating an environment that encourages domestic investment in next generation mobile networks in the 3.5 GHz band to effectively leverage the economies of scale created by international investments in the band. Numerous other countries have begun to auction spectrum in the 3.5 GHz range and several others are poised to do so in the near future.[139] It is important for the United States to create a robust marketplace in the band, particularly as the band is standardized for next-generation, 5G technology. By making sure that our PAL license area will foster investment in the band, including by those seeking to use it for mobile 5G use, we are better aligning ourselves with global developments and preparing to be a leader in the 5G ecosystem, as we have been in the LTE space.[140] We observe that service providers often determine their investments

[133] A bidding system user interface has to make manageable for bidders the complex dynamic interactions among the biddable items available for auction in multiple geographic areas, each with multiple blocks available.

[134] *See* CTIA Reply, Attach. A at 6; *see also* R Street Reply at 7.

[135] 47 U.S.C. § 309(j)(3)(D).

[136] *See, e.g.*, API Reply to Comcast at 2 (supporting counties in rural areas); Blooston Comments at 4 (supporting a mix of counties and census tracts); Cellcom Comments at 1-2; Charter Comments at 3; Charter Reply at 4; Comcast Comments at 5; GeoLinks Reply at 3; NCTA Comments at 2; *see also* Peoples Comments at 2 (arguing for license area no large than counties); Vantage Comments at 4 (noting counties might be a reasonable compromise for a portion of the PALs); Letter from Nicole Tupman, Corporate Counsel, Midco, to Marlene H. Dortch, Secretary, FCC, GN Docket No 17-258, at 2 (filed Oct. 14, 2018) (Midco Oct. 14, 2018 *Ex Parte* ) (arguing that "counties are the best compromise between the desire to adopt smaller license areas and the practical considerations that affect designing and deploying real-world wireless networks").

[137] GeoLinks Reply at 3.

[138] Cellcom Comments at 2 (quoting *2017 NPRM*, 32 FCC Rcd at 8080, para. 22).

[139] *See* CTIA July 9, 2018 *Ex Parte* at 1 & Attach. (*Analysys Mason July 2018 Report*); CTIA Oct. 16, 2018 *Ex Parte* at 2.

[140] Notably, a recent report by Analysys Mason shows census tracts are "significantly smaller than the license areas used for comparable spectrum in the rest of the world." CTIA July 9, 2018 *Ex Parte* at 1 (citing the *Analysys July 2018 Mason Report* attached to *ex parte* filing); *Analysys Mason July 2018 Report* at 6-7, Figure 1.2. Australia is considering 14 geographical regions for assignment in the 3450-3600 MHz range (six metropolitan areas and eight regional areas), and Canada has not yet finalized its approach, but the most granular of its breakdowns from previous spectrum allocations would consist of 172 service areas. *See Analysys Mason July 2018 Report* at 5, 7. Notably, other countries have already auctioned spectrum in the 3550-3700 MHz range. For example, South Korea auctioned 280 megahertz of spectrum in the 3420-3700 MHz range on a national basis in June 2018, and Japan has already assigned 40 megahertz of unpaired spectrum to each of the country's three mobile network operators in the

on a global scale, not just a domestic one, and we find that adjustments to our approach on the geographic licensing area will better facilitate service providers including offerings to U.S. customers in their plans. Specifically, we find that our revised approach to the geographic licensing area will better align the band with global developments, and with other bands in the U.S. that the Commission has found will play a role in the 5G ecosystem, including the millimeter wave bands and the 3.7-4.2 GHz band.[141] This consistent approach will ensure that the 3.5 GHz band in the United States is ripe for robust investment.

35. *Finally*, while we recognize that no approach to license sizes will satisfy all stakeholders, we find that counties represent a more appropriate middle ground that will address many of the concerns raised by stakeholders in this proceeding. We find that adopting counties as the geographic unit for PAL licensing balances the concerns that some commenters have raised about licensing PALs as small as a census tract[142] with the concerns that other commenters have raised about licensing PALs as large as a PEA.[143] In fact, across the various compromise proposals and hybrid approaches submitted in this proceeding—including the CTIA/CCA proposal and the CBRS Coalition's proposal—the main commonality is support for the use of counties as part of the PAL licensing scheme.[144] As such, we find that increasing the size of the geographic license area from census tracts to counties will be more likely to

(Continued from previous page)
3488-3600 MHz range on a national basis. *Analysys Mason July 2018 Report* at 3, Fig. 1.1; *see also* CTIA Oct. 16, 2018 *Ex Parte* at 3.

[141] *See Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et al.*, GN Docket No. 14-177 et al., Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC 18-73, 2018 WL 2932188 at *12, para. 33 (rel. June 8, 2018) (balancing objectives "towards facilitating rapid 5G deployment in the United States"); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et al.*, GN Docket No. 14-177 et al., Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 10988, para. 1 (2017) ("Today, we take further actions in this proceeding to make available millimeter wave [] spectrum, at or above 24 GHz, for [5G] wireless, Internet of Things, and other advanced spectrum-based services."); *3.7-4.2 GHz NPRM*, 2018 WL 3435167 at *1 (explaining that the *3.7-4.2 GHz NPRM* is another step in the Commission's efforts to secure U.S. leadership in the next generation of wireless services, including 5G wireless); *id.* at *42 (seeking comment on ways to promote efficient use of the 3.7-4.2 GHz band for next generation wireless technologies, including 5G); *see also* Non-Nationwide Carrier CEOs *Ex Parte* at 2 (noting that it is "vital that policymakers continue to focus on freeing up spectrum at low-, mid-, and high-band frequencies to ensure carriers have an adequate portfolio for deployment").

[142] *See, e.g.*, T-Mobile Apr. 25, 2018 *Ex Parte* at 2-3 (arguing that licensing PALs by census tract would raise insurmountable technical issues and that coordination among co-channel and adjacent channel systems at the border could be "almost impossible to implement" in urban areas); AT&T Apr. 5, 2018 *Ex Parte* at 1 (arguing that there would be engineering and cost challenges to using census tracts as the baseline license size, and that to cover the border areas, Priority Access Licensees would need to "severely limit their power and deploy many more CBSDs than what may be actually needed"); R Street Reply at 7, 11-13 (arguing that census tracts would increase transaction costs as compared to a larger license area); CTIA Reply, Attach. at 13 (the transaction cost of defining PALs at the census tract level for three-year terms "dwarfs the costs of defining PALs at the PEA level for ten-year terms").

[143] *See, e.g.*, Baicells Comments at 4 (arguing that, under PEAs, the cost to acquire a PAL will be significantly higher and out of reach for smaller companies that want to acquire protected spectrum for their business model); DSA Comments at 14; DSA Reply at 12 (arguing that PEAs would negatively impact rural deployment and increase the price to access the PAL tier, shutting out those without large amounts of up-front capital); EWA Comments at 4-5 (arguing that EWA members have defined coverage requirements that do not conform to PEAs); Google Reply at 9-10 (arguing that PEAs are too large for rural carriers' needs and for potential licensees with geographically targeted services); Vivint Comments at 4; William Lehr Comments at 11 (arguing that a change to PEAs could effectively foreclose a large number of potential users); Letter from Stephen J. Berman, Lawler, Metzger, Keeney & Logan, LLC, Counsel for GE, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 3 (filed Feb. 16, 2018) (GE Feb. 16, 2018 *Ex Parte*).

[144] *See supra* notes 62-68 and accompanying text (detailing compromise proposals). Even the Public Interest Coalition stresses that no PAL should be larger than a county, despite its preference to rely on the census tracts. PISC June 13, 2018 *Ex Parte* at 2 ("PISC urges the Commission . . . to auction no PAL larger than a county.").

unlock the potential for existing and new technologies and services to thrive in the 3.5 GHz band, while preserving the incentives and ability of smaller innovators to make use of PALs, reserved GAA spectrum, and unreserved GAA use as appropriate.[145]

36. We disagree with the argument that census tract licensing is necessary for localized use cases, or that these localized use cases should be the primary focus of the balance struck by our rules. WISPA, for example, argues counties are "too large for localized deployments such as those intended by colleges, industrial parks, manufacturing plants, sports arenas and other similar users."[146] Dr. Lehr argues that census tracts are the least costly way to support targeted use cases.[147] We find the public interest best served by ensuring that all potential use cases are technically and economically feasible, and by using competitive bidding to allocate the 3.5 GHz band to its highest and best use.

37. Further, we find that county-sized licenses will still enable the construction of localized, private networks using 3.5 GHz spectrum. Targeted use cases are already encouraged by the "use-or-share" nature of the band and the GAA tier.[148] We stress that a minimum of 80 out of 150 megahertz—more than half the band—will be available for GAA use even if all of the potential PAL channels are occupied, and note that we previously denied T-Mobile's request to change the apportionment of PAL to GAA spectrum.[149] As T-Mobile and R-Street note, even census tracts are already significantly larger than a single campus, hotel, factory, or other similar enterprise, and the demands of such targeted applications can be addressed in ways that provide interference protection without using license areas as small as census tracts, including entering into transactions tailored to the area or amount of spectrum needed through leasing, partitioning, or disaggregation, or entering into commercial agreements with PAL licensees in which the licensee manages the spectrum.[150] What is more, network deployers (like WISPs), manufacturers (like GE), and technology companies (like Microsoft) are well positioned to aggregate demand across counties to coordinate the deployment of localized use cases. We also open up the PAL market to partitioning and disaggregation, which should provide additional secondary market avenues for targeted uses and users. And our decision to impose end-of-term performance requirements will incentivize Priority Access Licensees to enter into the commercial transactions with entities that have targeted-sized uses that fall within their license areas.

38. We also disagree that increasing the size of PAL license areas will "strand" investments in the band. Those making this argument either are incumbents with grandfathered licenses in one

[145] WISPA argues that "substantial investment already made in pursuit of new service deployments in reliance upon the existing rules" belies the notion that changes to the license area and other aspects of the PAL licensing rules are needed to promote investment in the band. WISPA Reply at 6; *see* RWA Comments at 5-6. Such an argument misses the point. The existence of substantial investment in the band for one use case does mean we should preclude others. Rather we find that sizing license areas to accommodate multiple use cases, including 5G mobile deployments, will maximize investment in the band and ensure it is put to its highest and best use for the American people.

[146] WISPA Reply at 23; *see* GE Reply at 29 (arguing that county-sized licenses are "far too large for geographically targeted CBRS deployments, and the cost of county-based PALs would be well beyond what GE's industrial and critical-infrastructure customers are willing to spend"); GE Mar. 7, 2018 *Ex Parte* at 2-3 (filed Mar. 7, 2018) (arguing that if the Commission moves to county-based licensing, it is unlikely that either GE or its customers "will be able to obtain CBRS PALs, jeopardizing the benefits of IIoT").

[147] *See* William Lehr Comments at 11; *see also* GE Comments at 5; GE Reply at 13, 18.

[148] CTIA Reply at 16; CTIA June 15, 2018 *Ex Parte* at 10-11; *see id.* at 10 ("Management through the SAS, coupled with rules that allow PAL holders to partition or disaggregate spectrum into smaller parcels, and the PAL-GAA "use-or-share" framework, provide PAL licensees with strong incentives to make spectrum available on the secondary market to those who seek to acquire it for targeted deployments[.]").

[149] *See Termination Order*, 32 FCC Rcd at 8092, para. 59.

[150] *See* T-Mobile Reply at 24-25; R Street Reply at 8.

portion of the band or they have made those investments in reliance on the 2015 rules.[151] For one, we do not find any such reliance expectations to be reasonable. The Commission had neither scheduled nor even sought comment on how to design a competitive bidding system for PALs before seeking comment on CTIA and T-Mobile's petitions for rulemaking to change the 2015 rules—and no provider is ever guaranteed to win protected spectrum at auction in a given market, regardless of the size of the geographic license area.[152] For another, the unique structure and technical rules governing the 3.5 GHz band reduce the risk of stranded investment for all entrants and largely obviate the need to rely solely on auctioned licenses for access to the band. As stated previously, a minimum of 80 megahertz of the band will be available for use on a GAA basis in any area, by any entity that registers with the SAS.[153] Additional spectrum will also be made available when it is not in use by Priority Access Licensees.[154] The technical rules are the same for GAA and PAL users, meaning entities can use the same equipment in either tier, and can rely on both PAL and GAA spectrum, one or the other, or switch between the two to meet their business needs.[155] And so any entity that deploys in the band prior to the PAL auction would need to operate on a GAA basis for some period of time and would be able to continue to do so after the auction, regardless of the outcome. Moreover, counties are small enough that we anticipate rural providers and WISPs will actively seek county-sized PALs at auction,[156] or enter arrangements to

[151] *See, e.g.*, All Points Broadband Comments at 2; KWISP Comments at 5; The Junction Internet Comments at 2; Skywave Wireless Comments at 1; s*ee also* NCC Comments at 3-5. We note that nothing in our decision today effects the grandfathering of licenses in the 3650-3700 MHz band. *See* 47 CFR §§ 90.1338 (grandfathered operation and transition to Citizens Broadband Radio Service), 96.21 (protection of existing operators in the 3650-3700 MHz band).

[152] *Cf. Peterson v. US. Dep't of Interior*, 899 F2d 799, 813 (9th Cir. 1990) (rejecting the argument that investment-backed reliance alone constitutes an interest protected from regulation and finding that such reliance did not give rise to a constitutionally-protected property interest in a contract). Nor do regulated entities have a reasonable reliance interest in rules remaining unchanged. *See, e.g.*, *Celtronix Telemetry v. FCC*, 272 F.3d 585, 589 (D.C. Cir. 2001) (internal citations omitted) ("The pre-auction license system offered no vested right to any specific terms. Rather, it is undisputed that the Commission always retained the power to alter the term of existing licenses by rulemaking. The introduction of auctions made no change in this aspect of the licensing regime. In fact, Congress provided both that the Commission would retain its authority 'to regulate or reclaim spectrum licenses,' and that nothing in the use of auctions would 'be construed to convey any rights . . . that differ from the rights that apply to other licenses . . . .'" (citations omitted)); *Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992*, Fourteenth Order on Reconsideration, 12 FCC Rcd 15554, 15563, para. 21 (1997) (finding that "franchising authorities had no reasonable reliance interest in our rules remaining unchanged").

[153] *See 2015 Report and Order*, 30 FCC Rcd at 3982, para. 67.

[154] *See id.* at 3981, para. 64.

[155] *See id.* at 4009, 4024, paras. 155, 205.

[156] We note that several WISPs have supported the use of county-sized licenses even while others continue to argue for maintaining some PALs at the census tract level. *Compare* Cellcom Comments at 1-2, and GeoLinks Reply at 3 (arguing in favor of county licensing), *with* Joint WISP Letter at 1-3 (arguing that the Commission retain census tracts for at least two PALs in rural communities). As further evidence that county-sized PALs will not foreclose WISP participation in a PAL auction, we note that many other commenting WISPs describe their service areas in terms of counties, and cover all or significant portions of the relevant counties, some working in concert with the local county government, and while asserting that PEAs are too large for them, make no similar assertion regarding county licenses. *See, e.g.*, Arbuckle Comments at 1-2 (indicating coverage area of "over 6,000 square miles" and showing network coverage over multiple counties in Southern Oklahoma); Grand County Comments at 1 (stating that the county it serves consists of "3 census blocks," that it "serve[s] all of these," and that "[a]s a small business, serving only our county, it would be impossible to bid in auction for the PEA area"); HighSpeedLink.net Comments at 6 (stating that its "service area . . . is focused at the county level" and that "we serve 4 primary counties and 2 counties partially"); Kentucky WiMax Comments at 1 (stating that it "serve[s] over 1300 customers in 5 counties"); http://www.kywimax.com/ (depicting the 5 counties of Kentucky WiMax service area); North Carolina Wireless, LLC Comments at 7 (stating that it serves "all or parts of 7 counties" and that it recently "partnered with a County Government" to provide service); Rapid Systems Comments at 1 (providing service "for 11 Counties" and objecting

partition or disaggregate county-sized areas into smaller ones. Additionally, the opportunities for small entities and rural carriers to win will be supported by the bidding credits that have been successful in other Commission proceedings.[157]

39. We reject arguments that we should adopt PEAs nationwide, as petitioners, T-Mobile, and Verizon support, or MSAs in urban areas, as suggested in multiple hybrid proposals.[158] We believe that the incremental benefit for 5G mobile use of going from counties to MSAs or PEAs would be far less than the incremental costs incurred by other potential users of the band.[159] In particular, we agree with those commenters that cite the potential negative effects of adopting license areas as large as PEAs.[160] Many WISPs express concerns that the incongruity between PEAs and WISP service footprints will diminish or foreclose their ability to win PALs at auction.[161] In response to these concerns, we have decided not to increase the size of the PAL license area to PEAs.

(Continued from previous page)
to PEAs because it would put "Rural Hardee County" in the same PAL as "Metropolitan Orlando"); SmartBurst LLC Comments at 1 (stating its service area in rural North Texas "includes the Counties of Denton, Cooke, and Grayson" and objecting to "large-area licenses," i.e., those with "multiple counties"); StraightUpNet Comments at 1 (stating that it has made "huge investments in Amelia County" and currently makes service available to "30%-40% of the county citizens and business").

[157] *See infra* Section III.B (Competitive Bidding); *see, e.g.*, Mobile Future Comments at 8-9 (detailing success of bidding credits at enabling small and rural entities' ability to win at auction in the 600 MHz proceeding); RWA Comments at 6-7 (asking the Commission to ensure that the same bidding credits made available in the 600 MHz proceeding are available for future PAL auctions); Sacred Wind Comments at 7 (asking for bidding credits similar to those used in the 600 MHz proceeding). We disagree with certain organizations that suggest, without any supporting evidence, that rural bidding credits "do not work." *See* Access Humboldt et al. *Ex Parte* at 2.

[158] As discussed above, the CTIA/CCA proposal supports MSA licensing in urban markets, CTIA/CCA Proposal at 2, and the modified proposal supported by the CBRS Coalition and additional stakeholders also incorporates MSA licensing into some urban markets, CBRS Coalition *Ex Parte* at 1-2.

[159] *Compare* CTIA Reply, Attach. at 5 (arguing that the population of a census tracts is likely not sufficiently large to take advantage of possible economies of scale for many of the potential uses of the band, particularly the deployment of 5G), *with* William Lehr Comments at 11 (arguing that PEAs would "effectively foreclose a large number of potential users . . . that might otherwise be interested in taking advantage of the [Citizens Broadband Radio Service (CBRS)] spectrum to deploy wireless networks that support coverage (for services such as rural broadband) and localized private LTE networks for quality of service (for services such as [industrial] IoT).").

[160] *See, e.g.*, Baicells Comments at 4 (arguing that, under a PEA licensing scheme, the total cost to acquire a single license could be "significantly higher and out of reach for smaller companies who want to acquire spectrum for their business model"); Bernhardt Comments at 1, 2 (arguing that PEA encompass too great an area and will eclipse competition); DSA Comments at 13-14 (same); City of NY Comments at 2-3 (expanding to PEAs would discourage investment by smaller entities); Microsoft Comments at 5 (arguing that PEAs would be a "mismatch" for small-cell deployments); Port of LA Reply at 2 (arguing that PEAs would impede IoT utilization and delay innovation by the shipping industry); Vivint Reply at 5 (arguing that PEAs create an artificial barrier to entry); GE Feb. 16, 2018 *Ex Parte* at 3 ("[L]icensing CBRS on a PEA basis would exponentially raise the cost of PALs . . . . GE and its industrial and critical-infrastructure customers would be highly unlikely to bid for PEA licenses at auction, even in key, targeted geographic areas.").

[161] *See, e.g.*, AirLink Comments at 1; BDA Wireless Comments at 3-5; Cal.net Comments at 3-4 (comparing PEAs versus counties and census tracts for Sacramento County to illustrate that "anything larger than a Census tract is economically infeasible"); Cloud Alliance Comments at 2 ("Bound by mountain ranges, our service area comprises less than a dozen census tracts. We cannot compete with larger companies vying for PALs that would serve more than half the state and all of its largest cities and towns."); e-vergent Comments at 2-4; Imagine Networks Comments at 3 (noting that the majority of the PEA is not in its service area and would be cost prohibitive due to the inclusion of Dayton, OH in the PEA); InfoWest Comments at 1, 2 (noting that the total area of the two PEAs that include the communities InfoWest serves in Nevada is "larger than all but seventeen of the fifty states"); Joink Comments at 2; Link Technologies Comments at 3 ("Census tracts would allow operators from different states as well as operators within the same region to have the ability to bid on a PAL that would be of a size that we can actually use. By increasing the PALs to PEA size, it effectively eliminates the small businesses from the

40. Nevertheless, to provide greater flexibility to PAL applicants interested in serving larger areas, we will seek comment in the pre-auction process on allowing package bids to facilitate bidding for the counties that comprise a complete MSA in the top 305 markets.[162] CTIA and CCA argue that MSAs in urban areas will promote investment in the band in those markets, and—in combination with counties—will "provide[] an opportunity for parties to acquire PAL spectrum in areas that best fit their business models and investment plans,"[163] and will minimize burdens for applicants interested in a larger footprint in urban areas.[164] We expect that the proposed procedures for the auction will include specific procedures for a form of package bidding consistent with proposals for other bidding procedures proposed in the pre-auction public notice process. Licensing PALs by county, and seeking comment on the best flexible auction mechanism that may allow bidders to aggregate MSA bids, including possibly using package bidding for all of the counties in an MSA, could reduce secondary market transaction costs while still promoting an active secondary market.[165]

41. We reject hybrid approaches that offer multiple size PALs in every market, such as licensing 50 megahertz of PALs by county and 20 megahertz by census tract.[166] As discussed above, we find that using counties nationwide will support licensee diversity and increased investment. Further, there are already significant complexities inherent to the 3.5 GHz band authorization and spectrum coordination model, which involve the SAS coordinating access between and among the three tiers of users, including the protection of multiple discrete types of Incumbent user. While SASs may be—and likely are—capable of modifying their systems to address multiple sizes of PALs in a given geographic area, on balance, we do not believe it is in the public interest to add yet another layer of complexity to the SAS's spectrum coordination responsibilities at this time. Such additional requirements could delay SAS certification and, possibly, affect the deployment timeline for the band. No party has articulated a

(Continued from previous page)
marketspace."); NWNC Comments at 2-3 ("The current PEA boundaries shown above indicate we would have to obtain licensing in 5 areas, which go far beyond the existing NWNC wireless network."); TekWav Comments at 1-2; Wonderlink Comments at 2 & appxs. A, B (comparing the 41 census tracts it desires to bid on, covering about 128 square miles, with the PEA it would need to acquire under the proposed rule change, covering about 9,688 square miles, or "9,560 square miles more than our intended coverage"); Vertical Broadband Comments at 4 ("Vertical Broadband serves a small area inside the *largest partial economic area* in the United States. . . . Basing PAL auctions solely on PEAs rather than census tracts would *wholly prevent* us from bidding on our existing domain." (emphasis in original)); Virginia Broadband Comments at 3-5; *see also* WISPA Reply at 11 (arguing that PEA license boundaries would foreclose rural fixed wireless providers' participation in the auction because "PEAs are naturally centered on cities and large towns with both greater population and greater density, and rural providers typically operate outside these areas, often with service areas that overlap multiple PEAs"); Letter from Laurence Brett Glass, d/b/a LARIAT, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 2 (filed Feb. 14, 2018).

[162] If we adopt procedures allowing bids on packages of county licenses that comprise MSAs, we would consider how to resolve issues relating to the boundaries of counties to be included in MSA packages that are based on the 1992 MSA markets, given changes to county boundaries since that time. *See* Appendix A, Final Rules (definition of "county"); *MSA/RSA Public Notice*.

[163] CTIA/CCA Proposal at 2.

[164] *Id.* at 2 (arguing that "MSA licenses in larger urban areas[] promotes investment across those markets and will largely eliminate the border interference issues posed by census tract licensing in urban areas").

[165] *See, e.g.*, R Street Reply at 8-9 (arguing that in addition to reducing transactions costs by limiting the number of licenses, larger license areas will be more effective at facilitating the development of secondary markets).

[166] *See, e.g.*, CBRS Coalition *Ex Parte* at 1-2; NRTC/NRECA Comments at 6; Blooston Comments at 5-7; NTCA Comments at 7; Letter from Greg Kunkle, Keller and Heckman, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, Attach. at 10 (filed March 30, 2018). NRTC and NERCA, in supporting this type of approach—note that a variety of license areas were auctioned in the 700 MHz and AWS bands to encourage a diverse pool of bidders. NRTC/NRECA Comments at 6. In the AWS and 700 MHz contexts, however, different geographic license areas corresponded to different frequency blocks within the respective band.

compelling argument for the benefits of such a hybrid model (vis-à-vis nationwide use of counties) that would outweigh the potential costs inherent in increasing the complexity of the licensing and authorization framework at this stage of the SAS development cycle. We also agree with AT&T that, given the specific characteristics of the 3.5 GHz band, licensing all PALs available in a market using the same geographic area will avoid unnecessarily complicating network management burdens for all users.[167] We also find that using the same license area in both rural and urban areas, as opposed to a hybrid approach licensing different sized PALs in urban and rural areas, will minimize complexities in a band that has a unique tiered access structure with dynamic spectrum sharing.[168]

### 2. License Term and Renewal

42. *Background.* The rules adopted in the *2015 Report and Order* established a three-year license term for PALs.[169] Under the current rules, during the first application window, an applicant may apply for up to two consecutive three-year terms for a given PAL.[170] During subsequent regular application windows, however, an applicant will be able to apply for only a single three-year license term for any given PAL.[171]

43. In the *2017 NPRM*, the Commission proposed to revise our rules by increasing the PAL license term from three years to 10 years and eliminating the requirement that PALs automatically terminate at the end of the license term.[172] The Commission sought comment on this change and on the appropriate performance requirements and renewal standards for PALs.[173] The Commission noted that its proposed approach was consistent with other wireless services and would afford licensees sufficient time to design and acquire the necessary equipment and devices and to deploy facilities across the license area.[174]

44. The Commission traditionally has licensed many wireless services on a 10-year renewable basis. For example, the Commission issues 10-year renewable licenses in Personal Communications Services,[175] Wireless Communications Services,[176] 700 MHz Services,[177] and Advanced Wireless Services.[178] Since it adopted the *2016 Report and Order*, the Commission extended this licensing paradigm to the millimeter wave spectrum bands that make up the Upper Microwave Flexible

[167] AT&T Reply at 7.

[168] *Cf.* Verizon Comments at 13 (arguing for a single license area for all type of PALs because "[a]ttempting to license a mix of area types within the 3.5 GHz band could result in a chaotic hodgepodge of licenses and would further complicate the auction process, make effective price discovery substantially more difficult, and potentially reduce auction participation and revenues); USCC Reply at 8 (supporting Verizon).

[169] *See* 47 CFR § 96.25(b)(3); *2015 Report and Order*, 30 FCC Rcd at 3994, para. 105. This was longer than the one-year license term originally proposed in the *2014 FNRPM*. *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, 29 FCC Rcd 4273, 4288, para. 49 (2014) (*2014 FNPRM*).

[170] *See* 47 CFR § 96.27(b). Even if the same licensee purchases two PALs in the same license area during the first auction, the second license will not be considered a renewal. Rather, the two licenses will be considered independent initial licenses that automatically terminate at the end of their respective terms.

[171] *Id.*

[172] *2017 NPRM*, 32 FCC Rcd at 8076-78, paras. 13-18.

[173] *Id.* at 8076-78, paras. 13-18; *see also id.* at 8078, para.18 & n.42.

[174] *Id.* at 8076-78, para. 13.

[175] 47 CFR § 24.15.

[176] *Id.* § 27.13(a).

[177] *Id.* § 27.13(b).

[178] *Id.* §§ 27.13(g), (i), and (j).

Use Service (UMFUS), which, like the 3.5 GHz band, has been identified as important spectrum for 5G deployment.[179]

45. The record contains differing views on the appropriate license term for PALs and whether such licenses should be renewable. Many commenters, supporting our proposal to adopt 10-year renewable license terms, argue that such an approach will provide the necessary certainty to promote investment in the 3.5 GHz band and that it is consistent with the Commission's proven licensing approach in other bands.[180] Commenters supporting the existing three-year, non-renewable license framework assert that such a framework will best promote rural, diverse, and innovative entrants to the band.[181] Still other commenters advance various compromise and hybrid proposals with license terms of varying lengths and different approaches regarding license renewability.[182] API, Baicells, Blooston, Cantor Telecom, EWA, Motorola, NTCA, and WISPA are among those advocating for a five-year license term, [183] while Microsoft proposes a six-year term,[184] and Comcast and NCTA support seven-year license terms.[185] In an *ex parte* filed May 9, 2018, a group of twenty associations, organizations, and companies, including several that have previously supported non-renewable three- or five-year licenses, express support for renewable seven-year licenses as part of a compromise that also addresses license areas.[186]

46. *Discussion.* We find that it is in the public interest to extend PAL license terms to 10 years and make such licenses renewable. The service rules for the 3.5 GHz band must create incentives for investment, encourage efficient spectrum use, support a variety of different use cases, and promote

[179] *Id.* § 30.103; *see also Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8020, para. 7 (noting that the use of the UMFUS frequencies have been a "key concept" in the discussion about the potential fifth generation of mobile technology).

[180] AT&T Comments at 3-5; CTIA Comments at 4-7; CTIA Reply at 8-12; Daniel Vincent Comments at 3; Ericsson Comments at 5; GeoLinks Reply at 4; Mobile Future Comments at 3-5; Nokia Comments at 2-3; NRTC/NRECA Comments at 3-4; Peoples Comments at 4; R Street Reply at 13; Union Pacific Comments at 6-8; TIA Comments at 2; T-Mobile Comments at 4-5; T-Mobile Reply at 2-6; USCC Comments at 9-12; Verizon Comments at 5.

[181] *See* Bernhardt Comments at 2; Cantor Comments at 6; Cantor Reply at 3; City of LA Reply at 5-6; City of NY Comments at 2; DSA Comments at 9; DSA Reply at 8; GE Comments at 39; Google Comments at 14; NCC Comments at 9-10; OTI/PK Comments at 29-30; OTI/PK Reply at 26; Port of LA Reply at 2; Sacred Wind Comments at 7; Southern Linc Comments at 10-11; Starry Comments at 2; UTC Comments at 4; Vivint Comments at 3; William Lehr Comments at 13-16; WISPA Comments at 4, 41-42; WISPA Reply at 28-29.

[182] *See* Alaska Communications Comments at 3-5; API/ENTELEC Comments at 3-4; Baicells Comments at 4-5; Blooston Comments at 10-11; Blooston Reply at 7-8; Cantor Reply at 5; Comcast Comments at 16-18; Comcast Reply at 9-10; EWA Comments at 5-6; GE Comments at n.80; Microsoft Comments at 3-4; MSI Comments at 6; NCTA Comments at 11-12; NTCA Comments at 9-10; NTCA Reply at 9-10; Ruckus Comments at 6-8; Ruckus Reply at 4; RWA Comments at 9-10; Texas Carriers Comments at 6-7; Transit Comments at 2; Vivint Reply at 6-7; WISPA Comments at 40; *see also* Letter from Virginia Lam Abrams, Starry, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, at 3-4 (filed Mar. 19, 2018) (Starry Mar. 19, 2018 *Ex Parte*) (proposing licensees be required to make a payment into the U.S. Treasury at the end of its initial license term as a performance requirement and at the end of subsequent terms as a demonstration of continued compliance with the performance requirement in order to meet the Renewal Standard) ("Starry Proposal").

[183] API/ENTELEC Comments at 3-4; Baicells Comments at 4-5; Blooston Comments at 10-11; Cantor Reply at 5; EWA Comments at 5-6; MSI Comments at 6; NTCA Comments at 9-10; WISPA Comments at 40.

[184] Microsoft Comments at 3.

[185] Comcast Comments at 17; NCTA Comments at 11-12.

[186] *See* CBRS Coalition *Ex Parte* at 2, 5 (signatories, including, *e.g.*, GE, Port of LA, EWA, NTCA, and WISPA, arguing that a framework including seven-year, renewable license terms "will increase the value of PALs, promote longer-term, stable access to spectrum and network investment certainty, and avoid the need for the Commission to spend scarce administrative resources on recurring future auctions.").

network deployments in both urban and rural communities.[187] As we determined with regard to the license area size, we find that the rapid changes in the mobile marketplace, including the growing importance of mid-band spectrum for large-scale 5G mobile service, necessitate that we revise the license term for PALs to best advance these goals.[188] Since the Commission adopted the 3.5 GHz band licensing rules in 2015, it has become apparent that supporting the rapid deployment of next generation mobile networks, including 5G, will require a combination of low-, mid-, and high-band spectrum, and that the 3.5 GHz band will play a significant role as one of the core mid-range bands for 5G network deployments throughout the world, as well as the first mid-band spectrum to be commercially available in this country for such deployments.[189] Considering the critical importance this band will play in the United States' competitiveness in the global 5G arena, we believe it is also important to ensure that our rules for the 3.5 GHz band support robust investment in large scale mobile deployments like 5G, as well as other use cases. For the reasons discussed below, we conclude that 10-year renewable license terms will strike the right balance of providing the certainty needed to foster robust investment in next generation wireless networks—including 5G networks—while still maintaining the flexibility needed to support innovative and localized opportunities for a wide variety of entrants.

47. First, review of the record persuades us that longer, renewable license terms will provide Priority Access Licensees with the level of certainty needed to promote robust investment and widespread deployment in the band. Many commenters maintain that longer, renewable license terms are necessary to incentivize robust investment in the band.[190] T-Mobile, for example, asserts that successful network buildout is a "multi-year process" that "includes standardizing a new frequency band, developing and certifying equipment, introducing a new band into end-user devices, and deploying infrastructure."[191] NRTC and NRECA likewise maintain that 10-year renewable licenses "would provide rural service providers and utilities the long-term certainty required to invest in mission critical solutions utilizing the CBRS spectrum."[192] And GeoLinks contends that longer license terms will allow PAL holders to work with equipment manufacturers to lower equipment costs, the savings from which can in turn can be reinvested in networks to achieve higher speeds and additional rollout.[193] Indeed, even some commenters supporting a three-year, non-renewable term concede that it will "deter large carrier investment . . . ."[194] Google argues that the investment that larger entities have already made in 3.5 GHz band technology demonstrates that a three-year, non-renewable term will not deter their participation in the band.[195] Such preparatory efforts certainly reflect an encouraging interest in the band, but do not guarantee a robust level of investment and deployment going forward. We believe that the certainty provided by a 10-year, renewable license is warranted to help ensure the kind of robust investment and deployment that will achieve global leadership in next generation wireless technologies, including 5G.

48. Our conclusion that a longer, renewable PAL license term is necessary to support robust

[187] *2017 NPRM*, 32 FCC Rcd at 8072, para. 2.

[188] *See supra* Section III, paras. 7-8.

[189] *See supra* Section I, para. 1.

[190] AT&T Comments at 3; CTIA Comments at 4; CTIA Reply at 8-11; Daniel Vincent Comments at 3; Ericsson Comments at 5; GeoLinks Reply at 4; Mobile Future Comments at 5; Nokia Comments at 2; NRTC/NRECA Comments at 3-4; Peoples Comments at 4; R Street Reply at 13; Union Pacific Comments at 6; TIA Comments at 2; T-Mobile Comments at 4; T-Mobile Reply at 2-6; USCC Comments at 9; Verizon Comments at 5; *see also* Texas Carriers Comments at 6 (agreeing that "a longer, renewable license term will encourage investment in the 3.5 GHz band and reduce the risk of stranded investment").

[191] T-Mobile Comments at 4.

[192] NRTC/NRECA Comments at 4.

[193] GeoLinks Reply at 4.

[194] RWA Comments at 7.

[195] *See* Google Comments at 15.

investment in the band is further supported by economic analyses in the record. For instance, Professor Connolly argues that infrastructure investment decisions depend on the present value of the expected increase in profits on the investment.[196] Professor Connolly explains that expected profits are a function of revenues and costs over the period a firm expects to use the investment, and thus, with shorter non-renewable licenses, expected profits will decrease.[197] As such, Professor Connolly contends that three-year license terms, even when coupled with the option to obtain two consecutive three-year terms in the first license period, would provide insufficient time for investment returns in an infrastructure-heavy industry.[198] She further asserts that, without license renewal, "license valuation, investment, and the subsequent value to consumers would be severely diminished relative to a more standard, ten-year FCC license term[] with a presumption of renewal."[199] Professor Vincent, reaching a similar conclusion, states that "short term licenses discourage long-term investments in comparison to long-term licenses and the utilization of secondary markets."[200] Professor Vincent provides two bases for his conclusion. First, he explains that short-term licenses prevent license holders from determining the optimal time to resell their licenses.[201] Second, he explains that a resale auction at the end of a short license term can create pricing distortions, which can prevent a license holder from capturing as much of its investment surplus as it could in a secondary market where it negotiates the resale price.[202] CTIA also cites a study by former Commissioner Harold Furchtgott-Roth that supports this conclusion. In that study, shorter, non-renewable license terms are listed as one of the factors likely to decrease market value for PALs by as much as 50 to 95 percent overall relative to similarly licensed spectrum in the 2.5-2.6 GHz band.[203]

49. Second, the Commission's experience managing other commercial spectrum supports adopting this modification. A 10-year renewable license term is consistent with the time-tested licensing frameworks that have proven successful in many other bands.[204] Further, the Commission recently concluded in the Spectrum Frontiers proceeding that this framework was particularly appropriate for a band important for 5G, finding that "a 10-year license term will give licensees sufficient certainty to invest in their systems, particularly as the new technology is still nascent and will require time to fully develop."[205] The record in this proceeding reaffirms that conclusion. As Mobile Future asserts, for example, a longer license term is "even more appropriate given the significant planning and testing involved in deploying new technology . . . ."[206] Further, the next generation flexible use deployments envisioned for this band —including 5G networks—involve large numbers of small cells, which add complexity and siting delays to roll out, particularly given that these deployments will often require new

[196] CTIA Reply, Attach. A at 4.

[197] *Id.*

[198] *Id.*

[199] *Id.*

[200] Daniel Vincent Comments at 3.

[201] *Id.* at 3-4.

[202] *Id.*

[203] CTIA Comments at 4-5 (citing Harold Furchtgott-Roth, *The Potential Market Value and Consumer Surplus Value of The Citizens Broadband Radio Service (CBRS) at 3550-3700 in the United States*, at B-1-2 (Nov. 2017), https://www.cbrsalliance.org/whitepapers).

[204] *See supra* para. 44.

[205] *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8077-78, para. 176; *see also Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567, 6875, para. 759 (2014) (adopting a 12-year initial term and 10-year license renewals in the 600 MHz Band).

[206] Mobile Future Comments at 6; *see also* Nokia Comments at 2; Union Pacific Comments at 7-8; CTIA Reply at 8.

sites (e.g., street lights, billboards, sides of buildings) with new power and backhaul requirements.[207] Longer, renewable license terms will provide time for licensees to contend with these complexities and challenges, and help to position the band for robust network development.[208]

50. Third, the adoption of larger license areas for PALs further supports the modification to PAL license terms. The Commission in 2015 adopted a three-year, non-renewable term partly based on the conclusion that the economics and upgrade cycles for the small use case "in the context of census tract license areas" might resemble those for enterprise and Wi-Fi deployments rather than the large mobile deployments in other bands.[209] We expect the larger license areas we have now adopted to be more attractive to wide area network operators than census tracts and, as such, we anticipate more large scale mobile deployments, including 5G. Given the nature and scale of such investments, the economics and upgrade cycles of such deployments will likely be closer to those in other bands used for mobile broadband, such as those bands addressed in Spectrum Frontiers, for which we also adopted a ten-year renewable license term, and we find that a longer period is appropriate to ensure a sufficient return-on-investment.

51. Fourth, as with the adoption of counties as the license area size for PALs, we find that 10-year, renewable terms are suited for a wide variety of entrants in both urban and rural areas. Ten-year renewable terms were supported by a diverse group of commenters, including mobile wireless providers, rural telecommunications and electric cooperatives, fixed wireless broadband providers, and equipment manufacturers.[210] Further, a large number of other parties, as part of a multi-stakeholder consensus, support adoption of a renewable license term, albeit with a term of seven years rather than 10.[211] We find

[207] Nokia Comments at 2-3; Mobile Future Comments at 6; *see also* Comcast Comments at 18-19; Verizon Reply at 10-11 (arguing that "[l]onger license terms recognize basic structural and business realities, including the substantial transaction, regulatory, and capital costs of deploying dense networks in urban environments"). Nokia observes that widespread deployment of small cells must contend with lengthy siting review processes. *See* Nokia Comments at 3; *see also Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, Second Report and Order, FCC 18-30, paras. 1-8 (rel. Mar. 30, 2018) (discussing the impact of siting review processes on small cell deployments, including for 5G and enhanced 4G). We note that our recent infrastructure action addressing the application of Sections 253 and 332 to state and local government regulation of deployment of "small wireless facilities" would, of course, extend to those 3.5 GHz deployments that constitute "small wireless facilities." *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, Declaratory Ruling and Third Report and Order, FCC 18-133 (rel. Sept. 27, 2018). Similarly, we note that our *Second Report and Order* in WT Docket No. 17-79 found it in the public interest to "eliminate NEPA [National Environmental Policy Act] and NHPA [National Historic Preservation Act] compliance requirements for all small wireless facility deployments as defined [t]herein." *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, Second Report and Order, FCC 18-30, at paras. 38, 66, 73, & app. B (amending 47 CFR § 1.1312). In anticipation of the imminent deployment of 3.5 GHz service, we take this opportunity to make clear that this decision, based on the limited degree of federal control over such deployments, extends to small wireless facilities deployed in the 3.5 GHz band. Such facilities are licensed either (in the case of PAL licenses) on a geographic area basis, or (in the case of GAA service) without the requirement or issuance of any individual license by the Commission of any kind, site-specific or otherwise, and with no geographic limitation other than as determined through dynamic frequency coordination through the SAS.

[208] *See* Nokia Comments at 2-3; Mobile Future Comments at 5-6; Comcast Comments at 18-19; CTIA Reply at 8; Union Pacific Comments at 6-8; Verizon Comments at 5.

[209] *See 2015 Report and Order*, 30 FCC Rcd at 3996, para. 110.

[210] *See*, *e.g.*, AT&T Comments at 3; GeoLinks Reply at 4; Nokia Comments at 2; NRTC/NRECA Comments at 3-4; Peoples Comments at 1, 4; Union Pacific Comments at 6; TIA Comments at 2; T-Mobile Comments at 3, 4; USCC Comments at 9; Verizon Comments at 4.

[211] *See* Multi-Stakeholder June 8, 2018 *Ex Parte* at 3-4 (urging the Commission to adopt a license framework for 3.5 GHz band PALs that includes seven-year, renewable terms), 7 (listing companies and associations in support,

their support for renewability and a term only somewhat shorter than the one we adopt is further evidence that a 10-year, renewable term will serve a wide diversity of entrants. Regarding access by rural providers in particular, we note that the Commission's Mobility Fund II, which funds wireless broadband buildout, provides support in 10-year terms "in light of the significant capital and effort needed to deploy and upgrade broadband networks and [because it] is consistent with the timeframe used by rural carriers to plan and schedule network upgrades."[212] Indeed, some commenters maintain that longer license terms and renewability are necessary to incentivize rural service providers and utilities to invest in 3.5 GHz band networks.[213]

52. We are not persuaded by commenters who argue that the longer term and renewability will make PALs broadly uneconomical for rural and innovative investments or lead to a less efficient use and distribution of the band.[214] As discussed in Professor Connolly's economic analysis, a licensee's expected profits from license acquisition should generally increase with a longer term and renewability.[215] While Google challenges this assertion, arguing that extending the term will force prospective licensees to acquire spectrum for a longer period than they need, it offers no evidence that there is any mismatch between the longer term and the use cases discussed in the record.[216] Numerous parties with various use cases, including rural WISPs and industrial entities, assert that they seek to deploy with the use of PALs, and they do not assert that their need for or use of such priority access will terminate by some fixed period, or that they plan to switch to GAA spectrum after that period.[217] We anticipate that the longer, renewable term will provide additional value to small and rural entities seeking to use spectrum for commercial broadband networks and other uses that involve significant long-term investments, and that the greater value to small and rural entities will help such entities absorb a higher acquisition cost at auction to the extent it may result from such terms.

53. Other aspects of our revised framework should further help ensure that small and rural providers have affordable access to the 3.5 GHz band. The bidding credits we adopt for small businesses and rural providers will directly help them to compete for PALs at auction without compromising the certainty needed for substantial long-term investment. Our actions to expand access through the secondary market will also help facilitate access to PALs. As Professor Vincent remarks, "[i]n the presence of efficient and liquid secondary markets, incumbent owners who are no longer the most efficient users are able to resell the licenses to emerging alternative users who have better uses for the

(Continued from previous page)
including Charter, Cox, EI, EWA, Exelon, Fed Ex, Frontier, GE, Google, Motorola, NRECA, NRTC, NCTA, pdvWireless, Port of LA, Ruckus, RWA, Southern Linc, Transit, Union Pacific, UTC, Windstream, and WISPA).

[212] *Connect America Fund; Universal Service Reform – Mobility Fund*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 2152, 2191, para. 91 (2017).

[213] NRTC/NRECA Comments at 4; Texas Carriers Comments at 1-3, 6 (stating they provide service in rural and underserved areas, and supporting a longer, renewable term, "preferably ten (10) years," which "will encourage investment, . . . allow carriers a return on investment," and reduce the risk of stranded investment"); *see also* Peoples Comments at 1, 4 (same); Midco Aug. 29, 2018 *Ex Parte* at 1-2 (stating that it is seeking to deploy "its fixed wireless product more broadly in the most rural and remote areas of our footprint" and that "[a] longer PAL term allows Midco the security to build out our fixed wireless network using the CBRS band").

[214] *See, e.g.*, Cal.net Comments at 5; Cantor Comments at 6-7; City of LA Reply at 5; City of NY Comments at 1; DSA Comments at 10; GE Comments at 39; Google Comments at 14-15; NCC Comments at 9-10; OTI/PK Comments at 29-30; OTI/PK Reply at 26-28; Port of LA Reply at 2; Sacred Wind Comments at 7; Southern Linc Comments at 11; UTC Comments at 4; Vivint Comments at 3; Vivint Reply at 6; William Lehr Comments at 14-16; *see also* William Lehr Comments at 16 (arguing that longer, renewable licenses would create market inefficiencies, and would effectively foreclose or significantly diminish the attractiveness of the 3.5 GHz band to industrial, rural, and other users).

[215] *See* CTIA Reply, Attach. at 4.

[216] *See* Google Comments at 14; *see also* William Lehr Comments at 14.

[217] *See infra* note 252.

asset."[218] As discussed elsewhere, we are not persuaded by commenters' claims that small entities will be unable to participate in secondary market transactions.[219] Further, GAA spectrum will continue to be available on an opportunistic basis, and may be particularly suitable for short-term investments. Taking all these factors into account, we find that, to the extent a change to a longer-term, renewable license might still result in some reduction in liquidity in the market for priority spectrum access or otherwise raise the cost of access,[220] the benefits of longer, renewable terms outweigh these concerns.

54. Finally, while commenters advocate for a variety of license terms shorter than 10 years, with limited or no renewability,[221] we are not persuaded that these other options would encourage investment as effectively and efficiently as a 10-year renewable license. Many commenters maintain that less than a 10-year license term is insufficient for investors to obtain a return on investment.[222] Several commenters also contend that, without reasonable expectancy of license renewal, many potential entrants may be dissuaded from investing in the band because of the risk of stranded investment.[223] We conclude that our revised framework, when taken as a whole, appropriately addresses the needs of a wide variety of stakeholders, including those that wish to use the band for short-term purposes and those providers that require more certainty and stability, and will result in greater overall investment and deployment while still providing a wide variety of stakeholders with the opportunity to participate in this innovative band.

55. Regarding license renewal, we note that, last year, the Commission adopted a unified renewal framework for Wireless Radio Services (WRS) to replace the then-existing patchwork of service-specific rules for renewal.[224] Consistent with that reform, we find it appropriate to include PALs in the unified WRS renewal framework rather than create a service-specific standard. Consequently, PAL

[218] Daniel Vincent Comments at 2-3. We further note that secondary market transactions should help to facilitate business model experimentation, as parties may sell licensees they are no longer using, and thereby recover some or all of any additional cost from longer, renewable terms.

[219] *See infra* Section III.C.

[220] *See, e.g.*, Cantor Reply at 3; DSA Reply at 7.

[221] *See, e.g.*, Alaska Communications Comments at 3-5 (renewable 10-year term for four PALs and five-year term for 3 PALs); API/ENTELEC Comments at 3-4 (renewable five-year term); Baicells Comments at 4-5 (five-year term with option to double the term at initial auction); Blooston Comments at 10-11 (five-year term); Blooston Reply at 7-8; Cantor Reply at 5 (five-year term with one-time renewability); CenturyLink Reply at 5 (renewable three-year term); Comcast Comments at 16-18 (renewable seven-year term); Comcast Reply at 9-10; EWA Comments at 5-6 (five-year term with single renewal term); Microsoft Comments at 3-4 (six-year, non-renewable license); MSI Comments at 6 (five-year term with single renewal term); NCTA Comments at 11-12 (renewable seven-year term); NTCA Comments at 9-10 (renewable five-year term); NTCA Reply at 9-10; Ruckus Comments at 6-8 (five- to seven-year term); Ruckus Reply at 4; RWA Comments at 9-10 (no more than five-year term); Texas Carriers Comments at 6-7 (five- to 10-year term); Transit Comments at 2 (three-year term for small PALs and seven- to 10-year term for larger PALs); Vivint Reply at 6-7 (five-year term with single renewal term); WISPA Comments at 40 (five-year term with single renewal term). As discussed below, we decline to adopt the Starry Proposal as it relates to performance requirements and thus need not reach Starry's proposal at it relates to renewal.

[222] *See, e.g.*, AT&T Comments at 3; AT&T Reply at 3; CTIA Reply at 9, Attach. A at 4; Daniel Vincent Comments at 3; Mobile Future Comments at 5-6; Mobile Future Reply at 3-4; Union Pacific Comments at 6; Verizon Reply at 11.

[223] *See, e.g.*, NRTC/NRECA Comments at 4; Peoples Comments at 4; T-Mobile Comments at 4-5; Union Pacific Comments at 6; USCC Comments at 9-11.

[224] *See Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services*, Second Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 8874 (2017) (*WRS Renewal Reform 2nd R&O* and *WRS Renewal Reform FNPRM*, respectively).

licensees must comply with section 1.949 of our rules.[225] Under that section, each PAL licensee, in order to qualify for renewal, must demonstrate that over the course of its license term, the licensee either: (1) provided and continues to provide service to the public, or (2) operated and continues to operate the license to meet the licensee's private, internal communications needs.[226] Like other WRS licensees, Priority Access Licensees may avail themselves of appropriate safe harbors contained in section 1.949(e) or make a Renewal Showing consistent with 1.949(f).[227] We find that including PALs in the unified WRS renewal framework is consistent with the Commission's determination in the *WRS Renewals Second Report and Order* that "uniform renewal rules [across different Wireless Radio Services] will promote the efficient use of spectrum resources, serve the public interest by providing licensees certainty regarding their license renewal requirements, encourage licensees to invest in new facilities and services, and facilitate their business and network planning."[228] We also believe that in this band, such an approach "will provide incentives for licensees to continue to provide service" over their license terms.[229]

56. Some commenters have argued that, instead of renewability, the licenses should be reauctioned at the end of the license term. For example, Professor Milgrom describes an auction format under which an incumbent would be required to bid for a renewal of its license at the end of the license term, but it would be given a bidding credit so that, if it won, it would have to pay only a fraction of the auction-determined price.[230] Moreover, if the incumbent loses, it would be compensated with a transferable bidding credit to apply to the purchase of other licenses.[231] Professor Milgrom argues that this format would mitigate the risk that the incumbent licensee's investments may become stranded.[232] Professor Milgrom's proposal gained little support in the record, however.[233] Moreover, several commenters, opposing this proposal, argue that a "foothold" auction system will lower license valuations and initial investments in the band due to its complex approach within the setting of three-year terms and unknown subsidy rates.[234] We therefore decline to adopt this proposal in place of the time-tested approach of providing for renewability.

[225] 47 CFR § 1.949.

[226] *Id.* § 1.949(d).

[227] Our permanent discontinuance rule defines the allowable period during which a WRS licensee may discontinue service or operations without jeopardizing its license, defining that period as 180 consecutive days for providers operating under geographic licenses. *See* 47 CFR 1.953(b). Herein, we resolve issues regarding whether PAL licenses will be renewable and subject to the WRS framework, and we adopt additional performance requirements. *See 2017 NPRM*, 32 FCC Rcd at 8076-78, paras. 13-18 (seeking comment on adopting longer license terms, renewability, and performance requirements). As part of these decisions, we also specify that PAL licensees will also be subject to the WRS permanent discontinuance rule contained in section 1.953. Service continuity is a cornerstone of our renewal framework and one of the mechanisms for verifying that renewal is warranted. *See Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services*, Second Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 8874, 8877-78, para. 10 (2017).

[228] *See WRS Renewal Reform 2nd R&O*, 32 FCC Rcd at 8876, para. 5.

[229] *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8078, para. 177.

[230] Letter from Paul Milgrom, Auctionomics, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-354, at 6, para. 24 (filed Aug. 8, 2017) (Milgrom Letter).

[231] *Id.* at 6, para. 24.

[232] *Id.* at 6, para. 25.

[233] *See* Google Comments at 18; MSI Comments at 7; WISPA Comments at 42.

[234] CTIA Reply, Attach. A at 18-21; *see also* CTIA Comments at 5-6; T-Mobile Comments at 5-6 (arguing that a renewal bidding credit "would still leave too much uncertainty as to a licensee's ability to retain its authorization, depressing investment"); Verizon Comments at 6 (noting that renewal auctions negate the advantages of longer license terms and risk stranding investment).

### 3. Performance Requirements

57. *Background.* In the *2015 Report and Order*, the Commission determined that, in light of the three-year license term and non-renewability of PALs, the rules permitting opportunistic GAA use, and the relatively inexpensive deployment costs, "winning bidders for PAL licenses at auction will have sufficient incentive to deliver service so as to avoid the need for prescribing any further performance requirements."[235] In the *2017 NPRM*, the Commission sought comment on whether to adopt performance requirements for PALs, and if so, which type, if they are licensed with a longer term and renewability.[236]

58. A few commenters, including Ericsson and Verizon, argue that, even if we adopt a longer term and renewability, we should not impose performance requirements on Priority Access Licensees. These commenters contend that performance requirements may impede innovative network deployments and that, given the presence of the GAA tier and the "use or share" access model, performance requirements are not necessary to ensure that the spectrum is utilized.[237] The vast majority of commenters addressing this question, however, argue that, if we adopt a longer, renewable license term, we should also adopt performance requirements to prevent spectrum hoarding, ensure that PALs are appropriately and efficiently used, and satisfy statutory mandates.[238]

59. Commenters favoring performance requirements support widely varying approaches to performance requirements for PALs. For example, some commenters recommend adoption of a substantial service requirement, potentially with safe harbors.[239] Others recommend a wide range of coverage benchmarks, requirements, and methodologies.[240] Some commenters also propose, depending on the license term, that we adopt interim requirements, or provide that on renewal, a PAL should carry a new set of buildout requirements.[241] In addition, several commenters argue in favor of performance

[235] *2015 Report and Order*, 30 FCC Rcd at 3997, para. 113.

[236] *See 2017 NPRM*, 32 FCC Rcd at 8077, para. 17.

[237] *See* Ericsson Comments at 5-6; Verizon Comments at 7-8.

[238] *See* Alaska Communications Comments at 4-5; API/ENTELEC Comments at 4; ATN Comments at 8; AT&T Comments at 13-14; Charter Comments at 4-5; City of NY Comments at 3-4; Comcast Comments at 2, 20-22; DSA Comments at 11; GeoLinks Comments at 4; NRTC/NRECA Comments at 4; NCTA Comments at 13; OTI/PK Comments at 34; Peoples Comments at 1, 4; Ruckus Comments at 8; T-Mobile Comments at 6-7; Transit Comments at 2; Union Pacific Comments at 11; Charter Reply at 5; Federated Wireless Reply at 8.

[239] *See* AT&T Comments at 13-14; KWISP Comments at 5; NRTC/NRECA Comments at 4; *see also* Letter from Greg Kunkle, Keller and Heckman, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, Attach. at 9 (filed Feb. 22, 2018) (NRTC, NRECA & NTCA *Ex Parte*); Letter from Scott K. Bergmann, CTIA, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258, 2 (filed July 2, 2018) (CTIA July 2, 2018 *Ex Parte*) (supporting adoption of a substantial service performance requirement coupled with a safe harbor based on population coverage).

[240] *See, e.g.*, Alaska Communications Comments at 4-5 (50 percent coverage of the population if license term is 10 years, but proposing that Connect America Fund (CAF)-supported licensees have no specific performance requirements beyond a substantial service requirement); T-Mobile Comments at 7 (recommending 40 percent coverage of the population); Transit Comments at 2 (proposing, for three-year licenses, 20 percent buildout after the first term, or 40 percent after the second term, and for seven-year licenses, 40 percent buildout after three years, and 70 percent buildout at end-of-term); CTIA July 2, 2018 *Ex Parte* at 5 (supporting a 40 percent population coverage safe harbor for performance); *see also* GeoLinks Comments at 4 (recommending adoption of a geographic area percentage sufficient to ensure that unserved areas "are not left behind"); Ruckus Comments at 8 (proposing we establish a benchmark for cumulative average population or geographic coverage by the licensee, in order to incentivize both early deployment and continuous service); CenturyLink Reply at 6 (arguing that licenses used to achieve CAF objectives should have performance requirements that align with the CAF performance obligations); Starry Mar. 19, 2018 *Ex Parte* at 3-4 (proposing licensees be required to make a payment into the U.S. Treasury at the end of term as a performance requirement).

[241] *See, e.g.*, GeoLinks Comments at 4 (recommending renewal construction requirements); Transit Comments at 2 (proposing, for seven-year term licenses, interim performance requirements at three years); Federated Wireless

requirements generally, but do not make any specific proposals.[242] Commenters also address how performance requirements should be applied or administered; some recommend, for example, that we adopt interim reporting requirements or use-or-lose type enforcement mechanisms.[243] Some commenters contend that coverage by spectrum lessees should count towards performance requirements or urge the Commission to adopt other performance related-measures to promote secondary market transactions.[244]

60. *Discussion.* We find that, given the changes to PALs adopted herein (i.e., longer license terms, larger license areas, and renewability), it is in the public interest to revise our rules to adopt new end-of-term performance requirements for PALs. Specifically, we require Priority Access Licensees to provide a bona fide communications service that meets a "substantial service" standard of performance, and we adopt two specific safe harbors to meet this standard, one for mobile or point-to-multipoint services and a second for point-to-point services. A licensee providing a mobile service or point-to-multipoint service may demonstrate substantial service by showing that it provides reliable signal coverage and offers service over at least 50 percent of the population in the license area. A licensee deploying a point-to-point service may demonstrate substantial service by showing that it has constructed and operates, using Category B CBSDs, at least four links in license areas with 134,000 population or less, and at least one link per 33,500 population (rounded up) in license areas with greater population. Licensees may fulfill their performance requirements by showing that they meet at least one of these safe harbors, or they may make an individualized showing of substantial service by relying, for example, on a combination of different services for which there is a safe harbor or on services for which there is no defined safe harbor.

61. We conclude that new performance requirements are warranted given the other changes to the PALs that we adopt in this Report and Order. Performance requirements promote the productive use of spectrum, encourage licensees to provide service in a timely manner, and promote the provision of innovative services and technologies in unserved areas, particularly rural ones.[245] Further, Section 309(j)(4)(B) of the Act requires that the Commission, in establishing rules for auctioned licenses, must "include performance requirements, such as appropriate deadlines and penalties for performance failures . . . ."[246] These considerations have led the Commission to require licensees to meet a particular standard

(Continued from previous page)
Reply at 8 (suggesting coverage requirement that increases over time); *see also* Comcast Comments at n.69 (suggesting that renewal term performance requirement options being considered in the pending WRS Reform proceeding may be appropriate for PALs (citing *WRS Renewal Reform FNPRM*)); Letter from Michael Calabrese, Director, Wireless Future Program, OTI, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 8 (filed Oct. 16, 2018) (PISC Oct. 16, 2018 *Ex Parte*) (proposing interim requirement at 5 years, enforced by "keep what you use" mechanism); Access Humboldt et al. *Ex Parte* at 2 (asking for interim performance obligations or a shorter license term). In a joint letter, some rural providers and advocacy groups asks us "to include 'use or share'" in in this Report and Order. *See* Access Humboldt et al. *Ex Parte* at 2. We note that the dynamic sharing framework for the band already relies on a use-or-share model, with opportunistic GAA access to PAL channels when such channels are not in use. To the extent these groups are asking for a "keep what you use" model, we reject this idea herein. *See infra* para. 73.

[242] *See, e.g.*, ATN Comments at 8; Charter Comments at 4-5; NCTA Comments at 13.

[243] *See* GeoLinks Comments at 4-5 (proposing reporting requirements and adoption of rules that would allow other interested parties to acquire the unused portion of the PAL license areas); OTI/PK Comments at 34 (proposing that, if the Commission adopts license areas larger than census tracts, it should still require that each census tract be served, and that any census tract not served after the initial term should be returned for auction as a small area PAL); RWA Comments at 10; Cantor Reply at 5-6; *see also* KWISP Comments at 5 (proposing that licensees must provide substantial service in each census tract).

[244] *See* Federated Wireless Comments at 10; Ruckus Comments at 18.

[245] *See Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8084, para. 191; *see also* 47 U.S.C. § 309(j)(4)(B).

[246] 47 U.S.C. § 309(j)(4)(B).

or metric for performance in numerous other bands.[247] The Commission found in 2015 that Priority Access Licensees had sufficient incentive to use their licensed spectrum that similar requirements were not necessary, in part due to the short license term and non-renewability.[248] Given that the revised PALs will have a longer license term and renewability, as well as larger license areas, we find that the revised PALs are comparable to licenses in the other bands for which the Commission has adopted a standard or metric for performance. Consistent with these past Commission actions, we adopt such a performance requirement for the revised PALs to meet our obligations under Section 309(j)(4)(B), to reduce warehousing, and to promote timely and efficient use of spectrum, including in rural areas.

62. We also find that, given the revised PAL parameters adopted herein, the potential for opportunistic GAA use of unused PAL spectrum does not obviate the need for performance requirements. Under the current rules, GAA users can operate in unused 3.5 GHz band spectrum on an opportunistic basis.[249] GAA users will be excluded from operating only to the extent that the Priority Access Licensee actually operates over a given channel within its license area (i.e., only from the PAL Protection Area surrounding a deployed CBSD).[250] Given the other changes to PALs adopted herein (e.g., 10-year license terms, renewability, larger license areas), we do not believe that opportunistic GAA use is, in itself, sufficient to prevent warehousing and encourage robust spectrum use. Absent performance requirements, the revisions to PALs likely will increase incentives for parties to seek PALs for speculative investment or warehousing. Such conduct could prevent intensive use of the band and reduce overall investment notwithstanding the option of GAA use. Notably, a lack of PAL performance would increase the uncertainty for GAA users surrounding long term spectrum availability. Potential GAA users would have little idea regarding when, where, and with what technology Priority Access Licensees may ultimately choose to deploy, which could reduce the incentive for GAA users to invest and innovate in the band.[251]

---

[247] *See, e.g.*, *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8088, paras. 203-05; *Expanding the Economic and Innovations Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567, 6877, para. 764 (2014) (*Incentive Auction Report and Order*); *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780, and 2155-2180 MHz Bands*, Report and Order, 29 FCC Rcd 4610, 4659-60, paras. 135-37 (2014) (*AWS-3 Report and Order*); *Service Rules for Advanced Wireless Services H Block – Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz and 1995-2000 MHz Bands*, 28 FCC Rcd 9483, 9558-60, paras. 195-200 (2013) (*H-Block Report and Order*); *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Band et al.*, Report and Order and Order of Proposed Modification, 27 FCC Rcd 16102, 16173-74, para. 187 (2012) (*AWS-4 Report and Order*); *Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band et al.*, Report and Order and Second Report and Order, 25 FCC Rcd 11710, 11789, para. 191 (2010) (*WCS Report and Order*); *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Third Memorandum Opinion and Order and Second Report and Order, 21 FCC Rcd 5606, 5720, para. 278 (2006) (*BRS/EBS 2nd Report and Order*); *Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Report and Order, 18 FCC Rcd 25162, 25192, para. 75 (2003) (*AWS-1 Report and Order*).

[248] *See 2015 Report and Order*, 30 FCC Rcd at 3997, para. 113.

[249] *See id.* at 3983, para. 72; 47 CFR § 96.35(a).

[250] *See 2016 Report and Order*, 31 FCC Rcd at 5060-61, paras. 176-179; 47 CFR §§ 96.25(c) (allowing GAA use only "in areas outside of PAL Protection Areas"), 96.25(c)(1) (providing that a CBSD will be considered in use for purposes of calculating a PAL Protection Area if it is both registered and authorized for use on a Priority Access basis by an SAS), 96.25(c)(2) (defining a default protection contour that will be the outer limit of the PAL Protection Area for any CBSD but permitting a Priority Access Licensee to choose a contour smaller than the default).

[251] *See* Charter Comments at 4 ("[W]ithout performance requirements, a PAL licensee, who could at any moment activate a claim to its previously unused spectrum, poses a persistent threat to the business model of any network entity attempting to employ that spectrum as GAA."); *see also* WISPA Oct. 17, 2018 *Ex Parte* at 3 (arguing that the

Further, the record indicates that there is significant demand for 3.5 GHz spectrum that is contingent on the ability to obtain interference protection, and while an unused PAL will not foreclose GAA use, it can preclude others from deploying in that area with the benefit of priority access.[252] Adopting performance requirements in the 3.5 GHz band will encourage Priority Access Licensees to make timely and productive use of their licenses, and to the extent they choose not to do so, will incentivize them to make priority access to spectrum available to others through secondary market transactions.[253] Accordingly, we find that adopting performance requirements in this band is in the public interest.

63. After review of the record, and the various alternatives for performance requirements discussed therein, we conclude that an end-of-term performance requirement of substantial service, with certain specific safe harbors, is the appropriate requirement for the revised PALs.[254] Many commenters emphasize the importance of ensuring that performance requirements do not inhibit the innovation anticipated in this band.[255] We find that the substantial service requirement we adopt, with appropriate safe harbors for different types of network deployments, will provide licensees with the flexibility to deploy new and innovative technologies while ensuring that the spectrum is used in a productive manner by the end of the license term.

64. In particular, we find that specific safe harbors for different types of network deployments will provide additional regulatory certainty that will promote investment and encourage

(Continued from previous page)
Commission's proposed buildout rules would "encourage more intensive use of General Authorized Access spectrum in areas PAL holders elect to leave unserved").

[252] *See* Cloud Alliance Comments at 1-2 (indicating that operating only with GAA would be "fraught with risk" and investment in 3.5 GHz will depend on PALs); GE Comments at 25 ("[F]or GE and its industrial and critical-infrastructure customers, General Authorized Access ('GAA') spectrum is not a viable alternative to census-tract PALs . . . . GE's wireless solutions support mission-critical functions [and] PAL spectrum . . . offers the certainty needed for these important operations."); KWISP Comments at 5; NCTA Comments at 13-14; Southern Linc Comments at 7 (asserting that "[a]lthough the use of spectrum on a [GAA] basis may be appropriate in some instances, many of these applications, services, and deployments will require the guarantees of access to spectrum and protection from interference that are provided by PALs"); T-Mobile Comments at 8 (arguing that "the certainty of having access to the band through holding a PAL supports an end-of-term performance requirement"); USCC Comments at 15 (stating that "a variety of potential CBR Service providers require the quality of service guarantees that will only be available in the 3.5 GHz band via a PAL, including broadband service providers, hospitals, utilities and other critical infrastructure industries, and providers of video surveillance, telemetry, and monitoring services"); WISPA Comments at 22-23 (indicating, *inter alia*, that many WISPA members "cannot effectuate business plans without PAL spectrum"); Ruckus Reply at 4-5; UTC Reply at 4; *see also* Comcast Comments at 22 (arguing that "even if warehousing of spectrum itself is not a concern for the 3.5 GHz band, foreclosing others from obtaining priority access rights is").

[253] Similarly, given the revised terms of PALs, we are not persuaded that merely requiring an end-of-term payment, as proposed by Starry, would satisfy our statutory obligation under Section 309(j)(4)(B) to adopt performance requirements. *See* Starry Mar. 19, 2018 *Ex Parte* at 3-4. Further, putting other legal issues aside, we are not convinced that this proposal would be as effective as the performance requirements we adopt in fostering robust, efficient and innovative use of the band.

[254] For this purpose, we define substantial service, consistent with how it has been defined in Part 27 and many other performance contexts, as service which is sound, favorable, and substantially above a level of mediocre service which just might minimally warrant renewal. *See, e.g.*, 47 CFR § 27.14(a).

[255] *See* AT&T Comments at 13-14; ATN Comments at 8; Charter Reply at 5 (arguing that, "[c]onsistent with the innovative nature of the 3.5 GHz band, the Commission should adopt performance requirements that reflect the potential range of uses for this spectrum while ensuring that licensees actually deploy service"); Ericsson Comments at 6 (arguing that "CBRS can deliver new and unexpected uses that do not lend themselves to traditional buildout requirements" and requesting that "any mandates not dictate a single requirement, but rather allow for different requirements based on the multiple use cases expected in the band"); Federated Wireless Reply at 8 (arguing that "a variety of CBRS uses and use cases will emerge, and utilization standards should be flexible."); WISPA Reply at 30-31; CTIA July 2, 2018 *Ex Parte* at 4.

robust deployment in the band. Priority Access Licensees will have the option of satisfying their end-of-term performance requirement by demonstrating that they have provided service that meets or exceeds one of the safe harbors or making an individualized showing of substantial service in the license area. We believe that this approach will incentivize licensees to provide service throughout their license areas while retaining the flexibility to deploy new and innovative services. In addition, we anticipate that the option of opportunistic GAA use, while not eliminating the need for new performance requirements, will complement such requirements and provide a low-cost entry point in the band. This should promote additional use of spectrum assigned to PALs and thereby help ensure efficient and productive use of the band.[256] For these reasons, we find that a substantial service standard, with appropriate specific safe harbors, adequately safeguards effective use of spectrum in the 3.5 GHz band and satisfies our obligations under Section 309(j)(4)(B).

65. In selecting an appropriate safe harbor for mobile and point-to-multipoint services, we note that a wide range of metrics are proposed in the record.[257] In addition, the Commission has adopted a range of performance standards for similar services in other spectrum bands.[258] We find that several considerations in this band weigh in favor of a safe harbor that provides licensees with relatively greater flexibility. First, such flexibility is appropriate given the power limits for deployments in the 3.5 GHz band. The Commission adopted significantly lower limits in this band than it has typically imposed in other bands in order to reduce coexistence challenges and with the expectation that deployment in the 3.5 GHz band would often focus on innovative low-power technologies.[259] The adopted power limits and the technologies that we anticipate will be appropriate for them may bring significant localized benefits such as increased network capacity, but they may be less suitable for wide-area coverage as compared to other bands.[260] A more flexible safe harbor will therefore better accommodate these technologies and promote

[256] *See 2015 Report and Order*, 30 FCC Rcd at 3983, 4009, paras. 72, 155 (finding that GAA availability provides a "low-cost entry point" that would "ensure that the band will be in consistent and productive use"); *see also id.* at 4009, para. 155 ("We believe that GAA availability will promote competition, encourage flexible network deployments, and facilitate the efficient use of available spectrum."); CenturyLink Reply at 6 (arguing that if the Commission allows sufficient opportunity for GAA use of PAL-licensed spectrum that is not being used, performance requirements for PAL renewal can be more relaxed); WISPA Oct. 17, 2017 *Ex Parte* at 3 (stating that "WISPA representatives expressed support for the proposed build-out rules, which would encourage more intensive use of General Authorized Access spectrum in areas PAL holders elect to leave unserved").

[257] *See supra* note 240.

[258] *Compare, e.g.*, *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8088, para. 206 (requiring 40 percent population coverage after 10 years), *with Incentive Auction Report and Order*, 29 FCC Rcd at 6878, para. 764 (requiring 75 percent population coverage after 12 years).

[259] *See 2015 Report and Order*, 30 FCC Rcd at 4024, para. 260, 4026-27, para. 214; *see also 2016 Order on Reconsideration*, 31 FCC Rcd at 5032, para. 78 (rejecting requested increase of Category B power limit above 47 dBm/10 MHz). For example, the current rules for AWS-1, AWS-3, AWS-4, and PCS limit base station power to 1640 watts per MHz EIRP for emission bandwidths of greater than 1 MHz in non-rural areas (equivalent to 72 dBm/10 MHz), and double that (3280 watts/MHz) in rural areas (equivalent to 75 dBm/10 MHz). *See* 47 CFR §§ 24.232, 27.50; *see also 3.7-4.2 GHz NPRM*, FCC 18-91, at para. 164. Even the lower non-rural limit for these bands is approximately 316 times the 3.5 GHz limit of 47 dBm/10 MHz for Category B devices and 15,800 times the 3.5 GHz limit of 30 dBm/10 MHz for Category A devices.

[260] *See 2016 Order on Reconsideration*, 31 FCC Rcd at 5032, para. 76 (noting that while higher power limits may reduce deployment costs by enabling coverage with fewer deployments, lower limits could lead to reduced coexistence challenges, increased spatial reuse of the band, and greater aggregate network capacity), 5032, para. 78 (rejecting increase of Category B power limit above 47 dBm in part out of concern for "negative effects on the interference environment in the band"), 5032-33, para. 80 (finding increase in Category A limits would "likely present significant coexistence challenges"); *see also 2015 Report and Order*, 30 FCC Rcd at 3961, 3992, paras. 1, 98 (noting that "[t]he 3.5 GHz Band has physical characteristics that make it particularly well-suited for mobile broadband employing small cell technology," which can provide "broadband coverage and capacity in targeted geographic areas"); Ericsson Comments at 3 (asserting that the Citizens Broadband Radio Service will be "a good candidate for augmenting capacity needs"); Google Comments at 4 (stating that, "according to Google's field tests

the innovation we anticipate in the band.[261] In addition, the Commission's rules incorporate several other measures to facilitate coexistence that may introduce some uncertainty in the timing, cost, interference management, or technical specifics of deployment, such as limitations on commercial operations to protect incumbent users,[262] the SAS authority to require, in specific cases, power reduction below the rule limits (and potentially other technical restrictions), and the potential for dynamic spectrum re-assignments or even cessation of operations to which licensees will be subject to protect incumbent operations.[263] We find that these unique aspects of the licensing and authorization regime in the 3.5 GHz band generally supports providing licensees with greater flexibility in deployment than the Commission has provided in some other bands.

66. In addition, a flexible performance requirement for mobile and point-to-multipoint may provide particular benefits to WISPs and other small providers in the 3.5 GHz band. The record supports the conclusion that many small providers seek to overlay existing service areas that may incompletely cover a PAL license area, such as those who have deployed networks targeting unserved or underserved rural populations under the Commission's prior 3650-3700 MHz service rules.[264] A flexible requirement that allows these providers to implement such overlay or incremental strategies will thus benefit small entities and help to foster a diversity of users in the band.[265] Further, we anticipate that opportunistic GAA use, although not eliminating the need for performance requirements, will complement such requirements and help to ensure that spectrum is used productively, including in rural areas. Accordingly, we do not need to rely as heavily on performance requirements to ensure intensive and productive use in the 3.5 GHz band as in other bands.

(Continued from previous page)
of CBRS equipment, an operator would need to deploy more than 1,271 high-power 3.5 GHz base stations to cover even half of the average PEA").

[261] *See, e.g.*, T-Mobile Comments at 6-7.

[262] *See* 47 CFR § 96.15 (establishing service limitations for the protection of Federal Incumbent Users); *2015 Report and Order*, 30 FCC Rcd at 4038-39, paras. 259-62 (providing that, prior to ESC deployment, only Category A CBSDs may be deployed, and only outside of Exclusion Zones); *Promoting Investment in the 3550-3700 MHz Band*, Order, DA 18-538, para. 6 (WTB/OET rel. May 22, 2018) (adopting partial waiver allowing an SAS to implement Dynamic Protection Areas (DPAs) instead of Exclusion Zones, and requiring that DPAs, which will exclude 3.5 GHz CBSD operation when active to protect federal radar operations, must be set to active status until an ESC has been authorized that covers the relevant DPA, and noting that "[w]e expect that ESC sensors will be authorized and deployed on a rolling basis"). We note that certain parties have been conditionally approved as ESC operators, but these parties are not, at least currently, subject to any specific deployment deadlines. *See Wireless Telecommunications Bureau and Office of Engineering and Technology Conditionally Approve Four Environmental Sensing Capability Operators for the 3.5 GHz Band*, Public Notice, 33 FCC Rcd 1942 (WTB/OET 2018).

[263] *See 2016 Order on Reconsideration*, 31 FCC Rcd at 5033, para. 81 (emphasizing that 3.5 GHz power limits "should not be construed as a guaranteed power level for CBSD deployments" and that "CBSDs must still comply with the Commission's rules to prevent interference to Incumbent Users, including the requirements to operate only at power levels and in locations authorized by the SAS"), 5034, para 84 (noting that Category B CBSDs are required to report antenna height as part of their registration with an SAS, that SASs are required to take such information into consideration when calculating potential interference effects and protection distances, and that the protection criteria set forth in the rules "may require an effective limit on Category B antenna elevation in some cases").

[264] *See, e.g.*, StraightUpNet Comments at 1 (stating that it currently makes service available to "30%-40% of the county citizens and business"); Vantage Comments at 2 (asserting that "[r]ural providers are targeting PALs for overbuilding their existing network footprints").

[265] *See, e.g.*, Vantage Comments at 2 ("if the Commission attaches stringent buildout requirements to PAL licenses, this would require a buildout on a scale significantly larger than smaller, rural entities can manage operationally or financially"); Mimbres Communications Comments at 1 (raising concern that buildout obligation to cover a large area would require it to "seek outside capital for what would become a highly speculative business proposition"); CenturyLink June 8, 2018 *Ex Parte* at 2 (asserting that buildout requirements for county-based licenses could "render the license uneconomic for accomplishing the more targeted rural deployment desired").

67. After considering these factors and the arguments and proposals in the record, we conclude that a 50 percent population coverage safe harbor strikes an appropriate balance between, on the one hand, ensuring spectrum is used efficiently and productively in rural and non-rural areas, including through secondary market access, and, on the other, providing licensees the flexibility to invest in and deploy innovative network technologies that may be more suitable for smaller coverage areas and the co-existence regime that governs the 3.5 GHz band.[266] We find, consistent with the analysis above, that a 50 percent requirement, rather than the higher coverage requirements adopted in certain other bands, is appropriate in the context of the low power limits and other unique aspects of the licensing and authorization regime in the 3.5 GHz band. We further find that this safe harbor for substantial service, together with secondary market mechanisms and the potential for opportunistic GAA use, will foster efficient and innovative use of the band, including in rural areas.

68. As the Commission indicated in 2015, we contemplate that the band may also be used for fixed point-to-point services.[267] Commenters responding to our inquiry in the *2017 NPRM* concerning the possible performance metrics provide little discussion of a metric or approach for fixed point-to-point services.[268] We note that the Commission has adopted a link-based metric for fixed point-to-point services in many other bands, however.[269] In the absence of commenter proposals, we draw on the link-based metric adopted by the Commission for fixed point-to-point services in the 2.3 GHz Band. Specifically, in the *WCS Report and Order*, the Commission required 2.3 GHz licensees using the spectrum for point-to-point service to construct and operate a minimum number of links within each license area equal to the population of the license area divided by 33,500 and rounded up to the nearest whole number.[270] The Commission found that this metric was "achievable" and would "further our goal of ensuring meaningful wireless deployment."[271] We find that a similar metric is generally a reasonable safe harbor for such services in the 3.5 GHz band. We provide, however, that, for license areas with 134,000 population or less, licensees must construct and operate a minimum of four links to meet the safe harbor, which we find will be an achievable minimum given the geographic license areas we adopt.[272] Further, we limit the safe harbor to links that operate using registered Category B CBSDs. Category B CBSDs must be deployed outdoors and have higher maximum power limits in comparison with Category A CBSDs.[273] Links using Category B CBSDs are therefore likely to be more consistent with the traditional point-to-point services we intend for this safe harbor, and they will avoid the possibility that a licensee could satisfy its performance requirement for an entire license area with a single in-building IoT

[266] *See Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8088-89, para. 206.

[267] *See 2015 Report and Order*, 30 FCC Rcd at 4025, para. 211.

[268] *See 2017 NPRM*, 32 FCC Rcd at 8077, para. 17 (seeking comment on "what types of performance requirements" and "[w]hich performance metrics (e.g., population coverage, geographic coverage) and benchmarks" would be appropriate).

[269] *See, e.g.*, *WCS Report and Order*, 25 FCC Rcd at 11793, para. 207; *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8089, para. 208; *see also 3.7-4.2 GHz NPRM*, FCC 18-91, at para. 151 (proposing link-based metric for fixed point-to-point services).

[270] *See WCS Report and Order*, 25 FCC Rcd at 11793, para. 207.

[271] *Id.* at 11794, para. 207.

[272] *See, e.g.*, *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8089, para. 208 (requiring, for PEA and county-sized licenses, a four-link minimum performance for point-to-point services); 47 CFR § 30.104(a). While the Commission did not adopt a four-link minimum for the 2.3 GHz Band, we note that licenses in the 2.3 GHz Band were issued with geographic areas based on either REAGs (dividing the Nation into 12 areas) and MEAs (dividing it into 46 areas), and that the resulting population in each license area required this result for nearly all licenses regardless. *See Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS")*, Report and Order, 12 FCC Rcd 10785, 10814, para. 54 (1997).

[273] *See* 47 CFR §§ 96.41, 96.45.

deployment such as a sensor network.[274]

69. We recognize that Priority Access Licensees may seek to deploy innovative services, including low-power IoT-type services, for which the safe harbors discussed above may not be suitable. Given the lack of any comment on a metric or safe harbor for such services, and the uncertainty regarding what type of services will be deployed and what safe harbor would be appropriate in the context of the 3.5 GHz band's multi-tiered sharing regime, power limits, and other band-specific rules, we decline to adopt a specific safe harbor for such services at this time. Priority Access Licensees providing such services may file individualized showings to demonstrate that they provided a bona fide communications service, either for unaffiliated customers or for private, internal use, that meets the standard of substantial service.[275]

70. We also recognize that Priority Access Licensees may provide a mix of services covered by more than one safe harbor. With respect to such mixed deployments, we decline to establish a specific formula for applying the safe harbors. Instead, licensees whose deployments contain a mix of services covered by more than one safe harbor may either demonstrate that at least one of these safe harbors is met, or they may make an individualized showing that the services in combination meet a standard of substantial service.[276] We clarify, however, that in our assessment of individualized substantial service showings, the safe harbors established above will generally be important factors in cases involving, in whole or in part, services that fall within the scope of such safe harbors. Absent justifications such as those discussed above, and given the flexibility already incorporated into the safe harbors, we expect that, in cases of a service addressed by a safe harbor, substantial service will meet or exceed the relevant safe harbor standard.

71. We decline to adopt interim performance requirements for PALs.[277] We find that adopting specific coverage requirements as an interim requirement would be inconsistent with the flexible substantial service showings we allow at the end of the license term, and that requiring licensees to provide "substantial service" by both the end-of-term and some earlier interim point would create significant regulatory uncertainty as to the difference between the interim and end-of-term requirements, raise the risk of arbitrary and inconsistent results between licensees, and be unlikely to incentivize more rapid or extensive deployment in the band. Indeed, we find little support in the record for either of these approaches.[278] In addition, we find that the still-nascent status of 5G and other innovative wireless

[274] *See Spectrum Frontiers Second Report and Order*, 32 FCC Rcd at 11008, para. 65 (noting that, "in the case of IoT-type services, including networks of sensors and 'smart' devices, a licensing using the buildout metric for fixed services could fulfill the performance requirements for an entire multi-county license area . . . with a deployment spanning a single building, by counting each connection between the sensors as a fixed point-to-point link"), 11009, para. 69; *see also 2015 Report and Order*, 30 FCC Rcd at 4024, para. 207 ("We believe that the majority of Category A devices will likely be deployed indoors or at street level. [C]ategory B devices may be used for outdoor uses in other configurations such as non-line-of-sight backhaul."), 4025, para. 211 ("[W]e believe that the Category B criteria we adopt will allow a wide range of deployments, including point-to-point . . . transmissions . . . . Thus, we are not adopting specific rules for point-to-point deployments as we proposed.").

[275] *See, e.g.*, *RF Development, LLC*, Order on Reconsideration, 30 FCC Rcd 12340 (WTB BD 2015) (fixed point-to-point link not used to provide a bona fide communications service could not be relied on to demonstrate substantial service).

[276] *See Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8090, para. 210*; Nextlink Wireless, Inc.*, Memorandum Opinion and Order, 24 FCC Rcd 8585, 8587, paras. 8-9 (WTB BD 2009) (applying substantial service analysis to a combination of both point-to-multipoint and point-to-point service).

[277] Because we decline to adopt interim construction requirements, we also decline to impose reporting requirements to help monitor interim build-out progress. *See* GeoLinks Comments at 4; Federated Wireless Reply at 8.

[278] The Public Interest Spectrum Coalition proposes that, to account for flexible use, we adopt an interim requirement of a "substantial number of registered and operating CBSDs[.]" PISC Oct. 16, 2018 *Ex Parte* at 4. It

technologies anticipated for this band and the unique aspects of the 3.5 GHz sharing regime support providing Priority Access Licensees with additional flexibility in the timeframe provided to develop and deploy services in the band.[279]

72. In order to confirm that the spectrum is being utilized consistent with the performance requirements, we adopt performance verification procedures largely consistent with those for other bands.[280] We conclude that parties must comply with the procedures under section 1.946 of the Commission's rules in making their compliance demonstration.[281] That section provides, in part, that licensees must notify the Commission of compliance with the performance requirement within 15 days of the relevant deadline by filing FCC Form 601. As part of this notification, we will require that licensees submit and certify to a description of the service and documentation of the extent of the service, including electronic coverage maps accurately depicting the boundaries of each license area and where in the license area the licensee provides service that meets the performance requirement (e.g., for mobile services, where in the license area the licensee offers the service at a reliable signal level), supporting technical documentation, population-related assumptions if relevant, and any other information as the Wireless Telecommunications Bureau may prescribe by public notice. We further conclude that licensees, in demonstrating service coverage, may rely on the PAL Protection Areas[282] of the relevant CBSDs they use to provide the service. They must, however, specify the CBSDs and certify that they actually are being used to provide service, either to customers or for internal use. In any case, licensees may not claim service coverage outside of these PAL Protection Areas or deployments that are not reflected in SAS records of CBSD registrations. We find this approach appropriately leverages the SASs to help ensure consistency and accuracy in performance demonstrations, reduce administrative burdens on licensees and the Commission, and speed compliance and renewal review. We delegate authority to the Wireless Telecommunications Bureau to specify the format of submissions, consistent with these determinations.

73. Consistent with the approach in many other bands, we conclude that, if a licensee fails to meet the substantial service requirement, its authorization under the relevant license will terminate automatically without Commission action.[283] We decline to adopt a "use-or-lose" regime, as suggested by

(Continued from previous page)
provides no explanation, however, of the distinction in terms of performance between a "substantial number" of CBSDs that would be required at five years and the "substantial service" required at 10 years.

[279] *See Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8088, para. 205 (declining to adopt interim performance requirements for wireless deployment in the UMFUS bands in recognition that there was "a significant lead time before the full development of the technology" needed to support the innovative uses anticipated in the band); GE Comments at 18 (noting that "5G applications are evolving and not yet fully defined"). We also decline to adopt additional performance requirements that would apply to a license in its second or subsequent license term. We note that there already is an open proceeding examining whether to adopt renewal term construction obligations for "all flexible geographic licenses," in which we have specifically asked about possible renewal term obligations for licenses subject to a substantial service requirement with safe harbors. *See WRS Renewal Reform FNPRM*, 32 FCC Rcd at 8913-14, paras. 106, 110. We do not prejudge the outcome of that proceeding, but we observe that Priority Access Licensees may be subject to requirements adopted as part of that proceeding at some later date.

[280] *See, e.g.*, *Incentive Auction Report and Order*, 29 FCC Rcd at 6883, para. 778; *see also 2017 NPRM*, 32 FCC Rcd at 8077, para. 17.

[281] *See* 47 CFR § 1.946.

[282] *See id.* § 96.3 (defining "PAL Protection Area").

[283] *See, e.g.*, *H Block Report and Order*, 28 FCC Rcd at 9564, para. 212 (providing for automatic termination of license authorization, and noting that "the Commission has applied this approach [of automatic termination] to nearly all geographically licensed wireless services"); *see also Wireless Telecommunications Bureau Reminds Wireless Licensees of Construction Obligations*, Public Notice, 32 FCC Rcd 4802, 4802-03 (WTB 2017) (stating that, given the important purposes of the Commission's construction requirements, requests to extend obligations

some commenters, under which a licensee would lose only those areas or census tracts within a license area that are not developed.[284] We find that such an approach, which has been adopted rarely for other bands, would complicate coordination with the PAL tier and between PAL and GAA users, may reduce incentives for licensees to build out to the less populated areas covered by their license, and is unnecessary to ensure effective use of the spectrum.[285]

74. We clarify, as Federated Wireless and Ruckus recommend, that operations pursuant to lease arrangements, other than short-term *de facto* transfer leasing arrangements, may be counted toward meeting the performance requirement, either under the safe harbors or as part of an individualized showing of substantial service.[286] We note that doing so is consistent with our general rules for spectrum leasing, and we find that it will encourage parties to enter into secondary market transactions while ensuring that our performance requirements will be met for the license overall. Consistent with the general short term *de facto* transfer leasing rule (covering *de facto* transfer leasing arrangements of one year or less), we will not permit a licensee in such an arrangement to attribute to itself the activities of its spectrum lessee when seeking to establish that performance or build-out requirements applicable to the licensee have been met.[287] We reject proposals that we credit licensees for merely making spectrum available for leasing on a spectrum exchange or otherwise, which would undermine the purposes of the performance requirement discussed above.[288]

### B. Competitive Bidding Procedures for PALs

#### 1. Applicability of Part 1 Competitive Bidding Rules

##### a. PAL Applications Subject to Competitive Bidding

75. *Background*. Consistent with its proposals to lengthen the term of a PAL, to make a PAL renewable, and to increase the size of a PAL's geographic area, the Commission proposed in the *2017 NPRM* to employ its standard practice for finding mutual exclusivity among accepted applications.[289] It also proposed to eliminate the rule that made available one less PAL than the total number of PALs in a

(Continued from previous page)
would not be routinely granted, and failure to meet the requirements would result in automatic termination of authorization).

[284] GeoLinks Comments at 4-5 (proposing adoption of rules that would allow other interested parties to acquire the unused portion of the PAL license areas); OTI/PK Comments at 34 (proposing that, if the Commission adopts license areas larger than census tracts, it should still require that each census tract be served, and that any census tract not served after the initial term should be returned for auction as a small area PAL); RWA Comments at 10; Cantor Reply at 5-6; *see also* KWISP Comments at 5; PISC Oct. 16, 2018 *Ex Parte* at 4.

[285] *See, e.g.*, *AWS-3 Report and Order*, 29 FCC Rcd at 4664, para. 148. The PISC proposes that the lost portions of the PAL default to GAA, essentially reducing the number of PAL channels in that area. PISC Oct. 16, 2018 *Ex Parte* at 4. In addition to the other noted issues with "use or lose" mechanisms, we find no reason to believe that reducing the PAL channels in an area and expanding the already substantial amount of spectrum dedicated to GAA would promote greater investment and deployment, and this change would run contrary to the extensive record of interest in deployment through PALs.

[286] *See* Federated Wireless Comments at 10; Ruckus Comments at 18; 47 CFR §§ 1.9020(d)(5)(i) (allowing attribution of lessee's performance to the licensee in spectrum manager leasing arrangements), 1.9030(d)(5)(i) (providing that, for long term *de facto* transfer leasing arrangements (i.e., arrangements for more than one year), "[t]he licensee may attribute to itself the build-out or performance activities of its spectrum lessee(s) for purposes of complying with any applicable build-out or performance requirement").

[287] *See* 47 CFR § 1.9035(d)(3).

[288] *See, e.g.*, Federated Wireless Reply at 7. Some commenters propose adoption of an auction bidding credit that would be provided for early build-out. *See, e.g.*, NRTC/NRECA Comments at 4. We address bidding credits for PALs elsewhere in this Report and Order. We note, however, that early buildout is one consideration parties may present in making an individualized showing of substantial service.

[289] *2017 NPRM*, 32 FCC Rcd at 8086, para. 42.

license area for which all applicants had applied.[290] The Commission further proposed to assign a PAL even when only one applicant has applied for a PAL in a specific license area, subject to the applicant's being otherwise qualified, rather than to adhere to its decision in the *2015 Report and Order* not to assign any PAL for such a license area.[291]

76. *Discussion*. Given the other modifications we adopt for PALs in this Report and Order, we eliminate the rule that made available one less PAL than the total number of PALs for which all applicants had applied in a given geographic license area. By making a PAL renewable, increasing the size of its geographic area, and lengthening its license term to 10 years, we anticipate that the rights conferred by a PAL will be more beneficial to a wider range of potential users. The previous rule, which was adopted to limit the number of PALs available in a given license area, was premised on the view that GAA use should be easy to access and sufficient for many applications in the 3.5 GHz band, but that PALs should be available for those limited applications that required greater certainty as to interference protection because they would suffer in a congested use environment.[292] The changes we adopt in this Report and Order ensure that PALs will support all technologies and foster additional investment from a wide variety of users in the 3.5 GHz band, thereby expanding the potential use cases by Priority Access Licensees, and based on the record, we agree with the argument that GAA use is less likely to provide sufficient access for many application in the 3.5 GHz band.[293] Therefore, we can no longer conclude that the similar use cases for PALs and the GAA that existed under the prior rules provide a reasoned basis on which to limit the number of PALs available in a given geographic area.[294] We therefore agree with commenters that the public interest will not be served by limiting the availability of PALs within a given geographic area in the 3.5 GHz band.[295] Rather, by eliminating this rule, we can better achieve a licensing process that will promote the "efficient and intensive use" of this spectrum and the "development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas," that "recover[s] for the public . . . a portion of the value of the public spectrum resource made available for commercial use, and achieves the other goals of Section 309(j)."[296]

77. Instead, we will use our standard approach to determining whether accepted applications with respect to initial geographic area licenses are mutually exclusive applications subject to competitive bidding, which takes into consideration our need to "effectively implement" the public interest

---

[290] *Id.* In the *2015 Report and Order*, the Commission adopted a process that when there are two or more applicants for PALs in a given census tract, the Commission would make available one fewer PAL than the total number of PALs for which all applicants had applied in that license area, up to a maximum of seven PALs. *2015 Report and Order*, 30 FCC Rcd at 4002, para. 133; *2017 NPRM*, 32 FCC Rcd at 8085-86, para. 39.

[291] *2017 NPRM*, 32 FCC Rcd at 8087, para. 42; *2015 Report and Order*, 30 FCC Rcd at 4003, para. 136. Additionally, in lieu of this proposal, we sought comment on whether an application for a PAL in a given geographic area should be considered to be mutually exclusive with an application for GAA use. *2017 NPRM*, 32 FCC Rcd at 8088, para. 45.

[292] *2015 Report and Order*, 30 FCC Rcd at 4002, para. 133.

[293] *See* Ericsson Comments at 7; *see also* Alaska Communications Comments at 9 (arguing that the rule "would unnecessarily limit the number of areas in which PALs are awarded."); API/ENTELEC Comments at 4; AT&T Comments at 9-10; Comcast Comments at 23; CTIA Comments at 14; NCTA Comments at 15; Southern Linc Comments at 17; USCC Comments at 14; WISPA Comments at 50-51; Google Reply at 3; R Street Reply at 16-18.

[294] *2015 Report and Order*, 30 FCC Rcd at 4002, para. 133.

[295] *See* Nokia Comments at 5-6; WISPA Comments at 50-51.

[296] 47 U.S.C. § 309(j)(3).

considerations underlying the licensing of the spectrum.[297] Here, determining mutual exclusivity based on applicant interest in a given geographic area serves the public interest objective of assigning these licenses to the applicant that values them most highly and therefore is most likely to make effective use of them. Making the determination based on interest in geographic areas without respect to particular frequencies or bandwidth is necessary to provide applicants with maximum flexibility to pursue back-up strategies to aggregate blocks to meet their licensing needs as the auction progresses and the value of and opportunities in the band become better known.[298] Applicants here will have an opportunity to identify on their short-form application each geographic area(s) in which they are interested in bidding for PALs.[299] An applicant will only be permitted to bid for PALs in the particular geographic area or areas that it initially selects on its short-form application, subject to our 40-megahertz PAL aggregation cap.[300] The record supports following this approach for identifying an applicant's interest in a particular geographic area.[301] If the Commission accepts more than one application to bid on the generic PALs available in any particular geographic area, those PALs will be assigned by competitive bidding. As in other Commission auctions, we will proceed to competitive bidding even if other applicants ultimately do not pursue licenses in that area or pursue fewer than all the licenses available.[302]

78. We also adopt our proposal to assign PAL(s) even when there is only one application in a given geographic area, assuming the applicant is otherwise qualified.[303] In the absence of accepting mutually exclusive applications, the Commission cannot assign a license through the use of competitive bidding.[304] Accordingly, consistent with our long-standing approach, if we do not accept competing applications in a particular geographic area, we will cancel the auction for the PAL(s) in that area, and if the short form application is otherwise acceptable, we will establish a date for the filing of a long-form application by the applicant.[305] We also eliminate the single applicant exception in rural areas as the exception is no longer necessary under this approach.[306] Adopting this licensing approach for PALs

[297] *Benkelman Tel. Co. v. FCC*, 220 F.3d 601, 605-06 (D.C. Cir. 2000); *see also Bachow Comm. Inc. v. FCC*, 237 F.3d 683, 691-92 (D.C. Cir. 2001) (citing *Benkelman Tel. Co.*, 220 F.3d at 606); s*ee also DIRECTV, Inc. v. FCC*, 110 F.3d 816, 828 (D.C. Cir. 1997).

[298] *Benkelman Tel. Co.*, 220 F.3d at 605-06; *see also* 47 CFR § 1.2102(a).

[299] Short-form applications are required to identify each license or category of licenses on which the applicant wishes to bid. 47 CFR § 1.2105(a)(2)(i).

[300] Major amendments cannot be made to a short-form application after the initial filing deadline, and include changes in the license service areas identified on the short-form application on which the applicant intends to bid. *See* 47 CFR § 1.2105(b)(2).

[301] *See, e.g.*, AT&T Comments at 10 ("The Commission can satisfy the statutory requirement for mutual exclusivity by continuing to allow potential applicants to self-select the areas in which they are interested in bidding."); *see also* USCC Reply at 15 ("If the Commission adopts its proposed revisions to the PAL licensing framework, and also permits the selection of 'all areas' in the short-form application for the PAL auction, USCC believes it will be very unlikely that the Commission will lack auction authority with respect to any license area.").

[302] *2015 Report and Order*, 30 FCC Rcd at 4002, para. 132.

[303] *2017 NPRM*, 32 FCC Rcd at 8087, para. 42.

[304] *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order, 9 FCC Rcd 2348, 2350-51, para. 12 (1994) ("[I]f mutual exclusivity does not exist, a license or class of service would not be subject to competitive bidding.") (*Competitive Bidding Second Report and Order*).

[305] *2015 Report and Order*, 30 FCC Rcd at 4003, para. 135; *see also Competitive Bidding Second Report and Order*, 9 FCC Rcd at 2376, para. 165; UTC Comments at 6-7; CTIA Comments at 13-14.

[306] *See 2016 Order on Reconsideration*, 31 FCC Rcd at 5023-24, para. 50.

generally is also consistent with the Commission's earlier decision to do so on a limited basis.[307] The fundamental benefit of a PAL is the right to prioritized, interference protected use of 10 megahertz of spectrum in a given geographic area.[308] Commenters maintain that there are certain use cases that require the interference protected use of the spectrum that only a PAL can confer, making GAA access, with its lack of prioritized access, insufficient.[309] Under the rules adopted in this Report and Order, if there is only one applicant seeking a PAL in an area, that applicant will be able to acquire a PAL outside of the auction process.[310] Given that our decisions in this item make PALs similar in many ways to licenses in other services, we conclude that we should follow this approach as we do in other services. In light of this decision and given the limited record we received on the issue, we further conclude that we need not address the issue of whether an application for a PAL in a given geographic area should be considered to be mutually exclusive with an application for GAA use in the same area.[311]

79. We remind parties that the Commission will conduct any auction of PALs in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q of the Commission's rules, including any modifications that the Commission may adopt to its Part 1 general competitive bidding rules in the future. As has been the Commission's practice in past spectrum auctions, the rules we have adopted allow subsequent determination of specific final auction procedures.[312] The pre-auction process will be initiated by the release of an auction Comment Public Notice, which will solicit public input on final auction procedures, and which will include specific proposals for auction components, such as minimum opening bids and bidding credit caps. Thereafter, an auction Procedures Public Notice will specify final procedures, including dates, deadlines, and other final details of the application and bidding processes. Accordingly, issues involving bidding procedures, like those raised by commenters,[313] will be

[307] *See id.* at 5026, para. 56. As in the *Order on Reconsideration*, we find expanding this assignment of PALs more generally may facilitate a provider's ability to provide innovative services to its customers.

[308] *Id.* at 5024, para. 53.

[309] *See* CTIA Economic Analysis at 7-8 (explaining the potential investment effects for applicants whose business models require prioritized, interference protected use); UTC Reply at 4-5.

[310] *See* Amplex Comments at 3; Cantor Comments at 11; Ericsson Comments at 7; NCTA Comments at 15; Nokia Comments at 5-6; CenturyLink Reply at 8; R Street Reply at 16-18; *see also* NCC Comments at 11 n.28 (arguing its support for the Commission's proposal if the Commission adopts other rules to ensure access to the 3.5 GHz band for small and rural users and prevents spectrum aggregation by a single entity or segment of the telecommunications industry).

[311] *See* UTC Comments at 7 (arguing that there would be no mutual exclusivity between GAA and PAL use that would trigger auction authority.); AT&T Comments at 10 ("The FCC does not need to revisit its methodology for determining mutual exclusivity by finding that GAA use is mutually exclusive to PAL use of the spectrum.").

[312] *See 2015 Report and Order*, 30 FCC Rcd at 4007, para. 147 & n.333 (citing *Amendment of Part 1 of the Commission's Rules –Competitive Bidding Procedures*, Third Report and Order and Second Further Notice of Proposed Rule Making, 13 FCC Rcd 374, 447-49, paras. 124-25 (1997) (*Part 1 Third Report and Order*)); *Amendment of Part 1 of the Commission's Rules –Competitive Bidding Proceeding*, Order, Memorandum Opinion and Order and Notice of Proposed Rule Making, 12 FCC Rcd 5686, 5697-98, para. 16 (1997)). Although the full Commission has chosen to propose, consider, and adopt such final auction procedures in certain cases, we do not modify the Bureau's well-established authority to establish final auction procedures through a pre-auction public notice process. *See* 47 CFR § 0.131(c); *see also Incentive Auction Report and Order*, 29 FCC Rcd at 6574, para. 15.

[313] *See supra* para. 40 (discussing the Commission's intent to seek comment on package bidding); Alaska Communications Comments at 10 (arguing that setting a reserve price is reasonable, provided the FCC recognizes that market conditions vary widely in different parts of the country); Cantor Comments at 12-13 (explaining that its electronic auction system is well-suited to support the FCC in a 3.5 GHz band PAL auction); Frontier Comments at 7-8 (supporting the use of package bidding); OTI/PK Comments at 28-29 (supporting the use of limited package bidding); Peoples Comments at 3 (explaining that it does not oppose package bidding); WISPA Comments at 35

addressed at that time, and we will seek public input on the competitive bidding procedures to be used for a particular auction of PALs.[314] We conclude that the Commission's practice of finalizing auction procedures in the pre-auction process provides time for interested participants both to comment on the final procedures and to develop business plans in advance of the auction.[315]

### b. Bidding on Specific PAL License Blocks

80. *Background.* Under the current rules, Priority Access Licensees do not bid on specific spectrum blocks.[316] Rather, the SAS assigns frequencies based on the amount of spectrum that a PAL licensee is authorized to use in a given license area.[317] Licensees may request a particular channel or frequency range from the SAS, but they are not guaranteed a particular assignment.[318] The SAS will "assign geographically contiguous PALs held by the same Priority Access Licensee to the same channels in each geographic area" and "assign multiple channels held by the same Priority Access Licensee to contiguous frequencies within the same License Area" when it is feasible to do so.[319]

81. In the *2017 NPRM*, the Commission sought comment on the feasibility and desirability of allowing PAL licensees to bid on specific channel assignments.[320] Specifically, the Commission sought comment on how it could allow bidding on specific license blocks given the constraints of the band and the need to protect incumbents.[321] The Commission sought comment on whether the Incentive Auction could provide a model for a separate, voluntary channel assignment phase of the auction, and, if so, what changes to the Incentive Auction framework might be necessary to accommodate interference protection of federal incumbents by PALs.[322] It also sought comment on possible alternative auction methodologies that might be appropriate.[323]

82. *Discussion*. We affirm the Commission's decision that PALs will operate over 10 megahertz unpaired channels, wherein all channels will be assigned by the SAS. The exact frequencies of specific assigned channels may be changed by the SAS, if necessary, to facilitate sharing between the three tiers of authorized users. Accordingly, bidders will not be permitted to bid on specific channel assignments through competitive bidding. As the Commission previously explained, "flexible band management is essential to effective spectrum sharing between the three tiers of authorized users in the

(Continued from previous page)
(explaining that it generally opposes package bidding but it could be appropriate if the Commission keeps census tracts at the geographic license area).

[314] *See 2015 Report and Order*, 30 FCC Rcd at 4009, para. 153.

[315] We note that while we sought generalized comment on the possibility of employing package bidding in the *2017 NPRM*, we conclude a decision on such an issue is better suited for resolution in the pre-auction process.

[316] *See* 47 CFR § 96.25(b); *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93 ("all channels will be assigned by the SAS."); *see also 2015 Report and Order*, 30 FCC Rcd at 4059, para. 337.

[317] *See* 47 CFR § 96.13; *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93.

[318] 47 CFR § 96.25; *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93.

[319] 47 CFR § 96.59(b). The SAS thus assigns all channels and may change the frequencies if necessary, although SAS Administrators are required to "maintain consistent and contiguous frequency assignments for licensees with multiple PALs in the same or adjacent license areas whenever feasible." *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93. Two commenters argue that allowing the SAS to assign PALs creates uncertainty in the auction process. *See* AT&T Comments at 11-12; Nokia Reply at 2. However, given the ability of the SAS to assign contiguous blocks and reassign if necessary, we believe that static channel assignment would ultimately lead to a more complex PAL auction. *See* CenturyLink Reply at 8.

[320] *2017 NPRM*, 32 FCC Rcd at 8089, para. 49.

[321] *Id.* at 8089, para. 49.

[322] *Id.*

[323] *Id.* at 8081, para. 25.

band."[324] Coupled with the requirement that CBSDs be capable of operating across the entire 3.5 GHz band, SAS-controlled assignments will ensure that individual users are provided with flexible, stable access to the band.[325] In assigning frequencies for Priority Access, the SAS must assign multiple channels held by the same Priority Access Licensee to contiguous channels in the same license area.[326] Likewise, an SAS will be required to maintain consistent and contiguous frequency assignments for licensees with multiple PALs in the same or adjacent license areas whenever feasible.[327] A wide variety of commenters support the current framework of SAS-assigned PAL channels.[328]

83. While there may be some uncertainty for a Priority Access Licensee in receiving a channel assignment from an SAS rather than bidding on a specific PAL license block, it is precisely this flexibility that is needed in a tiered licensing approach to ensure that a Priority Access Licensee is not forced to shut down its operations indefinitely or even permanently.[329] Under a static channel assignment framework proposed by certain commenters, a Priority Access Licensee could be required to move off of a frequency to protect an incumbent, thus losing access to the exclusive channel until incumbent operations were no longer affected.[330] In contrast, under the approach we affirm here, the SAS will be able to reassign the Priority Access Licensee dynamically, ensuring prioritized access to 10 megahertz of spectrum.[331] A flexible channel assignment plan where the SAS can reassign a PAL dynamically when an incumbent is using a specific channel, will lead to better coordination and co-existence between PAL holders and incumbents. For this reason, we reject the argument that a predictable, static spectral environment provides the certainty needed for network deployments,[332] and we conclude that the approach the Commission adopted in 2015 supports a wide variety of use cases in the 3.5 GHz band. As the Commission previously explained, by having the SAS assign all channels, our rules aim to create a flexible, responsive spectral environment while retaining much of the stability of traditional static channel assignments. We further note, as the Commission has previously observed, that modern networks

[324] *2015 Report and Order*, 30 FCC Rcd at 3985, para. 80.

[325] *Id.* at 3986, para. 82.

[326] *Id.* at 3990, para 93. The SAS may temporarily reassign individual PALs to non-contiguous channels only to the extent necessary to protect Incumbent Users from harmful interference or if necessary to perform its required functions. *Id. See* Alaska Communications Comments at 11; DSA Comments at 7; Microsoft Comments at 9; NCTA Comments at 15; OTI/PK Comments at 34; Southern Linc Comments at 18; UTC Comments at 7; WISPA Comments at 51; *see also* ATN Comments at 9 (arguing that specific channel bidding could prevent PAL licensees from aggregating continuous spectrum).

[327] *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93. While a Priority Access Licensee may initially request a particular channel or frequency range, any particular request will not be guaranteed. *2015 Report and Order*, 30 FCC Rcd at 3990, para. 93.

[328] *See* Alaska Communications Comments at 11; ATN Comments at 9; Comcast Comments at 25-26; DSA Comments at 7, 29; Microsoft Comments at 9; NCTA Comments at 15; OTI/PK Comments at 34; Southern Linc Comments at 18; UTC Comments at 7; WISPA Comments at 51; CenturyLink Reply at 8; R Street Reply at 18-19.

[329] *2015 Report and Order*, 30 FCC Rcd at 3986, para. 81.

[330] *See* Comcast Comments at 26.

[331] One commenter argues that static channel assignments would allow for more accurate valuation of a PAL. An applicant for a PAL should perform its due diligence research and analysis before proceeding, as it would with any new business venture, and that each potential Priority Access Licensee knows that it is solely responsible for investigation and evaluation of all technical and marketplace factors that may have a bearing on the value of the license(s) that it may wish to apply for. *See* MSI Comments at 6.

[332] *See* API/ENTELEC Comments at 4; AT&T Comments at 11-12; T-Mobile Comments at 15-17; AT&T Reply at 1, 9-10; *see also* Ericsson Comments at 7-8 (arguing that a "separate, and voluntary, channel assignment phase . . . could be an effective means of offering more certainty to those who demand it while also allowing some . . . flexibility.").

typically have control features that allow for automated or managed channel selection.[333] We believe that, on balance, the flexibility afforded by the assignment of channels by the SAS allows us to ensure protection to the Incumbent tier, including federal users, exclusivity to the Priority Access tier, and access to GAA users.

### 2. Bidding Credits for PALs

84. *Background*. In the *2017 NPRM*, the Commission revisited its decision not to offer bidding credits in the 3.5 GHz band[334] and sought comment on whether it should consider adopting such provisions for certain bidders or areas if it increased the size of a PAL's license area.[335] Specifically, the Commission sought comment on whether it should adopt the bidding credits it used in the 600 MHz Band auction (Incentive Auction).[336]

85. *Small Business Bidding Credit*. Based on the significant changes we adopt for PALs, as well as the Commission's experience with the use of bidding credits in recent spectrum auctions, we conclude that utilizing bidding credits in competitive bidding for the 3.5 GHz band will provide us with an effective tool to achieve our statutory objective of promoting the participation of designated entities in the provision of spectrum-based service.[337] Section 309(j)(4) of the Communications Act requires that when the Commission prescribes regulations to establish a methodology for the grant of licenses through the use of competitive bidding, it must "ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women are given the opportunity to participate in the provision of spectrum-based services, and, for such purposes, consider the use of . . . bidding preferences."[338] In addition, Section 309(j)(3)(B) provides that in establishing eligibility criteria and bidding methodologies, the Commission shall promote "economic opportunity and competition…by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women."[339] Historically, one of the principal means by which the Commission fulfills this mandate is through "bidding preferences" in the form of bidding credits to small businesses.

86. Because we have modified the characteristics of PALs to more closely resemble those of other wireless licenses, we conclude that designated entities might have less opportunity to obtain spectrum in the 3.5 GHz band without small business size standards and bidding credits. Thus, by modifying our rules to include bidding credits we can address the concerns that some commenters have raised that our decision to adopt counties as the geographic area size for PAL licensing and a longer,

---

[333] *2015 Report and Order*, 30 FCC Rcd at 3987, para. 86.

[334] *Id.* at 4008, para. 151.

[335] *2017 NPRM*, 32 FCC Rcd at 8081, para. 25.

[336] *Id.* at 8081, para. 25 n.65. For the Incentive Auction, businesses with average annual gross revenues for the preceding three years not exceeding $20 million could qualify for a 25 percent bidding credit. Businesses with average annual gross revenues for the preceding three years not exceeding $55 million could qualify for a 15 percent bidding credit. *See Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7524-25, para. 74; *see also* 47 CFR § 1.2110(f)(2)-(4).

[337] *See* NCC Comments at 13 (arguing that bidding credits will help small and rural providers obtain PALs and secure meaningful access to the 3.5 GHz band and that without bidding credits, the high cost of PALs resulting from the NPRM's proposals will create insurmountable hurdles to use of the band by small and rural carriers); RWA Comments at 6; Sacred Wind Comments at 7.

[338] 47 U.S.C. § 309(j)(4)(D); *see Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd 12357, 12454, para. 293 (2012) (*Incentive Auction NPRM*).

[339] 47 U.S.C. § 309(j)(3)(B); *see Incentive Auction NPRM*, 27 FCC Rcd at 12454-55, para. 293.

renewal license term will impede small businesses' ability to effectively compete in the auction.[340] Commenters generally support implementing a system of bidding credits for the 3.5 GHz band and recognize the related pro-competitive benefits for smaller carriers.[341] Accordingly, we are persuaded by commenters that maintain offering bidding credits here should improve the ability of small businesses to attract the capital necessary to meaningfully participate in a PAL auction.[342]

87. In the *2017 NPRM*, the Commission sought comment on using the same small business size standards and bidding credits for the 3.5 GHz band as the Commission offered in the 600 MHz Band.[343] In adopting competitive bidding rules for the 600 MHz Band, and more recently in the UMFUS bands, the Commission offered bidding credits to promote opportunities for small businesses, rural telephone companies, and businesses owned by members of minority groups and women to participate in the provision of spectrum-based services.[344] Specifically, for the 600 MHz and UMFUS band auctions, the Commission adopted two small business definitions,[345] the highest two of the three thresholds included in the Commission's Part 1 standardized schedule of bidding credits.[346]

88. As a general matter, the Commission defines eligibility requirements for small businesses benefits on a service-specific basis, taking into account the capital requirements and other characteristics of each particular service in establishing the appropriate threshold.[347] While the capital requirements of the services to be deployed in the 3.5 GHz band are not yet known, based on the record before us and on the Commission's most recent actions in other similar wireless spectrum bands, we conclude that using the same small business size standards and bidding credits the Commission adopted in the 600 MHz and UMFUS bands should enhance the ability of small businesses to acquire and retain capital and thereby compete more meaningfully at auction in the 3.5 GHz band.[348] Use of these small business definitions

[340] *See, e.g.*, NCC Comments at 13 (arguing that bidding credits will help small and rural providers obtain PALs and secure meaningful access to the 3.5 GHz band and that without bidding credits, the high cost of PALs resulting from the NPRM's proposals will create insurmountable hurdles to use of the band by small and rural carriers).

[341] *See* NCC Comments at 13 ("the credits used in the Incentive Auction offer a starting point to consider how best to facilitate participation."); RWA Comments at 7 ("[T]he Commission should ensure that the same bidding credits made available in the Incentive Auction are equally available for future PAL auctions."); Sacred Wind Comments at 7 ("The credits would be similar to those adopted for the Incentive Auction.").

[342] *See* NCC Comments at 13; *see also Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7523, para. 72.

[343] *2017 NPRM*, 32 FCC Rcd at 8081, para. 25 n.65; *Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7524-25, para. 74.

[344] *See Incentive Auction Report and Order* 29 FCC Rcd at 6762-63, para. 475; *Competitive Bidding Update Report and Order* 30 FCC Rcd at 7523, para. 72*; Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8099-100, paras. 249-250.

[345] *See Incentive Auction Report and Order*, 29 FCC Rcd at 6762-63, para. 475; *Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7528, para. 83; *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8099, para. 249.

[346] *Part 1 Third Report and Order*, 13 FCC Rcd at 403-04, para. 47.

[347] *Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Memorandum Opinion and Order, 9 FCC Rcd 7245, 7269, para. 145 (1994); 47 CFR § 1.2110(c)(1). *See Part I Third Report and Order*, 13 FCC Rcd at 388, para. 18 (continuing a service-by-service approach to defining the eligibility requirements for small businesses).

[348] In response to our *2017 NPRM*, commenters supported our proposal to adopt two tiers of small business bidding credits for the 3.5 GHz band. As we explain here and the Commission has explained in previous service rules proceedings, when adopting small business size standards and associated bidding credits, the Commission takes into consideration the record before it regarding the distinctive characteristics of the service and the capital requirements of the licenses offered. Here, the Commission anticipates that PALs will face issues and costs like those presented to licensees in the 600 MHz and UMFUS bands. Recently, WISPA has requested that the Commission add a 35 percent bidding credit for eligible small businesses in the 3.5 GHz band. *See* WISPA Oct. 17, 2018 *Ex Parte* at 2.

and associated bidding credits should provide consistency and predictability for small businesses participating in competitive bidding in the 3.5 GHz band.[349]

89. Accordingly, for the 3.5 GHz band, an entity with average annual gross revenues for the preceding three years not exceeding $55 million will be eligible to qualify as a "small business" for a bidding credit of 15 percent, while an entity with average annual gross revenues for the preceding three years not exceeding $20 million will be eligible to qualify as a "very small business" for a bidding credit of 25 percent, consistent with the standardized schedule in Part 1 of our rules.[350]

90. *Rural Service Provider Bidding Credit*. In the auction of 600 MHz Band licenses, the Commission also offered, for the first time, a rural service provider (RSP) bidding credit to counter the fact that rural service providers have often faced "challenges in their efforts to obtain financing because the rural areas they seek to serve are not as profitable as more densely-populated markets."[351] The RSP bidding credit provides a 15 percent bidding credit to eligible entities that predominantly serve rural areas and have fewer than 250,000 combined wireless, wireline, broadband and cable subscribers.[352] Here too, the record supports our conclusion that an RSP bidding credit should provide an adequate tool to enable rural service providers to compete for 3.5 GHz band spectrum licenses at auction[353] and in doing so, will support our statutory objectives to disseminate licenses among a wide variety of applicants, ensure that rural telephone companies have an opportunity to participate in the provision of spectrum-based services,

(Continued from previous page)
However, no comments received in response to the *2017 NPRM* suggested adopting a third bidding credit tier. Focusing its argument on how such a credit would financially benefit its members, WISPA fails to explain how a third tier of bidding credits is needed to enhance the ability of small businesses to acquire and retain the capital necessary to compete meaningfully at auction in the 3.5 GHz band. *See Incentive Auction Report and Order*, 29 FCC Rcd at 6763-64, para. 477 (declining to adopt a 35 percent small business bidding credit because the record lacked specific and data-supported grounds to warrant adopting the additional tier); s*ee also Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Order on Reconsideration, 20 FCC Rcd 14058, 14076-77, paras. 34-35 & fn.114 (2015) (detailing the Commission's limited adoption of a 35 percent bidding credit, and explaining why offering a 35 percent small business bidding credit was not necessary for AWS-1 because the Commission anticipated that the licensing scheme would result in the dissemination of licenses to a diverse range of entities).

[349] *See* 47 CFR § 1.2110(f)(2).

[350] *See id.* § 1.2110(f)(2)(i)(B), (C). In the *Competitive Bidding Update Report and Order*, the Commission adopted a process for establishing a reasonable monetary limit or cap on the amount of bidding credits that an eligible small business or rural service provider may be awarded in any particular auction. *See Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7539-44, paras. 110-21. We established the parameters to implement a bidding credit cap for future auctions on an auction-by-auction basis. *Id*. Consistent with this approach, after we adopt the service rules for the 3.5 GHz band, we will initiate a public notice process to solicit comment on certain details of auction design and the auction procedures for the initial auction of PALs. *See supra* para. 79. As part of that process, we will solicit public input on the appropriate amount of the bidding credit cap and subsequently establish the cap that will apply for that 3.5 GHz auction, based on an evaluation of the expected capital requirements presented by the particular spectrum being auctioned and the inventory of licenses to be auctioned. *See Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7541, para. 114.

[351] *Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7532, para. 91.

[352] 47 CFR § 1.2110(f)(4); *Competitive Bidding Update Report and Order*, 30 FCC Rcd at 7530, para. 88. The pre-auction public notice process will solicit comment on the appropriate amount of the bidding credit cap, and subsequently establish the cap for both the small business bidding credit and rural service provider bidding credit. *See supra* note 350.

[353] NCC Comments at 13; RWA Comments at 6; Sacred Wind Comments at 7; *but see* Midco Oct. 14, 2018 *Ex Parte* at 4-5 (proposing the Commission should amend and expand its Part 1 definition of rural service provider).

and promote the availability of innovative services to rural America.[354]

91. *Tribal Lands Bidding Credit*. The Commission also made tribal lands bidding credits available to winning bidders of licenses in the 600 MHz auction. In light of the record support for having similar bidding credits here as the Commission offered in the 600 MHz Band auction, and the modifications we have adopted for PALs that, as explained above, may cause designated entities to have less opportunity to obtain spectrum in this band, we conclude that we should revise the Commission's earlier determination not to offer tribal lands bidding credits in competitive bidding for the 3.5 GHz band. The Commission generally has determined that such a credit should be available where wireless licenses are subject to the Commission's Part 1 competitive bidding rules, and wireless providers are willing to offer service to qualifying tribal lands.[355] Accordingly, a winning bidder for a market will be eligible to receive a credit for serving qualifying Tribal lands within that market, provided it complies with the applicable competitive bidding rules.[356]

92. Finally, we reject a proposal from some commenters to provide a bidding preference for applicants that indicate their intention to use a PAL to meet Connect America Fund (CAF) obligations.[357] Insofar as providers participating in CAF would be receiving CAF support already, additional bidding preferences should not be necessary, and are likely to distort participation in and the results of both the CAF-II and 3.5 GHz auctions.[358] We also reject other proposals from commenters asking the Commission to offer bidding credits to entities based upon standards other than the ones discussed above.[359] We reject these proposals as the record lacks support to justify a departure from our approach to promoting the participation of designated entities in the provision of spectrum-based service, and we believe that the small business and rural service bidding credits should help sufficiently to address the challenges that such groups face.[360]

### C. Partitioning and Disaggregation of PALs on the Secondary Market

93. *Background*. In the *2016 Report and Order*, the Commission prohibited Priority Access Licensees from partitioning or disaggregating their licenses because the Commission found that the typical reasons for permitting partitioning and disaggregation in more traditionally licensed bands were not present in the 3.5 GHz band.[361] The Commission noted that the licensing rules that it adopted in the *2015 Report and Order* did not have the same characteristics as other bands where partitioning and disaggregation were permitted, such as longer license terms, larger license areas, and construction

[354] *See* 47 U.S.C. § 309(j)(3)(A), (B), and (D).

[355] *See Extending Wireless Telecommunications Services to Tribal Lands*, Report and Order and Further Notice of Proposed Rulemaking, 15 FCC Rcd 11794, 11802, para. 22 (2000) ("This bidding credit is available to any winning bidder in a future auction that commits to deploy facilities to serve qualifying tribal lands."); *see also Wireless Telecommunications Bureau Announces Availability of Bidding Credits for Providing Wireless Service to Qualifying Tribal Lands*, Public Notice, 15 FCC Rcd 18354 (OMR/WTB) (2000) ("The rules adopted in the order take effect on October 2, 2000, and will apply to all auctions that commence after that date . . .").

[356] 47 CFR § 1.2110(f)(3).

[357] Alaska Communications Comments at 15-16; CenturyLink Reply at 4-5; *see also* GeoLinks Reply at 8-9.

[358] *See* CTIA Reply at 23.

[359] *See* GeoLinks Reply at 8-9 (proposing that the Commission offer bidding credits to small service providers for those with fewer than 10,000 customers and to offer bidding credits to PAL holders who are willing to offer access to other service providers on a wholesale basis); *see also* NRTC/NRECA Comments at 4 (proposing bidding credits or a refund of a portion of its original auction payment for a PAL licensee that meets substantial service benchmarks early in its license term).

[360] *See supra* note 288.

[361] 47 CFR § 96.32(b). *See 2016 Report and Order*, 31 FCC Rcd at 5077-5078, paras. 229-230.

obligations.[362] In other bands, partitioning and disaggregation were needed to promote key policy goals such as access to spectrum and flexibility of use, which in turn could result in greater service to consumers.[363]

94. In the *2016 Report and Order*, the Commission also determined that a light-touch leasing process could achieve the goal of making PAL spectrum use rights available in secondary markets—on a targeted, flexible basis—without the need for the Commission oversight required for partitioning and disaggregation.[364] The Commission modified its streamlined Part 1 spectrum manager lease rules to create a process tailored to the 3.5 GHz band.[365] Under this streamlined process, parties contemplating spectrum manager lease arrangements with Priority Access Licensees may submit the required, non-lease specific certifications, including ownership information, to the Commission at any time prior to reaching a spectrum manger lease agreement with a Priority Access Licensee.[366] The Commission will expeditiously process these certifications and provide SASs with confirmation that the putative lessee meets the corresponding eligibility criteria for a spectrum manager lease.[367] Once the lessee notifies the SAS of a spectrum manager leasing agreement with a Priority Access Licensee, the SAS may then quickly complete the spectrum manager lease notification process for that lease, and provide confirmation to the parties.[368] The lessee may then immediately begin operating under the lease.[369]

95. In the *2017 NPRM*, the Commission proposed to allow partitioning and disaggregation of PALs in secondary market transactions. It noted that such a modification would be consistent with proposals to lengthen the license term and enlarge the geographic area of PALs, and that it also would be consistent with the licensing paradigm for other similarly licensed services.[370] The Commission anticipated that, when coupled with a longer license term or larger license area for PALs, the ability to partition and disaggregate a PAL would be an effective way to improve spectral efficiency and facilitate targeted network deployments.[371] The Commission sought comment on this proposal and its underlying assumptions.

96. In general, commenters supporting larger license areas and longer, renewable license terms also support partitioning and disaggregation in the band to provide licensee flexibility and promote spectral efficiency.[372] Several commenters supporting smaller license areas also support partitioning and disaggregation, particularly in the context of license areas larger than census tracts.[373] Many commenters

---

[362] *2016 Report and Order*, 31 FCC Rcd at 5077, para. 229.

[363] *Id.*

[364] *Id.* at 5077, para. 228.

[365] *Id.* at 5069-74, paras. 209-23.

[366] *Id.* at 5070-71, para. 212.

[367] *Id.*

[368] *Id.* The SAS would: (1) confirm that the lessee meets the non-lease-specific basic qualifications criteria (as evidenced by the Commission's prior verification of this fact) and that the parties meet the lease-specific eligibility requirements; and (2) notify the Commission that the parties to the spectrum leasing agreement have satisfied the requirements for invoking the immediate processing procedures. *Id.*

[369] *Id.*

[370] *2017 NPRM*, 32 FCC Rcd at 8083, para. 31.

[371] *Id.*

[372] *See, e.g.*, AT&T Comments at 8-9; AT&T Reply at 4; CTIA Comments at 9-10; CTIA Reply at 18-19; Federated Wireless Comments at 4-5; Mobile Future Comments at 10; Mobile Future Reply at 8-9; NCTA Reply at 5-6; T-Mobile Comments at 12; T-Mobile Reply at 10-11; Verizon Comments at 14-15.

[373] *See, e.g.*, Alaska Communications Comments at 6-7; Blooston Comments at 11; Blooston Reply at 8; Cantor Comments at 9-10; Cantor Reply at 6-7; City of NY Comments at 4; MSI Comments at 7; NRTC/NRECA

favoring smaller licensed areas and shorter license terms, while not directly opposing partitioning and disaggregation, argue that such transactions are not a substitute for "right-sized" PALs because larger providers have not demonstrated a willingness to make spectrum available on the secondary market in other bands.[374]

97. *Discussion*. We adopt the proposal in the *2017 NPRM* to allow partitioning and disaggregation of PALs in the 3.5 GHz band, because it will promote investment, encourage robust use of the band by a wide variety of stakeholders, and help to ensure that spectrum is used efficiently. The Commission consistently has found that the flexibility afforded by partitioning and disaggregation facilitates "the efficient use of spectrum by enabling licensees to make offerings directly responsive to market demands for particular types of services, increasing competition by allowing new entrants to enter markets, and expediting provision of services that might not otherwise be provided in the near term."[375] Particularly here, where we have decided to license the 3.5 GHz band in larger geographic areas for longer, renewable license terms, allowing secondary market transactions will allow licensees and the marketplace to determine the correct size of licenses on a market-specific and needs-based basis.[376] These licensing changes also bring the 3.5 GHz band in line with other bands where partitioning and disaggregation are allowed.[377] Thus, the unique features of PALs that had previously militated against allowing partitioning and disaggregation in the band—small census tract licenses with three-year, non-renewable terms—are no longer present. We emphasize that partitioning and disaggregation of licenses in the 3.5 GHz band must comply with section 1.950 of our rules.[378] Accordingly, each party to a partitioning or disaggregation agreement must have a clear construction and operation requirement and each party will face license termination, in the event of failure to meet these requirements.[379] We also note that allowing partitioning and disaggregation will not alter the light-touch leasing rules adopted by the Commission in the 2016 Order.

98. Many commenters support allowing partitioning and disaggregation of PALs, particularly when coupled with the larger geographic area license size, longer license term, and license renewability that we adopt in this Report and Order.[380] These entities maintain that the flexibility afforded by partitioning and disaggregation will "encourage a thriving secondary market,"[381] "facilitate 'right sizing' PALs for any local market, and increase the likelihood that a greater percentage of the whole PEA

(Continued from previous page)
Comments at 7; Nokia Comments at 4-5; OTI/PK Comments at 33; Rajant Comments at 7; Ruckus Reply at 7; Union Pacific Comments at 10; Vivant Comments at 5.

[374] *See, e.g.*, API/ENTELEC Comments at 3; ATN Comments at 9; Frontier Comments at 8-9; GE Comments at 23-24; GeoLinks Reply at 6; Google Comments at 18; Google Reply at 23; Union Pacific Comments at 10.

[375] *Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8094, para. 233; *see also Geographic Partitioning and Spectrum Disaggregation by Commercial Mobile Radio Services Licensees,* Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 21831, 21833, para. 1 (1996).

[376] *See Spectrum Frontiers Report and Order*, 31 FCC Rcd at 8094, para. 233.

[377] *See 2017 NPRM*, 32 FCC Rcd at 8083, para. 31; 47 CFR § 30.105 (partitioning and disaggregation of Upper Microwave Flexible Use Service licenses); 47 CFR § 27.15 (partitioning and disaggregation of AWS and WCS licenses).

[378] 47 CFR § 1.950.

[379] *Id.* § 1.950(g).

[380] *See, e.g.*, Alaska Communications Comments at 6-7; AT&T Comments at 8-9; AT&T Reply at 4; Blooston Comments at 11; Blooston Reply at 8; Cantor Comments at 9-10; Cantor Reply at 6-7; City of NY Comments at 4; CTIA Comments at 9-10; CTIA Reply at 18-19; Federated Wireless Comments at 4-5; Mobile Future Comments at 10; Mobile Future Reply at 8-9; MSI Comments at 7; NCTA Reply at 5-6; NRTC/NRECA Comments at 7; Nokia Comments at 4-5; OTI/PK Comments at 33; Rajant Comments at 7; Ruckus Reply at 7; T-Mobile Comments at 12; T-Mobile Reply at 10-11; Union Pacific Comments at 10; Verizon Comments at 14-15; Vivant Comments at 5.

[381] City of NY Comments at 4.

ultimately will receive service."[382] The City of New York maintains that encouraging secondary market transactions "will help ensure that smaller entities with a plan to serve a small area—say, a particular community, a stadium, or a shopping district—will be able to invest locally in places where bigger players may not see a large enough return on investment to make the effort worthwhile."[383] CTIA contends that these secondary market transactions will "permit licensee flexibility, facilitate faster service deployment, and allow entities with limited needs to enter into transactions tailored to the area or amount of spectrum they desire . . . thereby benefitting small entities and promoting the goals of the Communications Act."[384] These rationales all support our decision to allow PAL partitioning and disaggregation in the 3.5 GHz band.

99. Some commenters maintain that partitioning and disaggregation are not substitutes for initially licensing smaller license areas.[385] Their positions, however, relate to disagreements over license size rather than opposition to these secondary market transactions *per se*. Thus, for example, ATN states that "the concept of secondary market transactions would not be a suitable replacement for smaller geographic areas."[386] DSA, which opposes increased license sizes in the band, contends that partitioning and disaggregation offer some benefits, particularly in rural areas where even census tract-sized licenses can be very large.[387] Similarly, NCTA agrees that, if PAL size is increased, partitioning and disaggregation will provide needed flexibility in the band "to both the license holder . . . and potentially to others who have a need for interference-protected spectrum in a discrete area but did not or could not win a license at auction."[388] GeoLinks, while not believing that the secondary marketplace alone will ensure access to PAL spectrum by smaller entrants, maintains that the secondary marketplace is a viable solution if PALs are subject to strict buildout and reporting requirements and subject to penalties for non-compliance.[389] For the reasons discussed above, we determine that licensing PALs on a county basis serves the public interest, and we do not repeat our rationale for that decision here. We agree, however, that partitioning and disaggregation are important tools which will help us fulfill our statutory mandate to make spectrum available across the United States, in all markets from urban to rural.[390]

100. Other commenters contend that simply allowing secondary market transactions in the band will not necessarily result in such transactions. These commenters maintain that large wireless providers generally are unwilling to make licensed spectrum available on the secondary market.[391] Google, for example, asserts that large providers lack a track record of transferring spectrum to other

[382] Alaska Communications Comments at 6-7.

[383] City of NY Comments at 4; *see also* Rajant Comments at 7 (partitioning and disaggregation will facilitate deployments in smaller, venue-sized areas such as the areas in which Rajant has deployed its innovative broadband system).

[384] T-Mobile Comments at 12.

[385] *See, e.g.*, API/ENTELEC Comments at 3; ATN Comments at 9; Frontier Comments at 8-9; GE Comments at 23-24; GeoLinks Reply at 6; Google Comments at 18; Google Reply at 23; Union Pacific Comments at 10.

[386] ATN Comments at 9; *see also* NCTA Comments at 10; NCTA Reply at 5.

[387] DSA Comments at 17-18.

[388] NCTA Comments at 10.

[389] GeoLinks Reply at 6.

[390] 47 U.S.C. § 151.

[391] API/ENTELEC Comments at 3; ATN Comments at 9; Bernhardt Comments at 3; Charter Reply at 8-9; Comcast Comments at 14; DSA Comments at 6, 17-18; DSA Reply at 13-14, 18; EWA Comments at 4; Frontier Comments at 8-9; GE Reply at 10-13; Google Comments at 19-20; Google Reply at 21-22; NCC Comments at 5; NRTC/NRECA Comments at 7; NTCA Comments at 6; NTCA Reply at 6-7; OTI/PK Comments at 32; Peoples Comments at 3-4; RWA Comments at 6; RWA Reply at 7-8; Sacred Wind Comments at 6; Starry Comments at 4-5; Union Pacific Comments at 10; Vivint Comments at 5; William Lehr Comments at 12; WISPA Comments at 43.

types of spectrum users; instead, it asserts, secondary market transactions operate far more frequently and efficiently in the opposite direction, allowing large carriers to aggregate spectrum that initially was acquired by smaller operators.[392] Other commenters argue that high transaction costs inhibit a robust secondary market.[393]

101. We are unpersuaded by commenters' claims that small entities will be unable to participate in secondary market transactions. We note that, contrary to some assertions in the record, Commission records reflect that there is an active secondary market for partitioned and disaggregated licenses. The Commission has received about 1,000 assignment applications involving partitioned or disaggregated licenses over the last 10 years.[394] Further, we find that the unique characteristics of the 3.5 GHz band are particularly conducive to secondary market transactions. First, the SAS can be leveraged to facilitate secondary market transactions.[395] In addition, as recognized by Professor Connolly, "the use-or-share rule greatly diminishes the concerns of potential hoarding or incomplete deployment over a license area."[396] Priority Access Licensees will be incentivized to sell on the secondary market spectrum within their license area that may lie outside of their current network build or that they otherwise do not need access to for their future deployments. Professor Connolly also points out that the availability of up to seven PALs in each market combined with a 40 megahertz spectrum aggregation limit "decrease the likelihood of excessive or even prohibitive transaction costs. . . ."[397]

102. We reject the suggestion of some commenters that, if we determine to license PALs in larger geographic areas, we should impose an affirmative obligation on larger providers to engage in secondary market transactions with smaller providers and new entrants.[398] As Verizon correctly recognizes, the Commission typically "relies upon market forces and economic incentives to drive spectrum to its most beneficial use."[399] And we believe that this remains the correct approach in this band.

103. Southern Linc questions whether our approach fulfills our statutory and public responsibilities under Section 309(j) of the Act to promote "economic opportunity for a wide variety of applicants."[400] Southern Linc maintains that the Commission would be relying solely on private commercial interests' use of partitioning, disaggregation, and secondary market transactions to provide

[392] Google Reply at 20-22; *see also* DSA Reply at 15; NTCA Comments at 6.

[393] DSA Comments at 22; Frontier Comments at 8-9; Google Comments at 19-20; Microsoft Comments at 7; WISPA Comments at 44.

[394] These included assignment applications in which larger providers assigned spectrum to smaller entities. *See, e.g.*, FCC File No. 0007151075, filed Feb. 25, 2016 (assigning partitioned AWS-3 license from T-Mobile USA, Inc. to Barat Wireless, L.P. (United States Cellular Corporation subsidiary)); FCC File No. 0005207547, filed May 14, 2014 (assigning partitioned 700 MHz A Block license from Cellco Partnership d/b/a Verizon Wireless to Texas Energy Network, LLC); FCC File No. 0005674615, filed Mar. 14, 2013 (assigning disaggregated Broadband PCS C Block license from New Cingular Wireless PCS, LLC (AT&T) to Coral Wireless, LLC); FCC File No. 0005330996, filed Sept. 6, 2012 (assigning partitioned Broadband PCS A Block license from T-Mobile License LLC to FWC Communications, Inc.).

[395] Federated Wireless Reply at 4-5. For example, if an entity desires to obtain spectrum on the secondary market via lease, partitioning, or disaggregation, it can contact an SAS Administrator who can help determine spectrum availability in the area. *See, e.g.*, *id*. at 5; *see also infra* Section III.E.

[396] CTIA Reply, Attach. A at 11.

[397] *Id.*

[398] *See, e.g.*, ATN Comments at 9; RWA Reply at 8.

[399] Verizon Comments at 14-15.

[400] Southern Linc Comments at 16-17 (quoting 47 U.S.C. § 309(j)(4)(C)).

such economic opportunities.[401] We disagree. By developing a new framework to license PALs by counties, we create opportunities for a variety of applicants both large and small to participate in this innovative band. Further, by making a variety of secondary market opportunities available to all licensees, we create economic opportunities for all types of entrants to the band. Contrary to Southern Linc's assertions, we believe that our decision to permit partitioning and disaggregation in the band furthers, rather than undermines, our efforts to fulfill our statutory responsibilities under Section 309(j). This change, along with the others we adopt in this Report and Order, will best balance the statutory objectives to promote competition, the efficient use of spectrum, and the deployment of innovative services to consumers—including those in rural areas.[402] We also note that our decision to adopt performance requirements for PALs advances our efforts to fulfill our statutory obligations under Section 309(j) by helping to ensure that spectrum won't lie fallow.

104. For these reasons, we find that it is in the public interest to permit partitioning and disaggregation in the 3.5 GHz band, subject to the requirements in section 1.950 of our rules. We note that our spectrum manager and *de facto* leasing rules remain in effect for PALs, thus affording potential entrants to the band a variety of options for accessing this spectrum.[403]

### D. PAL Spectrum Aggregation Limit

105. *Background.* In the *2015 Report and Order*, the Commission adopted an in-band spectrum aggregation limit of 40 megahertz (i.e., four PALs) of the possible 70 megahertz per license area at any given point in time.[404] The Commission concluded that the benefits of facilitating competition, innovation, and the efficient use of the 3.5 GHz band outweighed any harms of imposing such an aggregation limit.[405] In the *2017 NPRM*, the Commission asked whether it should modify or eliminate the PAL aggregation limit, in the event it determined to change the geographic license area or make other changes to the PAL licensing scheme.[406]

106. The vast majority of commenters addressing this issue—including Alaska Communications, Comcast, GeoLinks, Microsoft, MSI, and Vantage—argue in favor of retaining the PAL aggregation limit.[407] T-Mobile and NRTC/NRECA advocate for lowering the limit to 30 megahertz,[408] and only AT&T asks the Commission to eliminate the limit entirely.[409]

107. *Discussion.* The record largely supports retaining the PAL aggregation limit.[410] For the

[401] *Id.*

[402] *See supra* Section III, paras. 7-8.

[403] *See* 47 CFR §§ 1.9046, 96.32.

[404] *2015 Report and Order*, 30 FCC Rcd at 3998, para. 117.

[405] *Id.*

[406] *2017 NPRM*, 32 FCC Rcd at 8081, para. 27.

[407] *See* Alaska Communications Comments at 10; ATN Comments at 8-9; Comcast Comments at 15-16; GeoLinks Comments at 4; Microsoft Comments at 7-8; MSI Comments at 6; Vantage Comments at 5; WISPA Comments at 51; WISPA Reply at 38-39.

[408] *See* T-Mobile Comments at 10-11 (arguing that an in-band spectrum aggregation limit of 30 megahertz would allow three entities to secure spectrum without a single entity being able to dominate); T-Mobile Reply at 9-10; NRTC/NRECA Comments at 6-7 (arguing that lowering the limit to 30 megahertz would encourage additional auction participants by ensuring that PAL spectrum is open to at least three carriers in given area); *see also* Southern Linc Comments at 17-18 (suggesting that, if the Commission makes changes to the limit, it should be lowered, perhaps down to 20 megahertz).

[409] AT&T Comments at 7 (arguing that the limit "inhibit[s] the deployment of innovative 5G technologies, for which wider channels are necessary").

[410] As noted in the *2015 Report and Order*, we do not include PALs in the Commission's spectrum screen as applied to secondary market transaction given the unique characteristics of this band such as multiple tiers of users,

reasons articulated in the *2015 Report and Order*, we find that the current framework for auction, assignment, and operation of the 3.5 GHz band is sufficient to incentivize investment and participation by a broader range of participants. The other changes we make to the PAL licensing regime do not alter the Commission's underlying rationale that the 40 megahertz PAL aggregation limit will provide a minimum degree of diversity among users that likely will be operating in this band, and foster competition and innovation in both PAL and GAA uses.[411] Accordingly, we maintain the PAL aggregation limit for both licensees and lessees.[412]

### E. Confidentiality of CBSD Registration Information

108. *Background.* In the *2015 Report and Order*, the Commission required that all CBSDs[413] register with and be authorized by an SAS prior to initial service transmission.[414] The SAS ensures spectral efficiency, non-discriminatory coexistence, and the minimalization of interference among GAA users,[415] by such means as managing the frequencies in a manner to avoid assignment of the same frequency to multiple GAA users at the same location to the extent possible.[416] CBSD registration must include detailed information specifying the location and characteristics of the CBSD.[417] In addition, the CBSD must send an update to the SAS within 60 seconds of any change in the registration information.[418] The Commission required SAS Administrators to disclose CBSD registration information in three circumstances. First, SAS Administrators must immediately respond to requests from Commission personnel for information stored or maintained by the SAS.[419] Second, SAS Administrators must make available to other SAS Administrators all information necessary to effectively coordinate operations between and among CBSDs.[420] Third, SAS Administrators must make CBSD registration information available to the general public. However, due to concerns raised by commenters about the potential for public disclosure of confidential business information that could compromise personal privacy or affect competitive interests, the Commission required SAS Administrators to "obfuscate the identities of the

(Continued from previous page)
sophisticated sharing rules, and the range of technologies and heterogeneous business models. *See 2015 Report and Order*, 30 FCC Rcd at 3998, para. 117 & n.276.

411 *See 2015 Report and Order*, 30 FCC Rcd at 3999, paras. 119-120.

412 *2016 Report and Order*, 31 FCC Rcd 5011, 5071 n.483.

413 "Citizens Broadband Radio Service Devices," or CBSDs, are defined as "[f]ixed stations, or networks of such stations, that operate on a Priority Access or General Authorized Access basis in the Citizens Broadband Radio service consistent with [Part 96]." 47 CFR § 96.3. For CBSDs that consist of multiple nodes or networks of nodes, requirements apply to each node. *Id.* End User devices are not considered CBSDs. *Id.*

414 47 CFR § 96.39(c).

415 GAA users do not receive protection from harmful interference from other GAA users. 47 CFR § 96.35(c).

416 *2015 Report and Order*, 30 FCC Rcd at 4055, para. 321.

417 Specifically, the CBSD must provide the SAS with "its geographic location, antenna height above ground level (in meters), CBSD class (Category A/Category B), requested authorization status (Priority Access or General Authorized Access), FCC identification number, call sign, user contact information, air interface technology, unique manufacturer's serial number, sensing capabilities (if supported), and additional information on its deployment profile required by §§96.43 and 96.45." 47 CFR § 96.39(c). Section 96.43 requires Category A CBSDs to include whether the device will be operated indoors or outdoors. *Id.* § 96.43(b). Section 96.45 requires Category B CBSDs to include the following information: "antenna gain, beamwidth, azimuth, downtilt angle, and antenna height above ground level." *Id.* § 96.45(d).

418 *Id.* § 96.39(c).

419 *See 2015 Report and Order*, 30 FCC Rcd at 4062, para. 351; 47 CFR § 96.63(k).

420 *See id.* at 4057, para. 328; *see also id.* at 4057, para. 326 ("Absent access to and retention of such essential information, SASs will be unable to effectively manage coexistence between and among the different tiers of users in the band.").

licensees providing the information for any public disclosures."[421]

109. Noting that some parties had asserted that public disclosure of the registration information, even with licensee identities obfuscated, would raise both competitive and security concerns, the Commission proposed in the *2017 NPRM* to amend the rules to prohibit an SAS from disclosing publicly any CBSD registration information that may compromise the security of critical network deployments or be considered competitively sensitive.[422] The Commission noted that it was not proposing any change in SAS-to-SAS information sharing requirements.[423] The Commission sought comment, *inter alia*, on the potential risks presented by the public disclosure requirement, how to balance these potential risks against potential users' need for information to plan future GAA and/or PAL deployments, and whether there was a mechanism short of public disclosure for potential users to plan future GAA and/or PAL deployments, such as by communicating with an SAS on a confidential basis.[424] It further sought comment on whether there was certain information an SAS could publicly provide while balancing data sensitivity and security concerns.[425]

110. Several commenters argue that the public disclosure requirement should be retained.[426] They assert the requirement serves a number of important purposes, including: (1) enabling potential GAA operators to assess whether there is enough vacant spectrum in an area to support a deployment and to select channels and transmitter sites, (2) enabling PAL users to determine the source of an interference problem, and (3) fostering efficient use of the band by enabling the public to identify and hold licensees and SAS operators accountable for erroneous or obsolete information.[427] They argue that the public disclosure requirement is comparable to public disclosures that have been imposed without harm on other wireless services, and that there is no basis for giving registered deployments in the Citizens Broadband Radio Service greater protection.[428] They assert that similar deployment information can in any case be obtained by the public through other means, such as crowd-sourced applications, and that the harms of disclosure are therefore at most minimal.[429]

111. Other commenters favor eliminating the requirement that SAS Administrators publicly disclose CBSD registration data and some commenters recommend we go further and prohibit SAS

[421] *See id.* at 4057, paras. 327-28. The inter-SAS and public disclosure obligations were codified at sections 96.55(a)(2) and 96.55(a)(3), respectively. *See* 47 CFR §§ 96.55(a)(2), 96.55(a)(3). In a 2018 Public Notice conditionally approving seven entities as SAS Administrators, WTB and OET further stated, with regard to obfuscation under the public disclosure requirement, that "[t]o protect the identities of individual customers and licensees, conditionally approved SAS Administrators may obfuscate the location of any registered CBSD by up to +/- 50 meters (horizontal) and +/- 3 meters (vertical)." *Wireless Telecommunications Bureau and Office of Engineering and Technology Conditionally Approve Seven Spectrum Access System Administrators For the 3.5 GHz Band*, Public Notice, 31 FCC Rcd 13355, 13358, para. 7 (WTB/OET 2016).

[422] *See 2017 NPRM*, 32 FCC Rcd at 8083-85, paras. 34, 37.

[423] *See id.* at 8085, para. 37.

[424] *See id.* at 8085, paras. 37, 38.

[425] *See id.* at 8085, para. 38.

[426] *See* City of NY Comments at 4; DSA Comments at 22-23; Google Comments at 22; OTI/PK Comments at 35-36; Starry Comments at 7; Vantage Comments at 8; WISPA Comments at 51-52.

[427] *See* City of NY Comments at 4; DSA Comments at 23-24; Google Comments at 22; OTI/PK Comments at 37-38; Starry Comments at 7-8; WISPA Comments at 52.

[428] *See* DSA Comments at 23; OTI/PK Comments at 36; Starry Comments at 7-9; Vantage Comments at 8-9; WISPA Comments at 52-53 (arguing that existing rule already requires less information than must be disclosed by licensees in the 3650-3700 MHz service).

[429] *See* Google Comments at 23 (arguing that the likelihood that location data will become publicly available through other means regardless of confidentiality rules that apply to the SAS limits the real-world benefits of such restrictions); OTI/PK Comments at 36; Starry Comments at 8-9; WISPA Comments at 52.

Administrators from doing so.[430] They argue that the 3.5 GHz band framework does not justify providing the public with access to sensitive network information, and several assert that such public disclosures are unnecessary in light of alternative means that potential GAA users have to obtain information, such as through confidential communications with an SAS.[431] Some argue that the Commission's proposal to require public disclosure only if the information would not compromise the security of critical network deployments or be considered competitively sensitive would raise a number of difficult questions of interpretation and application, and that complete repeal of the public disclosure requirement is the better option.[432] Some commenters opposing the current requirement, however, support replacing it with a requirement that SASs publicly disclose information on 3.5 GHz band spectrum usage in an aggregated form such as a spectrum "heat map."[433] Others suggests disclosure should be prohibited unless expressly permitted under the contractual relationship between the provider and the SAS.[434]

112. *Discussion.* After careful consideration of the record, we find that it is in the public interest to protect CBSD registration information from public disclosure while still ensuring that aggregated data on spectrum use is made available to the public. Specifically, for the reasons explained below, we prohibit SAS Administrators from disclosing disaggregated CBSD registration data to the public except where such disclosure is authorized by the registrant.[435] However, we also require SAS Administrators to make aggregated spectrum usage data for any particular area of interest available to the public, including the extent of usage and available spectrum in the 3.5 GHz band throughout that area and the maximum available contiguous spectrum, using graphical "heat maps" or other appropriate formats. We find that this approach will effectively balance the interests in protecting sensitive network information and the legitimate needs that parties—including potential GAA operators—may have for information on the local spectrum environment. We are not modifying the current requirements governing SAS-to-SAS information exchange.[436]

113. Although the current requirement provides that licensees' identities must be obfuscated, numerous commenters argue that public disclosure of CBSD registration information would still allow competitors or other parties to identify the licensee—using a combination of publicly available data—and obtain competitively sensitive information about the licensee's network.[437] Some commenters also argue

[430] *See* Alaska Communications Comments at 8; AT&T Comments at 12-13; Comcast Comments at 31-32; CommScope Comments at 2; CTIA Comments at 11; Ericsson Comments at 6-7; Union Pacific Comments at 12; USCC Comments at 18-19; Verizon Comments at 16-17; API Reply to CTIA at 2.

[431] *See* AT&T Comments at 12-13; CommScope Comments at 2-3 (arguing parties may communicate with SAS Administrators on a confidential basis to determine available spectrum); CTIA Comments at 12 (arguing that disclosure is unnecessary because that "[m]embers of the public can coordinate with a SAS to determine where they can deploy CBSDs on a GAA basis."); T-Mobile Comments at 13 (same); USCC Comments at 19; Verizon Comments at 16-17; AT&T Reply at 7; *see also* CTIA July 2, 2018 *Ex Parte* at 6-7.

[432] *See* T-Mobile Comments at 13; USCC Comments at 18-19.

[433] *See, e.g.*, Federated Wireless Comments at 11; NCTA Comments at 18; NRTC/NRECA Comments at 9.

[434] *See* AT&T Comments at 13; Federated Wireless Comments at 11-12 (proposing that an SAS Administrator may offer an "opt-in" mechanism that will allow more detailed public disclosures for certain licensees and lessees).

[435] By restricting public disclosures, we do not exempt SAS Administrators from making specific disclosures required by a court order, law enforcement agency, or other controlling legal authority.

[436] 47 CFR § 96.55(a)(2).

[437] *See, e.g.*, CTIA Comments at 11-12; Comcast Comments at 31-32; Ericsson Comments at 6-7 (asserting that "[d]isclosure of radio configuration and location are two examples of data that could harm commercial interests by indicating the licensee's strategies—both in terms of the planned use of spectrum and the particular customers that are being targeted."); NCTA Comments at 17 (asserting an observer could correlate the CBSD locations with a network operator's known footprint, and would then "possess very detailed, competitively sensitive network information"). OTI/PK, while arguing that the current public disclosure requirement "protect[s] confidentiality,"

that such information could compromise the security of network infrastructure.[438] Further, as Alaska Communications notes, the risk that "even 'anonymous' location information could easily be used to identify a competitor's market entry plans and network architecture" will be heightened in rural Alaska and other remote areas that will often have a relatively small number of operators.[439] Due to the concerns raised by commenters, we find that, on balance, the current requirement to publicly disclose CBSD registration information does not adequately protect sensitive information about licensees' network deployments.

114. We continue to find, however, that the success of the shared spectrum model adopted for the 3.5 GHz band requires providing potential users of the band with enough information to accurately assess the overall spectrum environment in an area in order to make investment and deployment decisions. We further find substantial support in the record for the conclusion that revising the public disclosure requirement to require the disclosure of aggregated spectrum usage data will enable potential users of the 3.5 GHz band to make investment and deployment decisions, while significantly reducing the concerns from the disclosure of disaggregated device registration data. Federated Wireless, for example, supports disclosure of a graphical mosaic or heat map based on aggregate data showing the level of spectrum use in a given area and the amount of spectrum available, arguing that such an approach would permit current and prospective users to better plan for future deployments while withholding potentially commercially sensitive or security-related, licensee-specific information, and "thus would serve to balance the needs of licensees and prospective users."[440] NRTC/NRECA similarly asserts that "aggregate heat maps, showing the total amount of occupied and available spectrum in a given area" will "allow potential users to effectively evaluate the amount of spectrum in a given area in order to make an investment decision."[441] Accordingly, we find that it will serve the public interest to require SAS Administrators to make publicly available up-to-date aggregated spectrum usage data for any desired area of interest, including the extent of usage and available spectrum in the 3.5 GHz band throughout that area and the maximum available contiguous spectrum, using graphical "heat maps" or other appropriate formats that provide this information.

115. We find this approach strikes a better balance between protecting sensitive network information and the legitimate needs that parties have for information on the local spectrum environment than a prohibition on any public disclosures. Some commenters, while not disputing that potential users will need information on the spectrum environment to plan their deployments, argue that any public disclosure is nevertheless unnecessary. CommScope and CTIA assert a Commission disclosure requirement is unnecessary because, under a Wireless Innovation Forum working document, SAS Administrators must publish certain information to assist operators in assessing whether there is available spectrum.[442] The suggestion that no Commission requirement is needed in the light of the working document requirements is unpersuasive, particularly given that the working document requirements were

(Continued from previous page)
appears to concede that the protection will amount to little in practice, as it asserts that it will be "relatively easy to identify the carrier from the transmitted signal." OTI/PK Reply at 43, 45.

[438] *See* Alaska Communications Comments at 8; CTIA Comments at 11-12; NCTA Comments at 17; USCC Comments at 4, 18; Federated Wireless Reply at 9.

[439] Alaska Communications Comments at 8.

[440] Federated Wireless Comments at 11.

[441] NRTC/NRECA Comments at 9; *see also* Comcast Comments at 32 (arguing that disclosure of "basic spectrum utilization information" or "an aggregated overview of the spectrum environment" will help potential users plan GAA deployments or inform possible bidding on PAL rights without disclosing the confidential business information of other network operators); NCTA Comments at 18 (Commission should authorize SASs to make available sufficient aggregate information to prospective network operators, upon request, to enable them to understand the spectrum environment in areas where they wish to deploy).

[442] *See* CommScope Comments at 2-3; CTIA Reply at 20.

only adopted pursuant to the existing Commission disclosure requirement.[443] Some commenters argue that disclosure is unnecessary because potential users can obtain information from SAS Administrators on a confidential basis to make such decisions.[444] But these commenters do not provide details regarding how such an option would operate, who would be authorized to access CBSD registration information, and under what circumstances access would or would not be provided. We find that, on the record before us, the revised public disclosure requirement we adopt in this Report and Order is the best choice because it will ensure that all potential users have certain and convenient access to aggregate data on the spectrum environment for the area of interest while substantially reducing any legitimate concerns regarding the sensitivity of network data.[445] We acknowledge that aggregate spectrum usage data might in some circumstances implicitly reveal some provider- or CBSD-specific information (such as in cases where a 3.5 GHz Priority Access Licensee has deployed CBSDs in a particular geographic area with no other deployments in the band). We find, however, that the benefits of the revised public disclosure requirement and its importance to the success of the shared model in the 3.5 GHz band far outweigh any remaining concerns from the potential for such inferred disclosures.

116. Some proponents of the current requirement assert that the harms of disclosure should be discounted because the deployment information will in any case become available through other means.[446] We disagree that the possibility that, in the future, there may be independent methods to obtain data about *some* licensees' networks is an appropriate justification for us to disregard concerns over the commercial sensitivity of that data and to allow today the public disclosure of commercially sensitive data about *all* licensees' networks. We further note that there is no evident source currently that would reproduce the CBSD registration information and find it unlikely that any third-party public source will provide 3.5 GHz band network infrastructure data of the same character, in terms of information covered, specificity, comprehensiveness, timeliness, and accuracy. As evidence that CBSD registration data will likely be available from providers' own voluntary disclosures, Google cites several cable provider websites disclosing the location of their commercially offered Wi-Fi hotspots.[447] However, we find these disclosures of the locations of Wi-Fi hotspots reflect that such Wi-Fi services are typically provided only at discrete locations. Such disclosures do not support the conclusion that mobile broadband providers would similarly disclose the location of individual antenna sites that are subsumed within the broad coverage of a cellular service. Starry argues that claims of commercial sensitivity are refuted by the fact that mobile providers often publish their service coverage maps, but as Starry concedes, such maps do not include the location of their network infrastructure, let alone the detailed and band-specific information

[443] *See* Wireless Innovation Forum, Requirements for Commercial Operation in the U.S. 3550-3700 MHz Citizens Broadband Radio Service Band, Working Document WINNF-TS-0112 Version V1.4.1 at 4 (Jan. 16, 2018), https://workspace.winnforum.org/higherlogic/ws/public/download/5116/WINNF-TS-0112-V1.4.1%20CBRS%20Operational%20and%20Functional%20Requirements.pdf (*CBRS Operational and Functional Requirements*) (stating that "public registration data" is "[d]ata that SAS Administrators must share with the public according to FCC requirement 96.55(a)(3)").

[444] *See, e.g.*, T-Mobile Comments at 13 (arguing that "potential GAA users can work directly with SAS Administrators to determine where they can deploy CBSDs on a GAA basis"); AT&T Reply at 7 (arguing operators are free to directly contact SAS Administrators and request necessary information on a confidential basis); CTIA Reply at 20 (public disclosure is unnecessary because stakeholders could "contact SAS administrators to request information on a confidential basis to assist in planning GAA deployments."); *see also* USCC Comments at 19 (arguing that prohibiting public disclosure will not prevent GAA or PAL users from planning deployments because members of the public may coordinate with an SAS to determine where they can deploy CBSDs on a GAA basis).

[445] *See, e.g.*, WISPA Comments at 52 (arguing that with access to certain basic information, Citizens Broadband Radio Service users "will not have to go to the SAS on a trial-and-error basis to keep asking 'How's this?'").

[446] *See* Google Comments at 23; Starry Comments at 8-9; WISPA Comments at 52; OTI/PK Reply at 45 (arguing purported harms would not be solved by restricting disclosure because most base stations will generally be visible).

[447] *See* Google Comments at 23 & n.54; Google Reply at 27 & n.83.

available in CBSD registrations.[448] We also reject DSA's argument that concerns regarding the disclosure of the network data should be discounted because "access points will cover very limited areas."[449] While the anticipated deployment of 5G services in the band will likely often involve small cell technologies, that does not reduce the sensitive nature of the deployment information.

117. Some commenters also argue that the Commission typically has disclosed site information in historic site-based licensing regimes and that there is no reason to provide any greater protection here.[450] Their assessment of Commission practice disregards other Commission or Bureau actions, however, that have found that comparable disclosures of network infrastructure information encompass sensitive information that warranted some degree of protection.[451] We find that these latter precedents, as well as the record in this proceeding, support a determination that parties have legitimate concerns regarding the sensitivity of CBSD registration data that may impact their investment and deployment decisions.

118. Arguments in the record that a disclosure of aggregate data would be insufficient are similarly unpersuasive. Google argues that a GAA user will need to know how many contiguous channels are available throughout its service area in order to predict the speeds it can offer its subscribers; however, our modified requirement directly addresses that concern because we require publicly disclosed information to include aggregate information on the maximum number of contiguous channels available.[452] While WISPA argues that a heat map is inadequate because it does not necessarily provide sufficient information for the aiming of directional antennas,[453] aggregate data should enable potential users to identify geographic areas with sufficient available spectrum to support a range of directional orientations

[448] Starry Comments at 8.

[449] DSA Comments at 23-24.

[450] *See, e.g.*, DSA Comments at 36; OTI/PK Comments at 36; Vantage Comments at 8-9; WISPA Reply at 42 (arguing that "many radio services have their full details published in ULS, and no real harm comes of it.").

[451] *See, e.g.*, *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37,* Report and Order, 30 FCC Rcd 9551, 9651-52, paras. 240, 244, & n.616 (2015) (requiring 600 MHz Band licensees to register in the white space database the locations where they have commenced service, but directing database administrators not to make the information publicly available, finding the service providers' concerns about protecting competitively sensitive information outweighed the need to make the information public); *Wireline Competition Bureau and Wireless Telecommunications Bureau Release Instructions For Filing Terrestrial Middle-mile Network Maps*, Public Notice, 32 FCC Rcd 6863, 6865-66 (WCB/WTB 2017) (find that the "location of companies' middle-mile network maps (with links and nodes) is likely to contain confidential data" and providing an abbreviated means to obtain confidential treatment); *The FCC's Public Safety & Homeland Security Bureau Launches Disaster Information Reporting System (DIRS)*, Public Notice, 22 FCC Rcd 16757 (PSHSB 2007) (providing that filings on communications infrastructure status will be treated as presumptively confidential in part because "[p]ublic availability of these reports, which contain information the filers themselves do not routinely make public, could competitively harm the filers by revealing information about the types and deployment of their equipment and the traffic that flows across their networks."); *see also 2015 Report and Order*, 30 FCC Rcd at 4057, para. 328. We note that the white space rules do generally require the public disclosure of both TV Bands device registration and certain voluntarily collected information from protected entities. *See Unlicensed Operation in the TV Broadcast Bands*, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18709, para. 119 (2010) (*White Space Second MO&O*). The required public disclosures of commercial mobile service infrastructure, however, are only in cases where such deployments were pursuant to waiver and therefore already disclosed in the ULS database. *See* 47 CFR § 15.713(j)(4). In contrast, information on licensed wireless service deployments that was not already disclosed, i.e., 600 MHz licensee deployments, are treated as confidential and not subject to disclosure.

[452] Google Reply at 28 & n.87 (citing Arbuckle Comments at 3).

[453] *See* WISPA Reply at 43 (noting WISPA's members will use directional antennas on both base stations and fixed terminal devices, and arguing heat maps are more appropriate for illustrating areas where general mobile coverage exists, not for coordinating paths when using directional antennas).

for deployments within that area.[454] Some commenters argue that licensees need information on specific channel availability.[455] We find, however, that specific channel availability will be far less relevant to 3.5 GHz band network planning than aggregate spectrum availability, given that all 3.5 GHz band equipment must be operable across the entire band, and that the SASs will be making the frequency assignments, which will be subject to change during the operation of the equipment.

119. Starry proposes that if we determine that the current public disclosure requirement raises security or competitive concerns, we require SAS Administrators, in their public disclosure of disaggregated data, to obscure or randomize the location of individual CBSDs within a triangle of points 50 linear feet apart or another defined area.[456] Starry argues that this modified requirement is warranted to enable users "to determine the availability of spectrum in a geographic area, which is critical for planning and deploying networks."[457] We find Starry's proposal does not differ significantly from the current requirement, which does not adequately protect competitively sensitive information, and we find that our modified requirement is a better approach to address Starry's concern, as it will directly provide current and potential users with information on the availability of spectrum in a geographic area without requiring public disclosure of disaggregated CBSD data.

120. We find that other purposes that commenters identify for the public disclosure of disaggregated registration data are likely to be able to be achieved without the public disclosure of such data. For example, while OTI/PK argues that disclosure will help users identify sources of interference, that is a core function of the SAS itself and therefore does not require public disclosure of disaggregated SAS registration data.[458] The role of the SASs further distinguishes the 3.5 GHz band from the prior 3650-3700 MHz Band service rules, where the Commission adopted public disclosure of site registrations to enable non-exclusive licensees to coordinate to avoid harmful interference.[459] Under that regime, there was no license administrator to facilitate coordination.

121. OTI/PK also argues that disclosure will enable the public to detect and hold operators accountable for erroneous or obsolete information.[460] We acknowledge that, for the white space database, the Commission did adopt public disclosure for some registrations in part to "permit public examination of protected entity registration information to allow the detection and correction of errors."[461] However, we find the 3.5 GHz band is not analogous to the white space service in this regard, as the Commission discussed extensively in the *2016 Order on Reconsideration*. Among other distinctions in the case of 3.5 GHz, the Commission noted that "[t]he licensed nature of the service coupled with industry certification requirements for professional installers provides a higher degree of accountability for Citizens Broadband Radio Service users and SAS Administrators, ensuring that CBSD locations are accurately reported and

[454] *See* Ericsson Comments at 4, 6 (while recognizing the role of directional antennas in fixed wireless services in the 3.5 GHz band, asserting that disclosing registration information to the general public "does not serve any useful purpose . . . .").

[455] *See, e.g.*, DSA Comments at 23; Google Comments at 22; WISPA Comments at 52.

[456] Starry Mar. 19, 2018 *Ex Parte* at 2-3.

[457] *Id.* at 2.

[458] *See* OTI/PK Comments at 37-38; 47 CFR § 96.53(i), (o); *see also* 47 CFR 96.39(d) (requiring a CBSD to report to an SAS regarding received signal strength, received packet error rates, or "other common standard metrics of interference for itself and associated End User Devices as directed by an SAS").

[459] *Wireless Operations in the 3650-3700 MHz Band et al.*, Report and Order and Memorandum Opinion and Order, 20 FCC Rcd 6502, 6513, para. 29 (2005).

[460] *See* OTI/PK Comments at 38.

[461] *See White Space Second MO&O*, 25 FCC Rcd at 18709, para. 119.

verified."[462] It further noted that SASs "will have capabilities and responsibilities that exceed those of White Spaces database administrators," including rules that require authentication of CBSDs with an SAS and require that SAS Administrators maintain the accuracy of CBSD records, which "places a duty on SAS Administrators to take reasonable steps to validate newly entered data and to purge obsolete data."[463] Accordingly, we find there is not the same benefit from public disclosures in helping to ensure registration accuracy in this context as was present in the white space service.

122. WISPA argues that Category B GAA users will need disaggregated registration data, and particularly relevant contact data, to fulfill their obligation to coordinate with other Category B GAA users under section 96.35(e) of the Commission's rules.[464] We find, however, that mandatory disclosure of disaggregated CBSD registration data, including contact data, is not necessary for Category B GAA coordination, and that voluntary mechanisms and arrangements facilitated by an SAS, supplemented by the mandatory disclosure of aggregate spectrum usage data, can reasonably be expected to support and achieve the coordination contemplated in section 96.35(e), given that Category B GAA users will generally have mutual incentives to coordinate with one another and SASs are required to facilitate such coordination.[465] For example, one multi-stakeholder standards document for Citizens Broadband Radio Service commercial operation, noted by several commenters, addresses the need for GAA coordination through a voluntary approach to be administered by the SASs.[466] We anticipate that the SAS Administrators will play an active role in facilitating GAA coordination, and we base our expectation that a voluntary mechanism will be successful in part on SAS involvement.

123. Starry argues that information about the availability of spectrum within a PAL is necessary to have a functioning secondary market.[467] We anticipate that disclosure of aggregate information on spectrum availability will be sufficient in many cases to help interested parties identify potential secondary market opportunities, and that the SASs will help facilitate secondary market transactions in other ways that do not require disaggregated disclosure.[468] Further, parties can directly contact the Priority Access Licensees in a particular license area (which will be a matter of public record) for that purpose.[469] Indeed, even if we continued to mandate disclosure of anonymized CBSD data, it would still generally be necessary to determine from the licensees in an area (either directly or through SAS facilitation) whether a particular licensee has unused PAL spectrum it is willing to make available through a secondary market transaction. To the extent that mandatory public disclosures of detailed, disaggregated CBSD registration data might in some circumstances provide some additional benefit over aggregate data, we believe that the benefits are outweighed by the security and competitive concerns that

---

[462] *2016 Order on Reconsideration,* 31 FCC Rcd at 5047, para. 127.

[463] *Id.* at 5047, para. 128.

[464] *See* WISPA Reply at 44-55; 47 CFR § 96.35(e) (providing in part that "General Authorized Access Users operating Category B CBSDs must make every effort to cooperate in the selection and use of available frequencies provided by an SAS to minimize the potential for interference and make the most effective use of the authorized facilities.").

[465] *See 2015 Report and Order*, 30 FCC Rcd at 4054-55, para. 320 (stating that the "core functions that an SAS must perform" include "[f]acilitat[ing] coordination between GAA users to promote a stable spectral environment").

[466] *See CBRS Operational and Functional Requirements* at 42 (providing that "the SAS shall provide to a CBSD any coexistence information that is voluntarily provided for sharing with CBSDs by other potentially interfering GAA CBSDs."); Google Comments at 24; Nokia Comments at n.8; WISPA Comments at n.167.

[467] *See* Starry Mar. 19, 2018 *Ex Parte* at 2.

[468] *See, e.g.*, Letter from Jeffrey A. Marks, Senior Counsel, Policy and Regulatory, Nokia, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 et al., at 1 (filed Mar. 26, 2018) (stating that its "SAS technology and user-interface facilitates a frictionless subleasing market, empowering prospective users to request from licensees CBRS spectrum in highly-customizable geographic areas to meet their needs").

[469] *See* CTIA July 2, 2018 *Ex Parte* at 8.

such disclosures would raise. In sum, we conclude that the revised requirement provides a reasonable balance for the services in the 3.5 GHz band, including emerging 5G and other innovative services anticipated in this band, and will thus promote its effective and efficient use.[470]

### F. Emissions Limits for CBSDs and End User Devices

#### 1. Background

124. The Commission's rules include the following emissions limits for CBSDs and End User Devices operating in the 3.5 GHz band:

- -13 dBm/MHz from 0 to 10 megahertz from the assigned channel edge;
- -25 dBm/MHz beyond 10 megahertz from the assigned channel edge down to 3530 megahertz and up to 3720 megahertz;
- -40 dBm/MHz below 3530 megahertz and above 3720 megahertz.[471]

125. The Commission adopted these limits to achieve a balance between the ability of CBSDs and End User Devices to protect out-of-band incumbent services, the ability of equipment vendors to meet reasonable standards of design performance, and the ability of CBSD and End User Devices to minimize the addition of in-band noise affecting other users of the band.[472] The Commission denied petitions for reconsideration that sought changes to these limits in 2016.[473]

126. In the *2017 NPRM*, the Commission sought comment on two alternative emission masks to address concerns about the need to reduce transmit power for channels wider than 10 megahertz under the emissions mask set forth in section 96.41(e) of the Commission's rules.[474] Both alternative emission masks would extend the width of the -13 dBm/MHz transition step.[475] Instead of the fixed 10 megahertz wide transition step in section 96.41(e)(1), each alternative emission mask would extend the total transition bandwidth to be the bandwidth (B) of the fundamental transmission in megahertz. The first alternative emission mask (the Qualcomm Mask) has a single transition step at a level of -13 dBm/MHz.[476] The second alternative emission mask (the Graduated Mask) has two steps with a steeper

[470] Because we repeal the requirement to publicly disclose disaggregated registration information, we do not reach WISPA's requests that we clarify that the obfuscated data to be disclosed under the requirement includes CBSD location information, contrary to the interpretation in the relevant WinnForum working document. *See* WISPA Comments at 54 (proposing clarification that obfuscated information includes limited precision location information). We note, however, that while we encourage and welcome the efforts by multi-stakeholder groups to implement our rules governing the 3.5 GHz band, we retain our authority to determine the proper interpretation of these rules should disagreements or other need for clarification arise. *See, e.g.*, 47 CFR § 1.2.

[471] *Id.* § 96.41.

[472] Incumbent services include FSS earth stations and DoD systems.

[473] *See 2016 Order on Reconsideration*, 31 FCC Rcd at 5034-5038, paras. 85-98.

[474] The Petitioners' proposed emission mask accommodates up to 40 megahertz channels; 3GPP 5G NR standards have channel bandwidths ranging from 5 megahertz to 100 megahertz.

[475] Transmitters of wider bandwidth signals generally require more bandwidth beyond the edges of the fundamental signal to reduce the "leakage" of out-of-channel emissions (noise) to a low level (i.e., the emissions roll-off is less sharp for broader band transmissions than for narrow band transmissions) without additional filtering or emission reduction techniques. As a percentage of the occupied in-channel bandwidth, the band-edge leakage is not significantly worse for a wider bandwidth signal than it is for a narrower signal.

[476] Letter from Dean R. Brenner, Senior Vice President, Spectrum Strategy and Technology Policy, and John W. Kuzin, Vice President and Regulatory Counsel, Qualcomm, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-354 (filed June 19, 2017) (Qualcomm June 19, 2017 *Ex Parte*). T-Mobile had petitioned for a relaxation in the emission mask by eliminating the -25 dBm/MHz limit and the -40 dBm/MHz limits; or, alternatively, T-Mobile

reduction of adjacent emission power, -13 dBm/MHz from 0 to B/2 megahertz from the channel edge, and -20 dBm/MHz from B/2 to B megahertz from the channel edge.[477] The Commission sought comment on these two alternative emission masks and specifically requested quantitative analysis of the tradeoffs between the use of wider channels and the risk of higher interference to users in adjacent channels.[478]

127. Several commenters, including T-Mobile, Verizon, AT&T, CTIA, Nokia, TIA, and WISPA, support the Qualcomm Mask.[479] These commenters argue that the Qualcomm Mask would facilitate the use of wider bandwidth channels at higher transmit power and that such capabilities are essential for successful 5G deployment.[480] These commenters assert that the current rules would require licensees to transmit at lower power, which would reduce signal coverage, increase deployment costs, and discourage investment in the band.[481] Some commenters also contend that the Qualcomm Mask is consistent with a typical 3GPP (user device) mask while the Graduated Mask would necessitate greater power back-off than 3GPP requires.[482]

128. Qualcomm submitted results of a simulation study of the additional maximum power reduction (A-MPR) that would be required for the Qualcomm Mask and the Graduated Mask.[483] Qualcomm asserts that both masks require the same amount of (non-zero) power reduction (e.g., 2.2 dB) for channels with high resource utilization, but the Graduated Mask requires 0.8 dB – 2.5 dB additional power reduction than the Qualcomm Mask for channels with low resource utilization. Thus, Qualcomm argues that its mask will more effectively facilitate wider bandwidth operations with less impact on transmit power.

129. In *ex parte* presentations on March 6, 12, and 14, 2018, Qualcomm further asserted that with its proposed mask, emission reduction is achieved by power reduction resulting from both the spectrum emission mask (SEM) and the 3GPP Adjacent Channel Leakage Ratio (ACLR) requirement of 30 dB for user devices.[484] In some cases, the ACLR requirement (and not the SEM) determines the amount of emission reduction, and in other cases the SEM requirement (and not the ACLR) determines the amount of emission reduction.

130. Some supporters of Qualcomm's proposed mask gave conditional statements of support. Nokia argued that the Commission should adopt Qualcomm's proposal as long as such a change does not slow down the authorization of devices. Nokia also said that the potential for increased interference on

(Continued from previous page)
proposed that a limit of -25 dBm/MHz should begin no closer than 20 megahertz outside of the 3.5 GHz band edges, and -40 dBm/MHz should begin no closer than 40 MHz outside of the band edges. *See* T-Mobile Petition at 22.

[477] *See 2017 NPRM*, 32 FCC Rcd at 8090-8091, paras. 54.

[478] *See id.* at 8090-8092, paras. 54-58.

[479] *See* T-Mobile Comments at 18-19; T-Mobile Reply at 13; Verizon Comments at 17-18; Verizon Reply at 13-14; AT&T Reply at 12-14; CTIA Comments at 13; CTIA Reply at 20-21, Nokia Comments at 2; WISPA Comments at 56.

[480] *See, e.g.*, AT&T Reply at 12-13; Nokia Comments at 5-10; TIA Comments at 4.

[481] *See* T-Mobile Comments at 18-19; T-Mobile Reply at 13; Verizon Comments at 17-18; Verizon Reply at 13-14; AT&T Reply at 12-14; CTIA Comments at 13; CTIA Reply at 20-21.

[482] *See* T-Mobile Comments at 18-19; AT&T Reply at 12-13.

[483] *See* Qualcomm Comments, Tables 1A and 1B; Qualcomm Reply at 4. Qualcomm presents results for 14 waveform combinations out of 30,282 waveforms studied.

[484] *See* Letter from Dean R. Brenner, Senior Vice President, Spectrum Strategy and Technology Policy, and John W. Kuzin, Vice President and Regulatory Counsel, Qualcomm, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 (filed Mar. 8, 2018) (Qualcomm March 8, 2018 *Ex Parte*); Letter from Dean R. Brenner, Senior Vice President, Spectrum Strategy and Technology Policy, and John W. Kuzin, Vice President and Regulatory Counsel, Qualcomm, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-258 (filed Mar. 14, 2018) (Qualcomm Mar. 14, 2018 *Ex Parte*).

adjacent channels as a result of emission mask relaxation should be studied, and, retaining the -40 dBm/MHz limit outside of the band would result in no negative impact on incumbents.[485] Others, such as ATN, agree with Qualcomm that emission limits should be relaxed to facilitate wider channels without power reduction, but in doing so the Commission should make sure that such changes do not put a premium on being in the middle of the band vis-a-vis the edges of the band.[486] Also, Google supports relaxation of the emission limits to ensure compatibility with emerging 5G standards, but asks the Commission to take care not to make any changes that disrupt the process of developing industry standards or delay 3.5 GHz deployments.[487]

131. Commenters supporting the Graduated Mask include API and ENTELTEC.[488] Other commenters, including Comcast, the Content Companies, Intelsat/SES, MSI, NAB, SES Americom, and Vivint, support the Commission's existing rules and argue that changing the emission mask is not warranted. MSI asserts that no changes to the emission rules are necessary because current technologies can be utilized to meet the existing limits, and the existing rules allow higher total power with wider bandwidth, which helps counteract the need for a power reduction.[489] However, if the mask is relaxed, MSI prefers the Qualcomm Mask, and argues that channel aggregation should be limited to the PAL limit of 40 megahertz.[490] Vivint contends that relaxing the emissions mask will increase the risk of added noise and interference between adjacent channel operations in the band.[491] Ericsson argues that while 5G services may benefit from wider channels, additional analysis of emission masks is needed.[492]

132. Federated Wireless argues that new technical rules—including changes to the emission mask—should only be adopted if such rules would be compatible with ongoing technical work in the band and would not delay deployment of commercial services in the band.[493] Additionally, Alaska Communications contends that changes to emission limits should not require the replacement of existing network equipment, and multichannel operation should not cause adjacent channel interference.[494]

### 2. Discussion

133. After review of the record, we conclude, first, that we should make no changes to the OOBE limits outside the 3.5 GHz band, specifically at or beyond the 3550 and 3700 MHz band edges.[495] Second, we are not convinced that any change is needed in the emissions mask for Category A and B CBSDs to facilitate next generation wireless deployments, including 5G channels up to 40 megahertz wide. Third, we find that some relaxation in the emissions mask for uplinks from End User Devices is

[485] *See* Nokia Comments at 2.

[486] *See* ATN Comments at 9-10.

[487] *See* Google Comments at 23-24; Google Reply at 3.

[488] *See* API/ENTELTEC Comments at 4.

[489] MSI Comments, GN Docket No. 12-354, at 5-6 (filed July 24, 2017) (MSI July 24, 2017 Comments).

[490] *See* MSI Comments at 7-8.

[491] *See* Vivint Comments, GN Docket No. 12-345, at 8-9 (filed July 24. 2017).

[492] *See* Ericsson Comments at 8.

[493] *See* Federated Wireless Comments at 2.

[494] *See* Alaska Communications Comments at 11-12.

[495] *See* Qualcomm Mar. 8, 2018 *Ex Parte* at 2; Nokia Comments at 2. We also note that, in the *2017 NPRM*, the Commission declined to seek comment on proposals to alter the emissions limits at or beyond 3530 MHz and 3720 MHz and to eliminate the transition mask entirely. *See 2017 NPRM*, 32 FCC Rcd at 8090, para. 54 ("However, we are not persuaded by T-Mobile's proposals to eliminate the -25 dBm/MHz limit or to eliminate the -40 dBm/MHz limit below 3530 megahertz and above 3720 megahertz. We also are not persuaded by T-Mobile's proposal to increase the transition bandwidth to 40 megahertz outside of the band, because of the impact these changes would have on protecting adjacent operations.").

warranted to accommodate wider bandwidths. This change will help facilitate wide-network deployments, consistent with the other changes adopted herein.

134. There is little in the record to suggest that changes in the OOBE limits outside the 3.5 GHz band are necessary to accommodate signals having wide bandwidths. Indeed, many commenters argue that there should be no relaxation of the emissions limits outside the 3.5 GHz band.[496] The existing OOBE limits outside the 3.5 GHz band were adopted to ensure interference protection for fixed satellite services operating above the band and federal operations below the band.[497] These important adjacent band coexistence issues have not changed since the rules were adopted and, as such, we see no need to reconsider our prior findings on this matter.

135. In addition, we find that no changes to the emission limits for CBSDs are needed. Qualcomm's proposal is focused solely on End User Devices and there were no other technical showings that would support relaxation of the emissions limits for CBSDs. Indeed, equipment vendors such as MSI argue that no change to the emission limits are necessary because current technologies can meet the existing limits and the existing rules allow higher power with wider bandwidth, which helps counteract the need for a reduction in power.[498] We believe their comments were in the context of CBSDs (i.e., base stations).

136. We are aware that it is generally easier to employ linearization techniques and better filtering in CBSDs to achieve low out-of-channel emissions because they operate off external electrical power and are less constrained by space limitations in the device as compared to End User Devices. Accordingly, we are maintaining the existing OOBE limits for CBSDs.

137. We find that there is justification for relaxing the OOBE limits within the 3.5 GHz band for End User Devices to accommodate bandwidths wider than ten megahertz.[499] We adopt the Qualcomm Mask and an adjacent channel leakage requirement of -30 dBc for End User Devices, because Qualcomm's analysis showed that -30 dBc, a 3GPP standard, in addition to the Qualcomm Mask, would limit the total emission power that affects adjacent channels. While most commenters support the Qualcomm Mask rather than the Graduated Mask, we are concerned that the Qualcomm Mask, by itself, may lead to a higher level of OOBE than necessary to accommodate wider bandwidths with little or no power reduction.[500] We also believe that much of the equipment that will be used in this band will be designed to meet 3GPP standards. The 3GPP standards are based on an adjacent channel leakage ratio (ACLR) of 30 dBc for End User Devices, as well as a spectrum emission mask.[501] The value of ACLR is a measure of the total power in the adjacent channel, as opposed to an emission mask that specifies a (typically) flat (per-megahertz) limit over some frequency range, with reductions at particular points (i.e., 10 megahertz outside the channel). In its March 14, 2018 filing, Qualcomm demonstrated that for End User Devices, neither the Qualcomm Mask nor the Graduated Mask is sufficient, in some cases, to ensure that adjacent channel leakage is at least 30 dB below the fundamental channel power (i.e., 3GPP ACLR limit of 30 dB). This necessitates maximum power reduction based on an ACLR limit, to ensure that

---

[496] *See* Content Companies Comments at 1-9; NCTA Comments at 18-19; NAB Comments at 2-5; Comcast Comments at 26-30; Intelsat/SES Reply at 1-5.

[497] *See 2015 Report and Order,* 30 FCC Rcd at 4015-4020, paras. 176-190; *2016 Order on Reconsideration*, 31 FCC Rcd at 5034-5038, paras. 85-98.

[498] *See* MSI July 24, 2017 Comments at 5-6.

[499] We note that End User Devices pose a greater challenge for filtering OOBE due to power and size limitations.

[500] *See* TIA Comments at 4; CTIA Comments at 13; Verizon Comments at 17-18; Nokia Comments at 2; T-Mobile Comments at 18-19; AT&T Reply at 12-14; WISPA Reply at 37.

[501] *See* 3GPP TS 36.101 v15.3.0, *Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 15)*, Sec. 6.6.3.2 (Adjacent channel leakage ratio); 3GPP TS 38.101-1 v15.2.0, *NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone (Release 15)*, Sec. 6.5.2.4 (Adjacent channel leakage ratio).

adjacent channel emission power is sufficiently minimized.[502] Qualcomm performed software simulation of End User Device transmitter emission performance for many combinations of uplink sub-carrier assignments, for inner channels, for edge channels, and for different configurations of contiguous and non-contiguous spectrum assignments.[503] Their analysis showed the power back-off required to meet 3GPP performance standards for edge channels and inner channels, for the current mask, the Qualcomm Mask, and the Graduated Mask. Based on this analysis, we believe that adopting the two emission requirements assessed by Qualcomm—the Qualcomm emission mask and ACLR—would allow for wider transmission bandwidths, and ensure that in-band noise is appropriately limited for all End User Devices, not just 3GPP user equipment. Therefore, we adopt the Qualcomm Mask and an adjacent channel leakage requirement of -30 dBc for End User Devices.

138. ATN expressed concern that changes to the emission limits could make some channels in the band (i.e., those furthest from the band edges) more desirable than others.[504] While wider bandwidth operations using spectrum near the upper and lower edges of the 3.5 GHz band may need to make adjustments—including operating at lower power—to use those parts of the band, we do not believe this makes these parts of the band any less usable. The 3.5 GHz band will likely be used by a variety of different operators, each with unique spectrum needs. These operators should have the flexibility to use the band at a variety of different bandwidths and operational power levels suited to their particular business. For example, parties seeking to use the lower 10 megahertz channel may also seek to use it together with adjacent channels for wider aggregated bandwidth. They can also choose to employ devices with better filtering, slightly reduce power, or aggregate non-contiguous individual channels. We are also cognizant that there is apt to be wide variability in the ability of multiple contiguous channels at any given location because it will depend on factors such as which channels have different licensees and the extent of other deployments in the band.

139. Finally, we correct a typographic error in a paragraph reference in Section 96.41(e)(2) of our rules, which should reference paragraph (e)(1) instead of (d)(1).[505]

## IV. PROCEDURAL MATTERS

140. *Paperwork Reduction Analysis.*—This Report and Order contains new and modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law No. 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under section 3507(d) of the PRA. OMB, the general public, and other Federal agencies will be invited to comment on the new and modified information collection requirements contained in the proceeding. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002,[506] we previously sought specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees."[507] We have described impacts that might affect small businesses, which includes most businesses with fewer than 25 employees, in the Final Regulatory Flexibility Analysis (FRFA), attached as Appendix B.

141. *Congressional Review Act.*—The Commission will send a copy of this Report and Order to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

142. *Regulatory Flexibility Act.*—The Regulatory Flexibility Act of 1980, as amended (RFA),

[502] Qualcomm Mar. 14, 2018 *Ex Parte*, Attach. at 2-3.

[503] Qualcomm Mar. 8, 2018 *Ex Parte*, Attach. at 4.

[504] *See* ATN Comments at 9-10.

[505] See *2017 NPRM*, 32 FCC Rcd at 8091, para. 54, n.132.

[506] Pub. L. No. 107-198.

[507] 44 U.S.C. § 3506(c)(4).

requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."[508] The FRFA concerning the impact of the rule changes contained in the Report and Order is attached as Appendix B.

## V. ORDERING CLAUSES

143. Accordingly, IT IS ORDERED that, pursuant to Sections 1, 2, 4(i), 4(j), 5(c), 302, 303, 304, 307(e), and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 154(j), 155(c), 302, 303, 304, 307(e), and 316, this Report and Order in GN Docket No. 17-258 IS HEREBY ADOPTED.

144. IT IS FURTHER ORDERED that the amendments of the Commission's rules as set forth in Appendix A ARE ADOPTED, effective thirty (30) days after publication in the Federal Register. Sections 96.23(a), 96.25(b)(4), and 96.32(b) contain new or modified information collection requirements that require review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. The Commission directs the Bureau to announce the effective date of those information collections in a document published in the Federal Register after the Commission receives OMB approval, and directs the Bureau to cause Section 96.23(d), 96.25(b)(5), and 96.32(d) to be revised accordingly.

145. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

146. IT IS FURTHER ORDERED that this Report and Order SHALL BE sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

[508] 5 U.S.C. §§ 601 *et seq*.

## APPENDIX A

## Final Rules

**Parts 1 and 96 of the Code of Federal Regulations are amended as follows:**

**PART 1—PRACTICE AND PROCEDURE**

1. The authority citation for part 1 continues to read as follows:

Authority: 47 U.S.C. chs. 2, 5, 9, 13; Sec. 102(c), Div. P, Public Law 115-141, 132 Stat. 1084; 28 U.S.C. 2461, unless otherwise noted.

2. Amend section 1.907 definition of "Covered Geographic Licenses" to read as follows:

**§ 1.907 Definitions.**

* * * * *

*Covered Geographic Licenses.* Covered geographic licenses consist of the following services: 1.4 GHz Service (part 27, subpart I of this chapter); 1.6 GHz Service (part 27, subpart J); 24 GHz Service and Digital Electronic Message Services (part 101, subpart G); 218-219 MHz Service (part 95, subpart F); 220-222 MHz Service, excluding public safety licenses (part 90, subpart T); 600 MHz Service (part 27, subpart N); 700 MHz Commercial Services (part 27, subparts F and H); 700 MHz Guard Band Service (part 27, subpart G); 800 MHz Specialized Mobile Radio Service (part 90, subpart S); 900 MHz Specialized Mobile Radio Service (part 90, subpart S); Advanced Wireless Services (part 27, subparts K and L); Air-Ground Radiotelephone Service (Commercial Aviation) (part 22, subpart G); Broadband Personal Communications Service (part 24, subpart E); Broadband Radio Service (part 27, subpart M); Cellular Radiotelephone Service (part 22, subpart H); Citizens Broadband Radio Service (part 96, subpart C); Dedicated Short Range Communications Service, excluding public safety licenses (part 90, subpart M); H Block Service (part 27, subpart K); Local Multipoint Distribution Service (part 101, subpart L); Multichannel Video Distribution and Data Service (part 101, subpart P); Multilateration Location and Monitoring Service (part 90, subpart M); Multiple Address Systems (EAs) (part 101, subpart O); Narrowband Personal Communications Service (part 24, subpart D); Paging and Radiotelephone Service (part 22, subpart E; part 90, subpart P); VHF Public Coast Stations, including Automated Maritime Telecommunications Systems (part 80, subpart J); Upper Microwave Flexible Use Service (part 30); and Wireless Communications Service (part 27, subpart D).

* * * * *

3. Amend Section 1.949 by revising paragraph (c) to read as follows:

**§ 1.949 Application for renewal of authorization.**

* * * * *

(c) Covered Site-based Licenses, except Common Carrier Fixed Point-to-Point Microwave Service (part 101, subpart I), and Covered Geographic Licenses in the 600 MHz Service (part 27, subpart N); 700 MHz Commercial Services (part 27, subpart F); Advanced Wireless Services (part 27, subpart L) (AWS-3 (1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz) and AWS-4 (2000-2020 MHz and 2180-2200 MHz) only); Citizens Broadband Radio Service (part 96, subpart C); and H Block Service (part 27, subpart K) must comply with paragraphs (d) through (h) of this section. All other Covered Geographic Licenses must comply with paragraphs (d) through (h) of this section beginning on January 1, 2023. Common Carrier Fixed Point-to-Point Microwave Service (part 101, subpart I) must comply with paragraphs (d) through (h) of this section beginning on January 1, 2019.

* * * * *

**PART 96—CITIZENS BROADBAND RADIO SERVICE**

4. The authority citation for part 96 continues to read as follows:

Authority: 47 U.S.C. 154(i), 303, and 307.

5. Amend Section 96.23 by:

a. Adding the definitions of "Adjacent Channel Leakage Ratio" and "Aggregated Channel Bandwidth";

b. Removing the definition of "Census tract";

c. Adding the definitions of "County"; and

d. Revising the definition of "License area."

The additions and revision read as follows:

**§96.3 Definitions.**

*Adjacent Channel Leakage Ratio.* The Adjacent Channel Leakage Ratio (ACLR) is the ratio of the filtered mean power over the assigned Aggregated Channel Bandwidth to the filtered mean power over the equivalent adjacent channel bandwidth. The power in the assigned Aggregated Channel Bandwidth and its equivalent adjacent channel bandwidth are measured with rectangular filters with measurement bandwidths equal to the Aggregated Channel Bandwidth.

*Aggregated Channel Bandwidth*. The Aggregated Channel Bandwidth is the bandwidth of a single channel, or in the case of multiple contiguous channels, the bandwidth between the upper and lower limits of the combined contiguous channels.

* * * * *

*County.* For purposes of this part, counties shall be defined using the United States Census Bureau's data reflecting county legal boundaries and names valid through January 1, 2017.

* * * * *

*License area.* The geographic component of a PAL. A License Area consists of one county.

* * * * * *

6. Amend Section 96.23 by revising paragraph (a) and adding paragraph (d) to read as follows:

**§96.23 Authorization.**

(a) An applicant must file an application for an initial PAL. Applications for PALs must:

(1) * * *

* * * * *

(d) *Compliance Date.* Paragraph (a) of this section contains information-collection and recordkeeping requirements. Compliance will not be required until after approval by the Office of

Management and Budget. The Commission will publish a document in the *Federal Register* announcing that compliance date and revising this paragraph accordingly.

7. Amend Section 96.25 by revising paragraph (b)(3), and by adding new paragraphs (b)(4) and (b)(5), to read as follows:

**§96.25 Priority access licenses.**

* * * * *

(b) * * *

(3) *License term:* Each PAL has a ten-year license term. Licensees must file a renewal application in accordance with the provisions of Section 1.949.

(4) *Performance requirement:* Priority Access Licensees must provide substantial service in their license area by the end of the initial license term. "Substantial" service is defined as service which is sound, favorable, and substantially above the level of mediocre service which might minimally warrant renewal. Failure by any licensee to meet this requirement will result in forfeiture of the license without further Commission action, and the licensee will be ineligible to regain it. Licensees shall demonstrate compliance with the performance requirement by filing a construction notification with the Commission in accordance with the provisions set forth in § 1.946(d) of this chapter. The licensee must certify whether it has met the performance requirement, and file supporting documentation, including description and demonstration of the bona fide service provided, electronic maps accurately depicting the boundaries of the license area and where in the license area the licensee provides service that meets the performance requirement, supporting technical documentation, any population-related assumptions or data used in determining the population covered by a service to the extent any were relied upon, and any other information the Wireless Telecommunications Bureau may prescribe by public notice. A licensee's showing of substantial service may not rely on service coverage outside of the PAL Protection Areas of registered CBSDs or on deployments that are not reflected in SAS records of CBSD registrations.

(i) *Safe harbor for mobile or point-to-multipoint service.* A Priority Access Licensee providing a mobile service or point-to-multipoint service may demonstrate substantial service by showing that it provides signal coverage and offers service, either to customers or for internal use, over at least 50 percent of the population in the license area.

(ii) *Safe harbor for fixed point-to-point service*. A Priority Access Licensee providing a fixed point-to-point service may demonstrate substantial service by showing that it has constructed and operates at least four links, either to customers or for internal use, in license areas with 134,000 population or less and in license areas with greater population, a minimum number of links equal to the population of the license area divided by 33,500 and rounded up to the nearest whole number. To satisfy this provision, such links must operate using registered Category B CBSDs.

(5) *Compliance date.* Paragraph (b)(4) of this section contains information-collection and recordkeeping requirements. Compliance will not be required until after approval by the Office of Management and Budget. The Commission will publish a document in the *Federal Register* announcing that compliance date and revising this paragraph accordingly.

* * * * *

**§96.27 [Removed and Reserved]**

8. Remove and reserve Section 96.27.

9. Amend Section 96.29 by removing paragraphs (b), (c), and (d), and revising paragraph

(a) to read as follows:

**§96.29 Competitive bidding procedures.**

Mutually exclusive initial applications for PALs are subject to competitive bidding. The general competitive bidding procedures set forth in part 1, subpart Q of this chapter will apply unless otherwise provided in this subpart.

10. Section 96.30 is added to read as follows:

**§96.30 Designated entities in the Citizens Broadband Radio Service**

(a) *Small business*. (1) A small business is an entity that, together with its affiliates, its controlling interests, and the affiliates of its controlling interests, has average gross revenues not exceeding $55 million for the preceding three (3) years.

(2) A very small business is an entity that, together with its affiliates, its controlling interests, and the affiliates of its controlling interests, has average gross revenues not exceeding $20 million for the preceding three (3) years.

(b) *Eligible rural service provider*. For purposes of this section, an eligible rural service provider is an entity that meets the criteria specified in §1.2110(f)(4) of this chapter.

(c) *Bidding credits*. (1) A winning bidder that qualifies as a small business as defined in this section or a consortium of small businesses may use a bidding credit of 15 percent, as specified in §1.2110(f)(2)(i)(C) of this chapter. A winning bidder that qualifies as a very small business as defined in this section or a consortium of very small businesses may use a bidding credit of 25 percent, as specified in §1.2110(f)(2)(i)(B) of this chapter.

(2) An entity that qualifies as eligible rural service provider or a consortium of rural service providers who has not claimed a small business bidding credit may use a bidding credit of 15 percent, as specified in §1.2110(f)(4) of this chapter.

11. Amend Section 96.32 by revising paragraph (b) and adding paragraph (d) to read as follows:

**§96.32 Priority access assignments of authorization, transfer of control, and leasing arrangements.**

* * * * *

(b) Priority Access Licensees may partition or disaggregate their licenses and partially assign or transfer their licenses pursuant to § 1.950 and may enter into de facto transfer leasing arrangements for a portion of their licensed spectrum pursuant to part 1 of this chapter.

* * * * *

(d) *Compliance date.* Paragraph (b) of this section contains information-collection and recordkeeping requirements. Compliance will not be required until after approval by the Office of Management and Budget. The Commission will publish a document in the *Federal Register* announcing that compliance date and revising this paragraph accordingly.

12. Amend Section 96.41 by revising paragraphs (e)(1) through (e)(3) to read as follows:

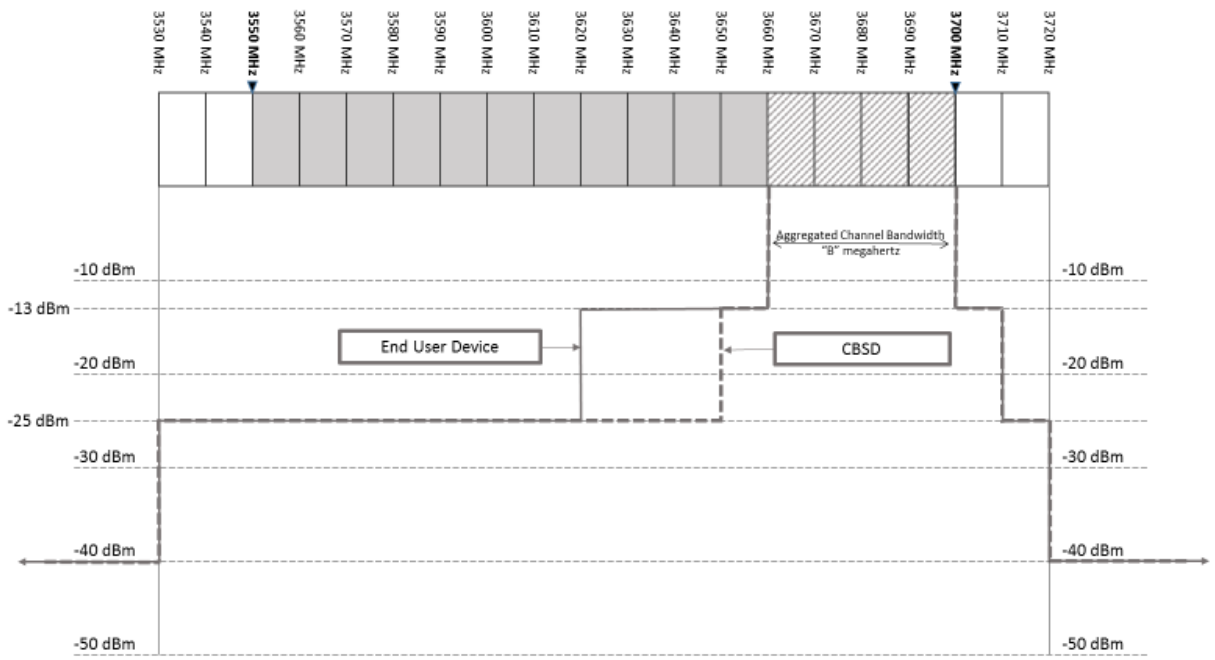
**§96.41 General radio requirements.**

* * * * *

(e) *3.5 GHz Emissions and Interference Limits.*

(1) *General protection levels.*

Figure 1 to paragraph (e) – Protection levels




(i) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in (e)(3) (whether the emission is inside or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed −25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

(ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

(2) *Additional protection levels.* Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

(3) *Measurement procedure.* (i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (*i.e.,* 1 MHz or 1 percent of emission bandwidth, as specified). The fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) * * *

(iii) * * *

* * * * *

13. Amend Section 96.55by revising paragraph (a)(3) to read as follows:

**§96.55 Information gathering and retention**

(a) * * *

(3) Upon request, SAS Administrators must make available to the general public aggregated spectrum usage data for any geographic area. Such information must include the total available spectrum and the maximum available contiguous spectrum in the requested area. SAS Administrators shall not disclose specific CBSD registration information to the general public except where such disclosure is authorized by the registrant.

* * * * *

## APPENDIX B

## Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[1] an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rulemaking and Order Terminating Petitions* (*2017 NPRM*) released in October, 2017.[2] The Commission sought written public comment on the proposals in the *NPRM* including comment on the IRFA. The Commission received comments from the Wireless Internet Service Providers Association (WISPA), the Rural Wireless Association (RWA), and CTIA, specifically directed toward the IRFA.[3] These comments are discussed below in Section B. The Commission also received a letter from the Chief Counsel for Advocacy of the Small Business Administration (SBA) related to this proceeding, which we discuss below in Section C.[4] This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.[5]

### A. Need for and Objectives of the Report and Order

2. With the *Report and Order*, we adopt limited changes to the rules governing Priority Access Licenses (PALs) that will be issued in the 3550-3700 MHz band (3.5 GHz band) to better support the deployment of 5G and other advanced wireless technologies while still accommodating a variety of use cases and users. The changes include larger geographic licensing areas, longer license terms, and license renewability that will provide licensees with greater certainty and predictability, which will in turn increase overall investment in the band by a wide variety of users, and specific performance requirements to ensure the revised PALs are used productively, including in rural areas. We also adopt changes to the competitive bidding rules for the issuance of PALs that will increase the availability of Priority Access protection, and we authorize partitioning and disaggregation of PALs to promote access to protected spectrum through secondary markets, which will help foster innovative use cases—including targeted and localized deployments—in the band. These changes are consistent with the service rules and license assignment models that helped foster the development of 4G and LTE services in the United States and we anticipate that adopting similar rules in this band will help promote additional investment in the next generation of wireless services. In addition, we adopt changes to the technical rules to facilitate transmissions over wider bandwidth channels without significant power reduction and changes to the information security requirements that will help safeguard sensitive information.

3. In reassessing the rules governing the Priority Access tier of the 3.5 GHz band, we considered—and balanced—a variety of different policy objectives and statutory requirements to determine what, if any, changes to the rules would advance the public interest. Notably, Section 309(j) of the Communications Act asks us to weigh a number of statutory objectives, including advancing new technologies and services, efficient and intensive use of spectrum, and promoting opportunity and competition through licensee diversity and the avoidance of excessive concentration of licenses.[6] In doing so, the Commission must decide how much precedence particular policies will be granted when

[1] *See* 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601-612, was amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[2] *See Promoting Investment in the 3550-3700 MHz Band et al.*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8017 (2017) (*2017 NPRM*), at Appx. B.

[3] *See* RWA Comments at 10-11; WISPA *IRFA* Comments, *generally*. CTIA addressed WISPA's *IRFA* Comments in its reply. *See* CTIA Reply at 23-24.

[4] *See* Letter from Major L. Clark, Acting Chief Counsel, and Jamie B. Saloom, Assistant Chief Counsel, Office of Advocacy, U.S. Small Business Administration, to Marlene [H.] Dortch, Secretary, FCC, GN Docket No. 17-258 et al. (filed Aug. 1, 2018) (SBA Letter).

[5] *See* 5 U.S.C. § 604.

[6] *See* 47 U.S.C. § 309(j)(3)(A)-(F).

several are implicated in a single decision. Bearing this in mind, we find that the public interest will be advanced by the totality of the decisions we make today, namely: increasing the size of the PAL license area to counties; extending the license term to 10 years and providing opportunity for renewal; adopting performance requirements for PALs; allowing PALs to be partitioned and disaggregated on the secondary market; eliminating the "N-1" approach for offering PALs at auction and adopting bidding credits for small and rural entities; safeguarding sensitive Citizens Broadband Radio Service Device (CBSD) registration data; and ensuring that our emissions mask for End User Devices supports operations over wider bandwidths. Our revisions will more effectively promote competition and ensure the development and rapid deployment of new technologies to consumers, including to those in rural areas, disseminate licensees among a wide variety of applicants, and encourage efficient and intensive use of the spectrum. We therefore anticipate that these changes, taken as a whole, will facilitate more robust investment and broader deployment in the band by a wide array of users than we could have anticipated under the rules adopted in 2015.

4. Our findings are reinforced by the changes that have occurred both in the United States and abroad since the Commission's 2015 Order. Since then, there has been increased demand for mid-band spectrum—and the 3.5 GHz band in particular—both here and globally for next generation flexible wireless deployments, including 5G. Like authorities in other nations, the Commission has made mid-band spectrum a top priority, including by recently proposing rules for the 3.7-4.2 GHz band and the 2.5 GHz band, and it has become clear that these bands will play a key role in future mobile networks, including 5G. Additionally, in 2015, the Commission assumed the 3.5 GHz band would be focused on small cell deployments and LTE technology. We continue to believe that these technologies and network deployment strategies will be an important part of the wireless ecosystem in the 3.5 GHz band, and we acknowledge the significant investments that have been made in these technologies by a wide variety of potential licensees. However, the revised rules are designed to increase flexibility so that licensees can efficiently deploy these next generation 5G networks in addition to—not in lieu of—the technologies that the Commission contemplated in 2015. Our actions herein, will promote investment in next generation networks, support a greater variety of technologies and uses cases, and facilitate international spectrum harmonization. We expect that these rules changes will increase the benefit society derives from this spectrum band while also reducing the operating costs incurred by license holders.

### B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

5. The Commission received comments specifically directed toward the IRFA from WISPA and RWA, as well as reply comments from CTIA.[7] WISPA and RWA argue that the IRFA failed to include an accurate description and estimate of the number of small entities that would be directly impacted because, unlike the FRFA in the *2015 Report and Order* that adopted rules for the 3.5 GHz band, the IRFA did not include an estimate of the number of holders of 3.65 GHz licenses.[8] We disagree that the description and estimate of the number of small entities to which the rules will apply was inaccurate or incomplete. It is well established that the RFA requires an analysis of small entity impacts only when a rule directly regulates small entities.[9] The IRFA did not include a separate description and

[7] *See* RWA Comments at 10-11; WISPA *IRFA* Comments; CTIA Reply at 23-24.

[8] WISPA *IRFA* Comments at 6-10. *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959 (2015) (*2015 Report and Order*).

[9] *See* SBA, Office of Advocacy, *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act*, at 22 (Aug. 2017) (*SBA Guidance on RFA*); *Mid-Tex Electric Coop., Inc., v. FERC*, 773 F.2d 327, 340-43 (D.C. Cir. 1985) (upholding FERC interpretation of the RFA and certification of no impact on small businesses; holding that "Congress did not intend to require that every agency consider every indirect effect that any regulation might have on small businesses in any stratum of the national economy. That is a very broad and ambitious agenda, and we think that Congress is unlikely to have embarked on such a course without airing the matter."); *see also* 5 U.S.C.

count of small entity 3.65 GHz licensees because 3.65 GHz licensees are not directly regulated by the proposed changes to the rules for PALs. Similarly, the revised power emissions limits will apply directly not to service providers, including 3.65 GHz licensees, but to the device manufacturers that must demonstrate their offered devices are compliant to get equipment authorization (and who are included as a category in both the IRFA and FRFA). We also note that WISPA does not suggest such licensees should be broken out for purposes of assessing the impact of relaxing emissions limits.[10] Further, to the extent any of the adopted changes will apply to entities that obtain PALs and also hold 3.65 GHz licenses, such entities will fall into one of the described categories for which we estimated the number of small entities, such as the category of "wireless telecommunications carriers" (which, for SBA purposes, includes entities providing "wireless Internet access" using the airwaves, *i.e.* WISPs).

6. While WISPA is correct that the *2015 Report and Order* included an estimate of the number of 3.65 GHz small entity licensees in its FRFA, it did so because it adopted rules specifically addressing 3.65 GHz licensees.[11] For example, the Commission exempted equipment deployed by such licensees under the pre-existing 3.65 GHz service rules from the new 3.5 GHz band-wide operability requirement, and thus, the exemption allowed 3650-3700 MHz users to continue operating under the new 3.5 GHz rules without need to retrofit or replace their equipment.[12] This *Report and Order* does not change any of the decisions directly regulating 3.65 GHz licensees, and such licensees may continue to operate equipment they have deployed in their licensed spectrum under the same terms previously established. We disagree with WISPA that 3.65 GHz licensees are directly regulated by the proposed PAL changes merely because 3.65 GHz licensees are "subsumed into the CBRS . . . ."[13] Although PAL holders and 3.65 GHz licensees will both operate as part of the Citizens Broadband Radio Service in the 3.5 GHz band, it does not follow that changing the terms of PALs directly regulates 3.65 GHz licensees, particularly given that, as WISPA acknowledges, PAL holders and 3.65 GHz licensees will operate in entirely separate parts of the band.[14] We therefore find that the description and count of affected small entities in the IRFA and this FRFA are complete, accurate, compliant with the RFA, and consistent with the Commission's prior analyses.

7. WISPA also asserts that the Commission imposed an improperly restrictive standard in its IRFA analysis for when an alternative would be rejected for its impact on small entities. We do not agree that the RFA imposes a substantive standard for when proposals should be rejected for small entity impacts.[15] In addition, WISPA's argument misconstrues the relevant statement in the Commission's IRFA. The IRFA stated that, while the Commission had not excluded consideration of any alternatives to the specific proposals discussed in the *2017 NPRM*, it would do so if the record in response to the *2017 NPRM* indicated that a particular proposal would have a significant and unjustifiable adverse economic impact on small entities. Thus, while it indicated that proposals meeting this standard would be rejected,

(Continued from previous page)
§ 603(b) (requiring the initial analysis include, a description of and, where feasible, an estimate of the number of small entities *to which the proposed rule will apply"* (emphasis added)).

[10] Indeed, we note that WISPA supports relaxing the emissions limit, reflecting that this measure has no adverse effect on small entities, and if anything, a beneficial effect, at least insofar as impact on WISPA's membership. *See* WISPA Comments at 55-57.

[11] *See 2015 Report and Order*, 30 FCC Rcd at 4126, para. 17.

[12] *Id.* at 4127, para. 20.

[13] WISPA *IRFA* Comments at 7.

[14] *See* WISPA *IRFA* Comments at 7 (acknowledging that "the Commission's existing rules do not permit PALs in the 3650-3700 MHz band and that the *NPRM* does not propose licensing of PALs in that band."); *see also* 47 CFR § 96.13(a) (providing PALs may only be authorized in the 3550-3650 MHz band).

[15] *See Nat'l Telephone Coop. Ass'n v. FCC*, 563 F.3d 536, 540 (D.C. Cir. 2009) (holding that RFA requirements are "[p]urely procedural" and "the Act in and of itself imposes no substantive constraint on agency decisionmaking" (internal quotations omitted)).

it did not state that *only* proposals that met this standard would be rejected for their impact on small entities. As discussed in the *Report and Order* and below, we have assessed the impact on small entities in determining the public interest, and modified our proposals or selected from the alternatives to reduce adverse impacts where appropriate, such as by choosing to license PALs by county rather than the larger Partial Economic Area (PEA) size proposed by some commenters.[16]

8. WISPA and RWA further argue that the IRFA failed to adequately analyze the impact of the proposed changes on small entities, and failed to adequately analyze significant alternatives that minimize economic impact on small entities.[17] We address the impact on small entities from the changes and significant alternatives considered in Section F below. While WISPA and RWA argue that the alleged deficiencies in the IRFA cannot be addressed in a final analysis and require that we reject the changes under consideration in the *2017 NPRM,*[18] we agree with CTIA that concerns regarding the initial analysis of economic impacts and alternatives can be addressed in the agency's decision and FRFA.[19] This understanding of the RFA is more consistent with the statute's text, which expressly contemplates that the FRFA will address any "significant issues raised by the public comments in response to the initial regulatory flexibility analysis . . . ."[20] We find further support for this view in the SBA's guidance documents, which direct agencies to draft FRFAs that "revise their initial regulatory flexibility analysis based on the public comments received."[21] Thus, the agency is not obligated to perfect its analysis at the NPRM-IRFA stage and is permitted to adjust course on the basis of comments in response to the NPRM for purposes of the FRFA.[22]

9. We also note that parties challenging a final agency action may seek judicial review of agency compliance with the RFA's final analysis requirements but not its IRFA requirements.[23] We find that interpreting the RFA to permit agencies to address any issues raised regarding the IRFA in their final analysis is more consistent with Congress's decision to limit court review to that final analysis.

### C. Response to Comments by the Chief Counsel for Advocacy of the Small Business

[16] *See also supra* Report and Order, paras. 36-37, 39.

[17] *See* RWA Comments at 11; WISPA *IRFA* Comments at 14-17.

[18] *See* RWA Comments at 11; WISPA *IRFA* Comments at 4.

[19] *See* CTIA Reply at 24.

[20] 47 U.S.C. § 604(a)(2) (requiring FRFA to include "a summary of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a summary of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments").

[21] *See SBA Guidance on RFA* at 44.

[22] *Cf. Mid-Tex Electric Cooperative, Inc., v. FERC*, 773 F.2d at 342 ("The problem Congress stated it discerned was the high cost to small entities of compliance with uniform regulations, and the remedy Congress fashioned—careful consideration of those costs in regulatory flexibility analyses—is accordingly limited to small entities subject to the proposed regulation.").

[23] 47 U.S.C. § 611(a)(1); *Allied Local and Regional Mfrs. Caucus v. US EPA*, 215 F.3d 61 (D.C. Cir. 2000) (finding court was without jurisdiction under RFA to consider the argument that initial regulatory flexibility analysis had failed to discuss two significant economic impacts); *U.S. Cellular Corp. v. FCC*, 254 F.3d 78, 89 (D.C. Cir. 2001) (holding that "the RFA expressly prohibits courts from considering claims of non-compliance with section 603 [imposing the requirement to make an initial regulatory flexibility analysis]"). We note further that any challenge to the FRFA that relies on the alleged inadequacy of the IRFA is similarly foreclosed under *National Assoc. of Home Builders v. EPA*, 682 F.3d 1032 (2012). In that case, petitioners argued that, although the RFA did not allow claims of non-compliance with section 609(b) of the RFA (requiring the convening of small business advocacy review panels), the court could regard a failure of compliance with that provision as one that renders the final analysis defective. *Id.* at 1041. The court rejected the attempt to indirectly enforce a non-enforceable provision, finding the RFA "does not authorize review of compliance with section 609(b)-even in connection with a [final regulatory flexibility analysis] claim." *Id.* Similarly, the RFA does not authorize review of compliance with the initial analysis requirements in connection with a claim against the final analysis.

**Administration**

10. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.[24]

11. On August 1, 2018, the SBA submitted an *ex parte* letter into the record, addressing this proceeding among others.[25] The SBA indicated that Advocacy staff had earlier spoken with small Wireless Internet Service Providers (WISPs) concerned that using PEAs to define the geographic license area for PALs "may foreclose the use of 3.5 GHz spectrum by anyone other than large mobile carriers."[26] The SBA stated that it had concerns that the change "could foreclose competition and result in decreased service in rural areas" and "urged staff to weigh the impact of decreased competition and market entry against any gains achieved through administrative efficiency when making a final decision."[27]

12. Consistent with SBA's recommendation, in determining the appropriate licensing area for PALs, we have weighed the potential impacts of different sized licensing areas, including the potential impact on WISPs and other small and rural entities. We have also considered the extent to which different licensing areas may affect the diversity of PAL uses and users, as well as the concerns raised by some commenters regarding the efficiency costs of small license areas. After weighing these and other considerations, and as explained further below in Section F, we decline to adopt PEAs as the license area for PALs, and conclude that licensing PALs by county appropriately balances the issues that commenters have raised with respect to licensing PALs as small as a census tract or as large as a PEA.[28]

### D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply

13. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the rules adopted herein.[29] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[30] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[31] A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.[32]

14. *Small Businesses, Small Organizations, and Small Governmental Jurisdictions*. Our action may, over time, affect small entities that are not easily categorized at present. We therefore

[24] 5 U.S.C. § 604(a)(3).

[25] *See* SBA Letter.

[26] *See id.* at 3.

[27] *Id.*

[28] *See also supra* Report and Order, Section III.A.1.b.

[29] 5 U.S.C. § 604(a)(3).

[30] 5 U.S.C. § 601(6).

[31] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

[32] 15 U.S.C. § 632.

describe here, at the outset, three broad groups of small entities that could be directly affected herein.[33] First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the SBA's Office of Advocacy, in general a small business is an independent business having fewer than 500 employees.[34] These types of small businesses represent 99.9 percent of all businesses in the United States, which translates to 28.8 million businesses.[35]

15. Next, the type of small entity described as a "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[36] Nationwide, as of Aug. 2016, there were approximately 356,494 small organizations based on registration and tax data filed by nonprofits with the Internal Revenue Service (IRS).[37]

16. Finally, the small entity described as a "small governmental jurisdiction" is defined generally as "governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[38] U.S. Census Bureau data from the 2012 Census of Governments[39] indicates that there were 90,056 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.[40] Of this number there were 37,132 general purpose governments (county[41], municipal and town or township[42]) with populations of less than 50,000, and 12,184 special purpose governments (independent school districts[43] and special

[33] *See* 5 U.S.C. § 601(3)-(6).

[34] *See* SBA, Office of Advocacy, "Frequently Asked Questions, Question 1—What is a small business?," https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf (June 2016).

[35] *See* SBA, Office of Advocacy, "Frequently Asked Questions, Question 2—How many small businesses are there in the U.S.?," https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf (June 2016).

[36] 5 U.S.C. § 601(4).

[37] Data from the Urban Institute, National Center for Charitable Statistics (NCCS) reporting on nonprofit organizations registered with the IRS was used to estimate the number of small organizations. Reports generated using the NCCS online database indicated that as of August 2016 there were 356,494 registered nonprofits with total revenues of less than $100,000. Of this number, 326,897 entities filed tax returns with 65,113 registered nonprofits reporting total revenues of $50,000 or less on the IRS Form 990-N for Small Exempt Organizations and 261,784 nonprofits reporting total revenues of $100,000 or less on some other version of the IRS Form 990 within 24 months of the August 2016 data release date. *See* http://nccsweb.urban.org/tablewiz/bmf.php where the report showing this data can be generated by selecting the following data fields: Show: "Registered Nonprofit Organizations"; By: "Total Revenue Level (years 1995, Aug to 2016, Aug)"; and For: "2016, Aug" then selecting "Show Results."

[38] 5 U.S.C. § 601(5).

[39] *See* 13 U.S.C. § 161. The Census of Government is conducted every five (5) years compiling data for years ending with "2" and "7." *See also* Program Description Census of Government, https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=program&id=program.en.COG#

[40] *See* U.S. Census Bureau, 2012 Census of Governments, Local Governments by Type and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG02.US01. Local governmental jurisdictions are classified in two categories - General purpose governments (county, municipal and town or township) and Special purpose governments (special districts and independent school districts).

[41] *See* U.S. Census Bureau, 2012 Census of Governments, County Governments by Population-Size Group and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG06.US01. There were 2,114 county governments with populations less than 50,000.

[42] *See* U.S. Census Bureau, 2012 Census of Governments, Subcounty General-Purpose Governments by Population-Size Group and State: 2012 - United States – States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG07.US01. There were 18,811 municipal and 16,207 town and township governments with populations less than 50,000.

[43] *See* U.S. Census Bureau, 2012 Census of Governments, Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG11.US01. There were 12,184 independent school

districts[44]) with populations of less than 50,000. The 2012 U.S. Census Bureau data for most types of governments in the local government category shows that the majority of these governments have populations of less than 50,000.[45] Based on this data, we estimate that at least 49,316 local government jurisdictions fall in the category of "small governmental jurisdictions."[46]

17. *Wireless Telecommunications Carriers (except Satellite)*. This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless Internet access, and wireless video services.[47] The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.[48] For this industry, U.S. Census data for 2012 show that there were 967 firms that operated for the entire year.[49] Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1000 employees or more.[50] Thus, under this category and the associated size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities.

18. *Satellite Telecommunications.* This category comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications."[51] Satellite telecommunications service providers include satellite and earth station operators. The category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules.[52] For this category, U.S. Census Bureau data for 2012 shows

(Continued from previous page)
districts with enrollment populations less than 50,000.

[44] *See* U.S. Census Bureau, 2012 Census of Governments, Special District Governments by Function and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG09.US01. The U.S. Census Bureau data did not provide a population breakout for special district governments.

[45] *See* U.S. Census Bureau, 2012 Census of Governments, County Governments by Population-Size Group and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG06.US01; Subcounty General-Purpose Governments by Population-Size Group and State: 2012 - United States–States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG07.US01; and Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States-States, https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG11.US01. While U.S. Census Bureau data did not provide a population breakout for special district governments, if the population of less than 50,000 for this category of local government is consistent with the other types of local governments the majority of the 38,266 special district governments have populations of less than 50,000.

[46] *Id.*

[47] U.S. Census Bureau, 2012 NAICS Definition, "517210 Wireless Telecommunications Carriers (Except Satellite)," https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517210.

[48] 13 CFR § 121.201, NAICS code 517210.

[49] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ5, Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

[50] *Id.* Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[51] U.S. Census Bureau, 2017 NAICS Definition, "517410 Satellite Telecommunications," https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517410&search=2017+NAICS+Search&search=2017.

[52] 13 CFR § 121.201, NAICS code 517410.

that there were a total of 333 firms that operated for the entire year.[53] Of this total, 299 firms had annual receipts of less than $25 million.[54] Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

19. *All Other Telecommunications.* The "All Other Telecommunications" category is comprised of establishments that are primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.[55] This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.[56] Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.[57] The SBA has developed a small business size standard for "All Other Telecommunications," which consists of all such firms with gross annual receipts of $32.5 million or less.[58] For this category, U.S. Census Bureau data for 2012 shows that there were 1,442 firms that operated for the entire year.[59] Of these firms, a total of 1,400 had gross annual receipts of less than $25 million and 42 firms had annual receipts of $25 million to $49,999,999.[60] Thus, the Commission estimates that a majority of "All Other Telecommunications" firms potentially affected by our action can be considered small.

20. We anticipate that some of these "All Other Telecommunications" firms which are small entities, are earth station applicants/licensees that might be affected by our rule changes. And while our rule changes may have an impact on both earth and space station applicants and licensees, space station applicants and licensees rarely qualify under the definition of a small entity. Generally, space stations cost hundreds of millions of dollars to construct, launch and operate. Consequently, we do not anticipate that any space station operators are small entities that would be affected by our actions.

21. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.[61] Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and

---

[53] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517410, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517410.

[54] *Id*.

[55] *See* U.S. Census Bureau, 2017 NAICS Definitions, "517919 All Other Telecommunications," https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017.

[56] *Id*.

[57] *Id*.

[58] 13 CFR § 121.201; NAICS Code 517919.

[59] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517919, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517919.

[60] *Id*.

[61] The NAICS Code for this service is 334220. 13 CFR § 121.201. *See also* U.S. Census Bureau, 2012 NAICS Definitions, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing," https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#.

broadcasting equipment.[62] The SBA has established a small business size standard for this industry of 1,250 employees or less.[63] U.S. Census Bureau data for 2012 shows that 841 establishments operated in this industry in that year.[64] Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.[65] Based on this data, we conclude that a majority of manufacturers in this industry are small.

### E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

22. The *Report and Order* adopts certain changes to the compliance requirements applicable to all entities, including small entities, that bid for and obtain PALs. First, the *Report and Order* extends the PAL license term from three years to ten years, and provides licensees with an opportunity for renewal subject to compliance with certain conditions. Consistent with our renewal framework for Wireless Radio Services (WRS), PAL licensees seeking renewal must comply with section 1.949 of our rules.[66] Pursuant to section 1.949, to qualify for renewal, a PAL licensee must demonstrate that over the course of its license term, the licensee either: (1) provided and continues to provide service to the public, or (2) operated and continues to operate the license to meet the licensee's private, internal communications needs.[67] Like other WRS licensees, PAL licensees may avail themselves of appropriate safe harbors contained in section 1.949(e) or otherwise make a Renewal Showing consistent with section 1.949(f).

23. Second, the *Report and Order* establishes that PAL licensees must meet an end-of-term performance requirement of substantial service and provides the following two safe harbors for what will constitute substantial service: (1) a licensee providing a mobile service or point-to-multipoint service may demonstrate substantial service by showing that they provide signal coverage and offer service over at least 50 percent of the population in the license area; and (2) a licensee deploying a point-to-point service may demonstrate substantial service by showing that they have constructed and operate at least four links in license areas with 134,000 population or less, and in license areas with greater population a minimum number of links equal to the population in the license area divided by 33,500 and rounded up to the nearest whole number. Licensees will be required to report information to the Commission to demonstrate compliance with the performance requirement, including electronic maps, supporting technical documentation, population-related assumptions if relevant, and any other information as the Wireless Telecommunications Bureau may prescribe by public notice.

24. The *Report and Order* also changes existing compliance requirements related to Citizens Broadband Radio Service Devices (CBSDs). First, it reduces the in-band power emissions limits for End User Devices to strike a better balance between enabling an evolution to wider bandwidth channels, protecting out-of-band incumbent operations, and not unnecessarily requiring maximum power reduction of user devices. Second, the *Report and Order* eliminates the rule requiring SAS Administrators to publicly disclose anonymized CBSD registration data to address concerns regarding sensitive information. The *Report and Order* instead requires public disclosure of aggregated spectrum usage data, and otherwise prohibits SAS public disclosure of CBSD registration data unless authorized by the

---

[62] *Id.*

[63] 13 CFR § 121.201, NAICS Code 334220.

[64] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1231SG2, Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012, NAICS Code 334220, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/31SG2//naics~334220.

[65] *Id*.

[66] 47 CFR § 1.949.

[67] 47 CFR § 1.949(d).

registrant.

### F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

25. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its approach, which may include the following four alternatives (among others): "(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities."[68]

26. For the PAL geographic license area, we considered several alternatives, including retaining the census tract area adopted in the *2015 Report and Order*, increasing the size to counties or PEAs for all PALs, or a hybrid of these approaches, as well as various other hybrid and compromise approaches proposed in the record. We find that increasing the size of the PAL license area to counties will serve the public interest. While the current census tracts size may well support the deployment of targeted use cases—particularly fixed uses—the record shows that census tracts could disadvantage flexible mobile use, including 5G and other wide-area network deployments, which in turn would decrease investment in the band. Increasing the PAL license area from census tracts to counties strikes a more appropriate balance and will more effectively support next generation mobile network deployments, while still retaining the ability to support small, targeted uses, including fixed uses.

27. In contrast, and after considering concerns raised by WISPs and others that the incongruity between PEAs and their service footprints will diminish or foreclose their ability to win PALs at auction, we find that increasing the license area size to something larger than counties (e.g., to PEAs) could disproportionately favor mobile use cases and hinder investment in innovative fixed networks and localized deployments. We therefore decline to increase the size of the license area to something as large as PEAs or Cellular Market Areas (CMAs), as some providers request. We find that counties will mitigate the concerns of WISPs and other providers with small footprints while still addressing the concerns regarding the inefficiencies and costs that could arise from census tract licensing, and will therefore support robust investment in the band by a diverse array of users, including those with investments already underway.[69] Counties are sufficiently small that we anticipate rural providers and WISPs will actively seek county-sized PALs at auction or enter arrangements to partition or disaggregate county-sized areas into smaller ones. We also anticipate that fewer license areas and fewer overall biddable items available through the PAL auction will reduce auction complexity and will enable us to move forward more quickly to offer all available PALs in one multiple round auction, conferring significant benefits to the public, including small entities. We note that opportunities for small entities and rural carriers to win licenses at auction will be further supported by the small business and rural provider bidding credits we have adopted, which have been successful in other Commission proceedings. We further find that county-sized licenses will not preclude the construction of highly localized, private networks in the 3.5 GHz band, including through secondary market and other commercial transactions and GAA use.

28. We decline to adopt a hybrid approach, such as offering multiple sizes of PALs in each market (e.g., licensing a certain number of blocks in a market by census tract and licensing other blocks by county). We find that using counties uniformly will support licensee diversity and increased investment. Further, we do not believe it is in the public interest to add yet another layer of complexity to the SAS's spectrum coordination responsibilities at this time, and licensing all PALs using the same geographic area will avoid unnecessarily complicating network management burdens for all users.

29. We adopt a ten-year, renewable term for PALs. We considered a number of alternative

[68] 5 U.S.C. § 603(c)(1)-(4).

[69] *See also supra* Report and Order, paras. 27-29.

options in the record with regard to license term and renewability, including a range of possible license terms, and offering non-renewable licenses but providing incumbents with a bidding credit. We find that extending the current three-year term for PALs to 10 years and making such licenses renewable will better promote robust investment in the band, which will be necessary to maintain the Nation's competitiveness in 5G and other next-generation wireless services. While some commenters argue that increasing the term to 10 years and allowing renewability will increase the cost of licenses and thereby make PALs less affordable to small entities, we find several factors mitigate such concerns.[70] First, we anticipate that the longer term and renewability will provide significant additional value to small entities and other licensees seeking to use spectrum for commercial broadband networks and other uses that involve significant long-term investment, and that the greater value to small and rural entities will help such entities absorb a higher acquisition cost at auction. Any impact on small entities will be further mitigated by actions discussed below that should facilitate small entity access to PALs, including bidding credits for small businesses and rural providers, spectrum aggregation limits, and eliminating unnecessary restrictions on the number of PALs offered in an area where there is limited demand. Further, access to PAL spectrum through secondary market transactions, which we take steps to facilitate and promote, as well as access to opportunistic GAA use, will appropriately balance the needs of parties, including small entities, who wish to use spectrum for more short-term needs, with the needs of providers that require more certainty and stability to justify additional investment. While one commenter argues that we should maintain a short term to "deter large carrier investment" in order to promote lower costs of entry for small and rural providers,[71] we do not believe that adopting policies to deter investment is in the public interest. The adoption of a 10-year, renewable license term will encourage investment from a variety of entrants, and better promote overall investment and deployment in the band, including in rural areas.

30. We also have several actions with respect to the auction of PALs that will facilitate greater access to such licenses, including access by small entities. We find that these actions will not have a significant economic impact on such entities, while providing significant benefits. In particular, we adopt new bidding credits to be available at auctions for PALs, including credits for small business, rural providers, and providers serving qualifying tribal lands. We also modify the rule permitting only one PAL to be assigned in a rural area where there is only one applicant, which will benefit small entities in rural areas where there are fewer providers and it is therefore more likely that only one will apply for PALs. In addition, we maintain the current PAL aggregation limit of 40 megahertz in a license area (i.e., four PALs out of the available seven), which will promote competitive access to PALs, including access by small entities. We have also adopted measures in the *Report and Order* that will promote greater access through secondary market transactions, which should significantly benefit small entities seeking to use spectrum for innovative uses that may be too localized or transient to warrant a full PAL license. In particular, we authorize licensees to partition and disaggregate their licenses. In addition, we have adopted flexible performance requirements that will help to accommodate small entities seeking to leverage their existing networks, while still incentivizing licensees to provide secondary market access to PALs, including access by small entities.

31. Some commenters raising concerns about changes to the rules adopted for PALs in the *2015 Report and Order* assert that, in reliance on those rules, they have made investments in the 3.5 GHz band, including investments in 3.65 GHz equipment that might be modified to operate over other frequencies in the 3.5 GHz band. They assert that these investments will be stranded if PALs are licensed with larger areas and longer terms. We disagree that the changes we adopt will "strand" such investments.[72] The changes do not alter the rules for 3.65 GHz licensees or modify the terms of their grandfathered licenses, and such licensees may continue to operate their 3.65 GHz networks and to use the associated equipment in which they have invested as they do currently. Further, while we have not

[70] *See also supra* Report and Order, paras. 52-53.

[71] RWA Comments at 7.

[72] *See also supra* Report and Order, para. 38.

tailored PALs to any particular use case, we have adopted a license area and term that we anticipate will support a diversity of users and use cases, including the fixed broadband services provided by WISPs. In addition, to the extent they are unable to obtain priority rights to spectrum at auction or through the secondary market, entities may rely on GAA spectrum to operate or expand the operation of networks they have deployed in the band.

**Report to Congress**

32. The Commission will send a copy of the *Report and Order*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.[73] In addition, the Commission will send a copy of the *Report and Order,* including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and FRFA (or summaries thereof) will also be published in the *Federal Register*.[74]

[73] *See* 5 U.S.C. § 801(a)(1)(A).

[74] *See* 5 U.S.C. § 604(b).

## APPENDIX C

### List of Commenters

2017 NPRM Comments:

4SIWI, LLC
AcelaNet, LLC
Aeronet Wireless Broadband LLC (Aeronet Wireless)
AirFi, Inc.
AirLink Internet Services (AirLink)
Airosurf Communications, Inc.
Alaska Communications
AlignTec Incorporated
All Points Broadband
Aloha Broadband Inc.
Alsat Wireless
American Petroleum Institute and the Energy Telecommunications and Electrical Association (API/ENTELEC)
Amplex Electric, Inc. (Amplex)
Arbuckle Communications, LLC (Arbuckle)
AT&T Services, Inc. (AT&T)
ATN International, Inc. (ATN)
Baicells Technologies North America, Inc. (Baicells)
Bays-ET Highspeed Internet Service
BDA Wireless, LLC (BDA Wireless)
Bernhardt Communications Company (Bernhardt)
Blooston Rural Carriers (Blooston)
Bolt Internet
BPS Networks
Broadband Corp
Broadband VI, LLC
Byhalia.net, LLC
Cal.net, Inc. (Cal.net)
Cambium Networks, Ltd., ENTELEC, and UTC (Cambium)
Cantor Telecom Services, L.P. (Cantor)
Cardinal Wireless
Casey Imgarten, AirLink Rural Broadband (AirLink)
CBS Corporation, Scripps Networks Interactive, Inc., The Walt Disney Company, Time Warner Inc., 21st Century Fox, Inc., Univision Communications Inc., and Viacom Inc. (Content Companies)
Charter Communications, Inc. (Charter)
Cirrinity Wireless, LLC
City of New York (City of NY)
Cloud Alliance LLC (Cloud Alliance)
CnGWireless
CNSP, Inc. d/b/a NMSURF
COLI, Inc. d/b/a 186networks
Colorado Valley Communications, Inc., Nortex Communications Company, and Pathway Com-Tel, Inc. (Texas Carriers)
Comcast Corporation (Comcast)
CommScope
CTIA
Cyber Broadband Inc

Dan Lubar
Daniel Vincent
Daniel White (CTIconnect)
DMCI Broadband, LLC.
DSLbyAir, Inc.
Dynamic Spectrum Alliance (DSA)
Eastern Oregon Net, Inc.
EBTX Wireless, LLC (EBTX Wireless)
Emerald Harbor Communications
Enterprise Wireless Alliance (EWA)
Eric Ozrelic, Webformix Company (Webformix)
Ericsson
e-vergent.com, LLC (e-vergent)
Express Dial Internet, Inc. d/b/a KWISP Internet (KWISP)
Federated Wireless, Inc. (Federated Wireless)
Fire2Wire
Fourway Computer Products, Inc. (Fourway)
Frontier, Windstream, and Consolidated (Frontier)
Future Wireless Technologies of Nebraska
General Electric Company (GE)
GeoLinks
GigaBeam Networks, LLC (GigaBeam Networks)
Google LLC (Google)
Grand County Internet Services Inc. (Grand County)
Hexis LLC (Hexis)
HomeSmart Internet by Satellite Station Fire & Security
Imagine Networks
In The Stix Broadband, LLC
InfoWest, Inc (InfoWest)
Intelligent Computing Solutions
Internet Services, LLC d/b/a HigherSpeed Internet
Inventive Wireless of Nebraska, LLC dba Vistabeam
InvisiMax Inc
JAB Wireless, Inc. d/b/a Rise Broadband (Rise Broadband)
Jeremy Sheets, CMS Internet LLC (CMS Internet)
Joink, LLC (Joink)
Kcindur Communications, Inc., d/b/a Advanced Wireless (Advanced Wireless)
Kentucky WiMax
L. Elizabeth Bowles, Aristotle Unified Communications (Aristotle)
Larry Ash
Link Technologies, Inc., TowerCoverage.com (Link Technologies)
Matthew Thomas, Cameron Rose (WON Communications Employees)
Medianet Wireless
MetaLINK Technologies, Inc.
Michael Polk
Microsoft Corporation (Microsoft)
Mid-States Services, LLC
Mimbres Communications, LLC (Mimbres Communications)
Mission Valley Communications, LLC. (MVC)
MitoTec, LLC
Mobile Future
Motorola Solutions, Inc. (MSI)

National Association of Broadcasters (NAB)
NCN Data, LLC
NCTA—The Internet & Television Association (NCTA)
NETEO High Speed Internet
New Era Broadband, LLC
New Lisbon Broadband and Communications, Steven Barnes
New Lisbon Telephone Company, Inc.
New Wave Net Corporation (NWNC)
NewarkNet
Next Century Cities (NCC)
Night Owl Wireless, LLC
Nokia
North Carolina Wireless, LLC
Northern Skies Wireless
NRTC and NRECA (NRTC/NRECA)
Nsighttel Wireless, LLC (Cellcom)
NTCA—The Rural Broadband Association (NTCA)
OnlineNW
On-Ramp Indiana, Inc.
Open Technology Institute and Public Knowledge (OTI/PK)
Paladin Wireless LLC
Pearl Creek Broadband LLC
Peoples Telephone Cooperative, Inc. (Peoples)
Portative Technologies, LLC
QUALCOMM Incorporated (Qualcomm)
Q-Wireless, LLC
Rajant Corporation (Rajant)
Rapid Systems, Inc. (Rapid Systems)
RED Technologies SAS (RED Technologies)
Resound Networks, LLC
Rfwave LLC, Tom Dunne (Rfwave)
Ridge Wireless Inc
Ridgetop Networks, LLC
Rio Cities Internet
River Valley Internet
Rocket Communications Corp., Joshua Powell (Rocket Communications)
Roller Network LLC
Royell Communications Inc.
Ruckus Networks, an ARRIS Company (Ruckus)
Rural Broadband Network Services d/b/a HighSpeedLink.net (HighSpeedLink.net)
Rural Wireless Association, Inc. (RWA)
Sacred Wind Communications, Inc. (Sacred Wind)
Sandhills Wireless, LLC
Select Spectrum (Select)
Shelby Broadband
SJP Network Solutions, LLC
Skywave Wireless, Inc. (Skywave Wireless)
Smart Way Communications, LLC
SmartBurst LLC
SmarterBroadband, Inc.
Softcom Internet Communications, Inc.
Solvaris, Inc.

SonicNet Inc.
Southern Communications Services, Inc. d/b/a Southern Linc (Southern Linc)
Southern Internet, Inc.
SPITwSPOTS, Inc.
Starry, Inc. (Starry)
StraightUpNet LLC (StraightUpNet)
STT Rural Net
Tanner Bender
TecInfo Communications
Telecommunications Industry Association (TIA)
Tennessee Wireless, LLC
Texoma Communications, LLC d/b/a TekWav (TekWav)
The Computer Works
The Junction Internet
T-Mobile USA, Inc. (T-Mobile)
Transit Wireless, LLC (Transit)
Union Pacific
United States Cellular Corporation (USCC)
Utilities Technology Council (UTC)
Vantage Point Solutions, Inc. (Vantage)
Veopoint Internet
Verizon
Verso Networks
Vertical Broadband, LLC (Vertical Broadband)
Virginia Broadband, LLC (Virginia Broadband)
Vivint Wireless, Inc. (Vivint)
Wave Wireless, LLC
Wavelinc Communications LLC
Wi-Fiber, Inc
Wilderness Wireless
William Lehr
Wireless Data Net, LLC
Wireless Etc.
Wireless Infrastructure Association (WIA)
Wireless Internet Service Providers Association (WISPA)
WISP Partners, Inc.
Wonderlink Communications, LLC (Wonderlink)
ZipLink Systems LLC

2017 NPRM Reply Comments:

ACT, The App Association (ACT)
American Petroleum Institute (API)
AT&T Services, Inc. (AT&T)
Blooston Rural Carriers (Blooston)
Cantor Telecom Services, L.P. (Cantor)
CBS Corporation, Scripps Networks Interactive, Inc., The Walt Disney Company, Time Warner Inc., 21st Century Fox, Inc., Univision Communications Inc., and Viacom Inc. (Content Companies)
CenturyLink
Charter Communications, Inc. (Charter)
City of Los Angeles, California (City of LA)
Comcast Corporation (Comcast)

CTIA
Dynamic Spectrum Alliance (DSA)
Federated Wireless, Inc. (Federated Wireless)
General Electric Company (GE)
GeoLinks
Google LLC (Google)
Intelsat License LLC and SES Americom, Inc. (Intelsat/SES)
Laurence Brett Glass, d/b/a LARIAT (LARIAT)
Mobile Future
NCTA—The Internet & Television Association (NCTA)
Nokia
NRTC and NRECA (NRTC/NRECA)
NTCA—The Rural Broadband Association (NTCA Rural Broadband)
Open Technology Institute and Public Knowledge (OTI/PK)
Qualcomm Incorporated (Qualcomm)
R Street Institute (R Street)
Rowland J. Martin d/b/a Mile One Broadband Consortium (Mile One Broadband)
Ruckus Networks, an ARRIS Company (Ruckus)
Rural Wireless Association, Inc. (RWA)
Telecommunications Industry Association (TIA)
Telrad Networks, LTD (Telrad)
The Port of Los Angeles (Port of LA)
T-Mobile USA, Inc. (T-Mobile)
United States Cellular Corporation (USCC)
Utilities Technology Council (UTC)
Verizon
Vivint Wireless, Inc. (Vivint)
Wireless Internet Service Providers Association (WISPA)

**STATEMENT OF**
**CHAIRMAN AJIT PAI**

Re: *Promoting Investment in the 3550-3700 MHz Band,* GN Docket No. 17-258

Last year, the FCC decided to take another look at the 3.5 GHz band in order to better promote its potential for 5G, and American leadership in that next generation of wireless connectivity.

In particular, we wanted to re-examine the rules governing the Priority Access License (PAL) tier. The modifications proposed included a change to the size of the licenses to be auctioned off. Striking a balance wasn't easy. Some wanted the Commission to maintain its previous decision to license the PAL tier by census tracts. Others wanted the Commission to change the license size to a significantly larger geographic area called Partial Economic Areas. Others called for county-based licensing. And still others proposed a hybrid of these zones.

After extensive deliberations, and under Commissioner O'Rielly's leadership, the Commission charts a middle course. On one hand, it finds that census tracts are too small. For example, there are over 2,000 census tracts in New York City alone, which would make it incredibly difficult to acquire the necessary licenses to deploy 5G at scale. On the other hand, the Commission finds that Partial Economic Areas are too large. They would significantly limit the range of potential licensees interested in making this band work.

And so we find that county-based licenses are just right. This compromise will allow most interested parties, large and small, to bid on 3.5 GHz spectrum in order to provide 5G services.

To be sure, some have claimed that our decision today is bad for rural America. But that's just not true. For example, the county-based approach has been endorsed by the Rural Wireless Association, which told us that "the use of county-based license sizes will allow rural providers to participate in the 3.5 GHz auction for Priority Access Licenses ('PALs') and further deploy rural broadband service." This compromise has also been endorsed by NTCA-The Rural Broadband Association.

It's also been argued that our decision today will benefit large carriers at the expense of small carriers. But the Competitive Carrier Association, which represents smaller carriers, backs our decision today, saying that "[c]ounty license sizes provide competitive carriers, especially those that serve rural areas, with a meaningful opportunity to bid on and acquire spectrum to provide these areas with the latest broadband services."

License sizes aside, we make other necessary changes today to promote investment and innovation in the 3.5 GHz band, including extending the license terms and giving an expectancy of license renewal. And of course, our three-tiered framework ensures efficient use of the band regardless of license sizes. This is because even after PALs are granted, General Authorized Access users can provide service in the PAL spectrum until licensees deploy. Taken together, these reforms will help make this band a sandbox for 5G and represent another aspect of our comprehensive 5G FAST plan to secure American leadership in the next generation of wireless connectivity.

I thank Commissioner O'Rielly and his staff for their efforts over the last year. They pored over the record, met with all interested parties, and found a balanced path forward that enjoys broad support.

Thanks also to the staff who worked on this item and continue to make the 3.5 GHz band a success: Kamran Etemad, Jessica Greffenius, Joyce Jones, Gary Michaels, Matthew Pearl, Paul Powell, Kelly Quinn, Jeremy Reynolds, Becky Schwartz, Christian Segura, Dana Shaffer, Don Stockdale, Cecilia Sulhoff, and Peter Trachtenberg from the Wireless Telecommunications Bureau; Corey Cahill, Navid

Golshahi, Julius Knapp, Robert Pavlak, and Axel Rodriquez from the Office of Engineering and Technology; Chana Wilkerson from the Office of Communications Business Opportunities; and David Horowitz, Bill Richardson, and Anjali Singh from the Office of General Counsel.

**STATEMENT OF**
**COMMISSIONER MICHAEL O'RIELLY**

Re: *Promoting Investment in the 3550-3700 MHz Band,* GN Docket No. 17-258

The U.S. has a wireless marketplace that other countries envy and try to emulate, in part because of our commitment to free market principles and practices. In sum, the Commission makes spectrum available under flexible use policies, assigns through multi-round auctions, and encourages an active secondary market, ultimately facilitating a competitive marketplace and placing the nation's spectrum into the hands of those who maximize its use for Americans.

These are the very same policies that are the foundation of today's order. By modifying the licensed portion of the 3.5 GHz, or CBRS, band we ensure that there will be maximum investment, continued development, and successful deployment of this spectrum. We also open this mid-band spectrum for 5G technologies, which have developed since the original proceeding and have been targeted for global harmonization, wide-area networks, and 5G roaming.

This change in circumstances is a key reason we must act as outlined in this item. Specifically, it was clear during this review that the past Administration's rules would not support large-scale deployments, such as mobile or 5G networks. Imagine being at the dawn of the Uber age and having the government declare that only Toyota Priuses may Ubers. As many opponents to this order have admitted, the rules in place favored small-scale, fixed networks, by making it unattractive for any other type of deployment. Basically, the rules were designed so that a select group could get licenses on the cheap. Some of these entities assert, to this day, that these are "their licenses." They seem to be forgetting that spectrum belongs to the people and that it is the Commission's obligation to manage it in the public interest for *all* Americans.

We right the ship today by fixing the CBRS band so that there are opportunities for all, regardless of whether an entity is interested in fixed or mobile, 5G, or another technology. Among other changes, we modify the rules to ensure Priority Access Licenses, or PALs, will be available in all markets and change the term to ten years with an expectation for renewal. These will allow winning bidders to freely invest in networks, knowing that if they follow our rules and meet performance requirements, their investments will not be stranded.

The contentious debate, however, centered on the appropriate geographic license size, ranging from the 74,000 census tracts set by the prior Commission to 416 partial economic areas, with other options in between. After almost a year of conversations and considerable movement by some parties, which I greatly appreciate, it was clear that a consensus agreement could not be reached among all parties, so the Commission had to make the appropriate and justified policy decisions. And we are doing just that by changing the geographic license size to counties, which amount to approximately 3,200 market areas nationwide. Contrary to what some are asserting, we did not just throw our hands up in the air, throw a dart at a dartboard, succumb to a "political solution," or draw straws, because we couldn't figure out what to do. Nor is this an effort to give licenses to the nationwide providers or turn this into a 5G-only band. As I like to say, such claims are pure gibberish.

Counties are appropriate because they are big enough that larger mobile providers will be able to successfully aggregate PALs, especially with an option for package bidding, but small enough that they are attractive to small and rural wireless companies, cable operators, and new entrants. I thank the nationwide providers, small and rural mobile operators, the cable industry, and wireline carriers for supporting these efforts and being constructive partners in this endeavor.

This geographic license size will also alleviate the harmful interference issues that arise from all the borders created by 74,000 census tracts, especially in metropolitan areas where the use of a PAL in one census tract could preclude the use of the same spectrum in adjacent areas; require fewer coordination agreements between neighbors; and allow greater and more cost-efficient deployments. Rural providers have also said that census tracts are too small and will not let them take advantage of the CBRS band's propagation characteristics to bring broadband Internet to all those seeking it.

Further, distributing licenses at the county-level will expedite the auction and bring spectrum that, by some accounts, was needed yesterday, into the marketplace as soon as possible. It became apparent, after meeting with our auction team, that we could not conduct a timely auction for over 74,000 markets or more than 500,000 licenses. I was told that, instead, the plan was a single, sealed bid auction. I cannot support abandoning our successful multi-round auction approach that provides flexibility, price discovery, and ensures licenses go to their highest value use under any circumstances, rather than into the hands of a select few. I am bewildered that some suggest that returning to a framework that imposes command-and-control style spectrum policy using an old-fashioned sealed-bid auction is somehow an innovative, new idea that will ensure our continued leadership in wireless. In fact, it seems like a colossal step backwards.

That said, I recognize and fully appreciate all the efforts of interested parties in getting this complex "experiment" up and running. I am disappointed, however, by some parties' arguments that their investments will be stranded due to their inability to access to this spectrum. Those claims are simply false. First, no one is ever guaranteed to win licenses at auction, so it rings hollow that these investments were solely contingent on their ability to win PALs. Regardless, I hope the skeptics of these new rules will still participate in the auction, because outcomes are unpredictable, and, despite their protests, they do not know if they will be outbid. No one would have guessed that the largest two mobile providers would basically take a pass on the 600 MHz auction. Additionally, we are providing bidding credits, to those qualified, to help offset costs. Second, these investments were made in large part to access the 80 MHz of GAA, or unlicensed-like, spectrum that will remain available. Nothing we do today changes the availability of this spectrum. Ironically, I put the idea on the table of converting some GAA spectrum to licenses, even trying to find a way to offer them by census tract in a much later auction, but that was a non-starter, as these entities understandably wanted GAA. Further, with our use-or-share policies, if PAL spectrum is not being used, it can be accessed by GAA users.

Lastly, today's item also expands secondary market options. Some argue that the secondary market may not be as effective as we would hope. I would welcome a full discussion of how the Commission can incentivize secondary markets. If we can provide incentives to further invigorate the marketplace, we should look into doing so.

Similarly, proponents have stated that the performance requirements in this item are insufficient. These metrics were reasonably formulated, taking into account that this spectrum will be offered at the county-level, which is the smallest area the Commission has offered, at a lower power than our normal licenses, and that providers will have to protect federal users. I am a strong proponent of stringent buildout requirements and, in fact, have asked parties in various proceedings about ways we can update our metrics for today's technologies. I am always met with silence. I would be supportive of efforts to modernize and strengthen our construction benchmarks for auctions going forward. Both issues, however, should be looked at holistically and are broader than the current 3.5 GHz proceeding.

In conclusion, I would like to thank the Chairman for providing me the opportunity to lead this effort. I would also like to take this opportunity to acknowledge the staff for their efforts throughout this process and who worked long hours to get this order done. Your hard work does not go unnoticed. Thank you.

**STATEMENT OF**
**COMMISSIONER BRENDAN CARR**

Re: *Promoting Investment in the 3550-3700 MHz Band*, GN Docket No. 17-258

Thompson, North Dakota is a 1,000-person town that sits about 90 miles from the Canadian border. It has more churches than stoplights. The tallest structure you'll find along the town's dirt roads is a grain elevator owned by a farmers co-op. The closest Apple Store is a four-and-a-half hour drive away. It's the type of place that big companies could easily overlook when they plan 5G and next-gen broadband deployments.

But right now, a fixed wireless provider is using 3.5 GHz spectrum and an experimental FCC license to beam 100 Mbps broadband to the community. To do this, the provider attached an antenna to the top of that dusty grain elevator and from that height they can reach houses nearly eight miles away. Justin, one of the company's network technicians, took me up there on a snowy October day two weeks ago. He even pointed out a home about four miles away that topped out at 238 Mbps broadband, and he noted that the speeds would be even higher once the customer upgraded their in-home equipment. He talked optimistically about the 3.5 GHz band, and the company's fixed wireless offering, helping to close the digital divide.

The key, as his company put it, is to strike a balance "between the desire to adopt smaller license areas and the practical considerations that affect designing and deploying real-world wireless networks." Auctioning licenses at the county level—not census tract—they say, represents the best compromise and will support next-gen deployments in Thompson and many rural communities just like it. Other providers serving rural America agree. And elected leaders from rural states, including Montana, Wyoming, and Alaska, all argue that county-sized licenses will serve the needs of their rural communities.

Not everyone agrees. Some larger providers want bigger license areas. Some smaller ones want census tracts. In the end, we adopt an approach that is not tailored to any particular technology or business model. Rather, our approach is targeted at ensuring robust investment and deployment from big cities to rural communities. It's suited to a wide variety of business models from broadband to next-gen IoT and industrial applications.

Commissioner O'Rielly deserves credit for his leadership on these issues and in this band. He worked hard to bridge the gaps between stakeholders and to ensure that this critical piece of mid-band spectrum will work in the real world.

And while there's no doubt we'll hear overheated rhetoric about the decision to license spectrum over counties versus census tracts, remember this: We're doing something we've never done before. We've never auctioned licenses over geographic areas as small as counties. We've never used a SAS to coordinate spectrum access. And we've never implemented a "use-or-share" regime that can both guard against spectrum warehousing and allow a WISP, a manufacturer, or any other entity to access the entire 3.5 GHz band—even channels that have been licensed to another provider. I am confident that our innovative and experimental approach to 3.5 GHz will succeed.

So I want to commend Commissioner O'Rielly again on his leadership and thank the teams in the Wireless Telecommunications Bureau and the Office of Engineering and Technology for their work on the item. It has my support.

**STATEMENT OF**
**COMMISSIONER JESSICA ROSENWORCEL,**
**DISSENTING**

Re: *Promoting Investment in the 3550-3700 MHz Band,* GN Docket No. 17-258

Throughout the course of the Federal Communications Commission's history there have been opportunities big and small to sway the course of spectrum policy. For the most part, this agency has a proud tradition of rising to the challenge. Decades ago we took the academic ideas of Ronald Coase and ushered in a new era of spectrum auctions. We pioneered the use of unlicensed spectrum—the airwaves we now know and use every day as Wi-Fi. More recently, we blazed a trail for two-sided incentive auctions with last year's first-of-its-kind repurposing of broadcast spectrum. With each of these efforts we reoriented ourselves from what was to what could be. In doing so, we changed the way that wireless systems are developed and distributed not just domestically, but worldwide.

But no one will count today's decision as a shining example of our daring. Because here we fall short. Our innovative spirit is in retreat.

That's because today this agency reverses course on the experimental vision we had for wireless policy in the 3.5 GHz band. This is shortsighted. Instead of offering a bold new vision, we adopt more of the stale policies of the spectrum past.

Let's begin with what could have been. Three years ago this agency recognized that our traditional spectrum auctions needed an update—and that the 3.5 GHz band was the perfect place to test a new framework. Instead of relying on the traditional binary choice between licensed and unlicensed, the agency adopted an unprecedented three-tiered model for spectrum sharing and management. On top of that, we experimented with a new mix of service rules aimed at lowering barriers to entry, cultivating new sources of investment and competition, and creating new opportunities to reach rural and hard-to-serve areas of the country.

We accomplished this by adopting license areas based on census tracts, shortening license terms to three years, and setting up frameworks to support lightweight leasing. Together, these rules made our scarce spectrum resources more abundant for all. They put this spectrum in reach of non-traditional wireless interests who want to innovate and join the ranks of those who bid on airwaves and support the internet of things.

This had all the hallmarks of a wild success. We saw interest in the 3.5 GHz band auction from far and wide. In addition to the familiar carriers, we had interest from entities that support industrial operations and wanted to use this spectrum for intelligent manufacturing, power generation and distribution, and healthcare. Our record supported its use for advanced inspection and sensor technologies, including aerial drones, terrestrial crawlers, and robotics. The American Petroleum Institute expressed interest in its use for updating drilling operations. The Port of Los Angeles wanted to explore its use for sharing shipping data. Rural interests saw a unique opportunity to bring more service and more competition to remote areas of the country that are too often left behind.

This was exciting. With a creative framework for the 3.5 GHz band along with smaller licenses and shorter terms, the universe of bidders in our auctions was poised to grow. This, of course, is precisely what we need for successful auctions in the future. Moreover, the enthusiasm for this effort was real. Millions were invested in exploring its possibilities. More than 200 experimental authorizations were granted. Multiple applications were received from aspiring database providers. Protocols regarding operations, interoperability, security, and device testing were all underway.

But instead of seizing this opportunity, we are in retreat. What this agency adopts today is a hollow version of our initial proposal. Instead of doing something new, we are reverting to the old. We take what was most innovative about our 3.5 GHz band model and cast it aside in favor of existing business models. We expand licenses from census tracts to counties and all but bless even larger service territories at auction. We extend the terms for licenses. We adopt last generation build-out requirements for an innovation band that was designed for flexible new services and sensors.

This is a lost opportunity. In our effort to reach a messy compromise, we've created a band that is not well suited to the services of today and offers too few opportunities for the services of tomorrow. This is like being at the dawn of the Uber age and doubling down on taxi medallions. It's at odds with the experimentation that spectrum policy needs for a successful future—and it lacks the audacity that has been a powerful part of our wireless success in the past.

I dissent.