

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

In the Matter of)
)
Wireless Telecommunications Bureau and) GN Docket No. 12-354
Office of Engineering and Technology Seek) RM-11788
Comment on Petitions for Rulemaking) RM-11789
Regarding the Citizens Broadband Radio)
Service)

To: Chief, Wireless Telecommunications Bureau
Chief, Office of Engineering and Technology

**COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
And PUBLIC KNOWLEDGE**

Michael Calabrese
Paul St. Clair
Wireless Future Program
New America's Open Technology Institute
740 15th Street NW, Suite 900
Washington, D.C. 20005
(202) 986-2700

Harold Feld
Public Knowledge
1818 N Street NW, Suite 410
Washington, D.C. 20036
(202) 861-0020

July 24, 2017

Table of Contents

Executive Summary	3
I. THE CTIA AND T-MOBILE PROPOSALS AMOUNT TO AN INDUSTRIAL POLICY TAILORED TO BENEFIT A SINGLE INDUSTRY SEGMENT AND EXCLUDE OTHER USERS AND INNOVATIVE USE CASES	7
A. CBRS is Designed to Encourage More Intensive, Localized Use of the Band by Market Entrants and Innovative Use Cases, Not Only Mobile Carriers	7
B. Investment and Innovation by New Users and for New Uses is Emerging, Facilitated by the Unique CBRS Framework	12
II. PROPOSED CHANGES TO PRIORITY ACCESS LICENSING RULES WOULD EXCLUDE COMPETING AND INNOVATIVE USERS AND USE CASES AND SHOULD BE REJECTED	19
A. Large License Areas Will Exclude Localized, Smaller and New Users, Undermining the Value of the CBRS Framework	19
1. Large PAL Areas Will Foreclose Small ISPs Serving Rural, Small Town Areas	20
2. Large PAL Areas Will Foreclose Localized Users and Use Cases	22
B. Longer PAL License Terms and Automatic Renewal Create Expensive, Permanent Licenses that Foreclose the Ability of Market Forces to Easily Accommodate New Users and Technologies	25
III. THE COMMISSION SHOULD SUMMARILY REJECT T-MOBILE’S PROPOSAL TO RELITIGATE THE MERITS OF A BALANCE BETWEEN LICENSED AND UNLICENSED USE OF THE 3.5 GHZ BAND	28
A. A Balance Between Licensed and GAA Access to the Band Benefits Consumers and the Entire Wireless Ecosystem	28
B. The Commission Should Retain Dynamic Channel Assignment	30
IV. CBSD REGISTRATION INFORMATION MUST BE PUBLICLY AVAILABLE TO OPTIMIZE PRODUCTIVE USE OF THE BAND AND HOLD SAS OPERATORS ACCOUNTABLE	31
V. CONCLUSION	33

Executive Summary

The Commission should reject the changes to the Citizens Broadband Radio Service (CBRS) proposed by Petitioners CTIA and T-Mobile. As an initial matter, the Petitions should be dismissed because they are, in reality, late-filed and redundant petitions for reconsideration addressing precisely the same issues, and making the same arguments, that the Commission rejected in the *CBRS Order on Reconsideration* more than a year ago. Substantively, the Petitions should be rejected because they urge the Commission to adopt a spectrum industrial policy for the benefit of one type of provider (a handful of wide-area cellular providers) to the detriment of thousands of other users and use cases, some of which would compete directly with CTIA's members. The Commission should trust market forces, not adopt an industrial policy.

CTIA and T-Mobile propose to fundamentally redefine Priority Access Licenses (PALs) to tightly fit the mobile carrier business model and, thereby, to foreclose potential competitors to, or substitutes for, the offerings of the largest mobile carriers. The Petitions propose to convert the CBRS band from a flexible, small cell band that facilitates the widest possible variety of users and use cases, including small rural broadband providers and very localized network solutions, into yet another band designed for the sole use and benefit of three or four national mobile carriers for a particular (and still undefined) set of services generically labeled "5G."

In crafting CBRS as a unique framework for small cell spectrum access, the Commission never intended PALs to be auctioned solely to fit the business model of wide-area network operators. The CBRS concept of making spectrum available on a "localized" and "targeted" basis is user- and industry-neutral. As the *CBRS Order* stated, the intention is to make PALs available and affordable to the largest possible number of users, including rural WISPs, private "neutral host" LTE networks, office complexes, factories customizing machine-to-machine

networks, utilities, airports, shopping malls, and sporting arenas. These localized and third-party uses may or may not have the same *capabilities* as a mobile carrier “5G” offering from the user’s perspective. That is a judgment the Commission should leave to the marketplace – as the *CBRS Order* wisely did – rather than adopt an industrial policy fashioned by an incumbent industry segment to foreclose diversity, innovation and choice concerning America’s wireless future.

The underutilized 3550-3700 MHz band is already attracting substantial investment based on the technical and regulatory rules adopted by the Commission in the 2015 *CBRS Order*. The new framework’s combination of small area, short-term licensing (Priority Access Licenses) and band-wide opportunistic access, open to anyone (General Authorized Access), has so far stimulated interest, investment activity and innovative use cases that exceed expectations.

Auctioning licenses with coverage areas larger than census tracts would undermine the purpose of this small cell innovation band. In rural and other low-density areas, auctioning PALs the size of PEAs, or even the size of counties, would make the licenses unaffordable for rural broadband providers or any wireless service other than a deep-pocketed wide-area cellular provider. Since mobile carriers already have coverage spectrum and networks, the use of 3.5 GHz to densify networks with additional capacity would almost certainly be targeted at – and limited to – urban core and other high-traffic and high-ARPU locations. A traditional licensing scheme based on exclusive access to very large geographic areas for inherently small cell deployments would not allow the largest possible number of businesses, individuals, nonprofit institutions and other entities the ability to self-provision capacity for mobile data offload, for neutral host LTE networks, or to customize highly-localized networks for machine-to-machine, smart city and other connectivity needs.

The CTIA and T-Mobile Petitions compound the foreclosure effect of their proposal to license only very large geographies by proposing to replace limited-term PALs with 10-year license terms that renew automatically, creating virtually permanent license rights. Converting PAL licenses into traditional cellular industry licenses, as CTIA proposes, would make PALs prohibitively expensive and uneconomic for all but the largest wide-area mobile carriers for several distinct reasons explained herein.

As an alternative to large license areas and automatic renewal, if the Commission proposes that package bidding is in the public interest, we suggest that package bids be limited to three or at most four of the PALs (30-40 megahertz) in each census tract. This compromise could ensure that one or more licensees can achieve area-wide (even regional) quality of service, for at least a certain level of capacity, while in most cases leaving at least some PA spectrum available for more localized or small-area operators seeking only a single or small number of licenses.

The Commission should summarily reject T-Mobile's proposal to disrupt the balance the Commission struck between licensed and effectively unlicensed access to this mid-band spectrum. T-Mobile's extreme proposal would also pull the rug out from under rural WISPs and the many innovative use cases and market entrants that are already well along in their plans to intensively use the band to meet a myriad of local needs described in the next section.

Finally, our groups strongly oppose the proposals by CTIA and T-Mobile to rescind public disclosure of the CBSD registration information used by SAS operators to calculate protection areas both between PALs and for the purpose of facilitating access to vacant PAL spectrum on a GAA basis. We also oppose T-Mobile's proposal to replace dynamic channel assignment, managed by the Spectrum Access System to protect Naval operations, with specific and static channel assignments.

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

In the Matter of)
)
Wireless Telecommunications Bureau and) GN Docket No. 12-354
Office of Engineering and Technology Seek) RM-11788
Comment on Petitions for Rulemaking) RM-11789
Regarding the Citizens Broadband Radio)
Service)

To: Chief, Wireless Telecommunications Bureau
Chief, Office of Engineering and Technology

**COMMENTS OF
OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
and PUBLIC KNOWLEDGE**

New America’s Open Technology Institute and Public Knowledge (together the “Public Interest Organizations” or “PIOs”), in response to the Commission’s *Public Notice*,¹ submit these Comments in opposition to the Petitions for Rulemaking filed by CTIA² and by T-Mobile USA, Inc. (“T-Mobile”)³ in relation to the Citizens Broadband Radio Service (“CBRS”) spectrum band. The Commission should reject any change to the existing CBRS three-tier access framework or to the Priority Access licensing rules. The CTIA and T-Mobile proposals to tailor licensing rules to closely fit the carriers’ wide-area business model will needlessly foreclose localized, innovative and potentially competing new users and uses that will benefit both consumers and the business community more broadly.

¹ See *Public Notice*, “Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on Petitions for Rulemaking Regarding the Citizens Broadband Radio Service,” DA17-609 (rel. June 22, 2017).

² See CTIA Petition for Rulemaking, GN Docket No. 12-354 (filed June 16, 2017) (“CTIA Petition”).

³ See T-Mobile Petition for Rulemaking, GN Docket No. 12-354 (filed June 19, 2017) (“T-Mobile Petition”).

I. THE CTIA AND T-MOBILE PROPOSALS AMOUNT TO AN INDUSTRIAL POLICY TAILORED TO BENEFIT A SINGLE INDUSTRY SEGMENT AND EXCLUDE OTHER USERS AND INNOVATIVE USE CASES

It is obvious to everyone that the CTIA and T-Mobile Petitions have a single purpose: To change the fundamental character of the Priority Access Licenses (PALs) to tightly fit their business model and, thereby, to foreclose potential competitors to, or substitutes for, the offerings of the largest mobile carriers. In contrast to the industry-specific spectrum policy proposed by CTIA and T-Mobile, in the *CBRS Order* the Commission made it clear that its intention was to accommodate a far broader and diverse set of users and use cases, including rural Wireless ISPs (WISPs), utilities, enterprise broadband providers, private LTE networks (including neutral host networks in high-traffic venues), government agencies, schools and libraries. It remains unclear how the high-capacity, low-latency wireless networks of the future (with capabilities the carriers call “5G”) will be deployed and interconnect, but if current “4G” capabilities are any indication – with roughly 80% of mobile device data traffic dependent on a combination of Wi-Fi and *fixed* networks – the Commission would be wise to retain the industry- and technology-neutral framework of CBRS and reject the CTIA’s and T-Mobile’s blatant gambit to hobble non-cellular providers and services.

A. CBRS is Designed to Encourage More Intensive, Localized Use of the Band by Market Entrants and Innovative Use Cases, Not Only Mobile Carriers

Until the late 1990s, the FCC designed exclusive allocations to accommodate specific technologies and business models. The result was a Table of Frequency Allocations derided as “a fossilized record of fading services and technologies.”⁴ This “command-and-control” approach

⁴ Michael Calabrese, “Principles for Spectrum Policy Reform,” Working Paper, New America Foundation (Oct. 2001).

became increasingly subject to criticism by advocates of both flexible licensing and unlicensed use. Narrow, highly-specified allocations can rapidly become obsolete or spectrally inefficient, since “[a]ny narrow allocation locks in a particular technology or spectrum use” long after “it has been surpassed by an existing service or technology . . . or by an entirely new service or technology.”⁵ Beginning with the service rules for the new Personal Communications Service (PCS) spectrum allocated for mobile telephones in 1993,⁶ the Commission began to allow licensees greater flexibility with respect to both services offered and technologies used.

Although PCS and subsequent mobile terrestrial (IMT) licenses were rightly lauded for offering “flexibility” with respect to *service rules*, they have also been fashioned in very particular ways to advance a specific cellular industry business model based on wide-area coverage (very large geographic license areas), long terms (10 years), non-competitive renewability (permanent licenses), and GSM technologies (allocating distinct uplink and downlink channels). The Commission’s policy with respect to licensing terms and geography generally intended to facilitate wide-area networks offering ubiquitous coverage using relatively high power and expensive base stations. Accordingly, the amortization period for coverage networks is many years, which justifies long terms. Similarly, the risk of coverage gaps have encouraged carriers to push for license areas roughly as large their intended customer base. This has created tensions between national and regional carriers, as the Commission experienced in the debate that led to Partial Economic Area (PEA) licenses in the TV Incentive Auction, as

⁵ Covington & Burling, *Prospects for U.S. Spectrum Management* (June 2002), at p. 4. “Narrow allocations are likely to be suboptimal: Any system that demands *ex ante* evaluation of competing technologies and their public benefits involves some risk of error, even by an expert agency.” *Id.*

⁶ See *Amendment to the Commission’s Rules to Establish New Personal Communications Services*, 8 FCC Rcd 7700 (1993).

advocated by the Competitive Carriers Association.⁷ And as the AWS-3 and other recent auctions demonstrate, the use case for very large geographic area licenses – and the auction winners – are predictably limited to large mobile carriers (typically national, sometimes regional, as in the case of PEAs).

The CBRS band was intended to be something very different: An inherently small cell band accessible on both a licensed and unlicensed (GAA) basis to a far larger and more diverse set of users and use cases, for both outdoor and indoor deployments. CTIA, T-Mobile, and their equipment suppliers (Qualcomm, et al.) spent several years arguing that PALs should be fashioned just like traditional cellular wide-area licenses. The Commission, in 2015 and again in 2016, rejected this traditional wide-area cellular licensing model, including on reconsideration after reviewing exactly the same arguments that CTIA and T-Mobile repurpose in cursory form in their new Petitions. The *CBRS Order* quite purposefully fashioned a spectrum access regime that “*make[s] the 3.5 GHz Band hospitable to a wide variety of users, deployment models, and business cases, including some solutions to market needs not adequately served by our conventional licensed or unlicensed rules.*”⁸

To date, the Commission has sought to *avoid* adopting a command-and-control style allocation that is fashioned to boost the prospects of one specific industry and/or business model. With respect to license terms and renewability, the *CBRS Recon Order* made it clear that “even for large carriers, the economics and upgrade cycles for small cell use may resemble those for

⁷ See generally William Lehr and J. Armand Musey, *Right-Sizing Spectrum Auction Licenses: The Case for Smaller Geographic License Areas in the TV Broadcast Incentive Auction*, Summit Ridge Group (Nov. 20, 2013), available at <https://ecfsapi.fcc.gov/file/7520958842.pdf>.

⁸ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, 30 FCC Rcd 3959 (2015) (“*CBRS Order*”), at 3962 (emphasis added).

Wi-Fi deployments rather than traditional macro cell deployments.”⁹ The Commission noted that non-renewable, short-term licenses are essential so that the broadest number of “users are able to efficiently target their use of the 3.5 GHz band to their specific needs . . . while permitting periodic market-based reassignment of these rights in response to changes in local conditions and operator needs.”¹⁰

With respect to geographic license areas, the *CBRS Order* never intended PALs to be auctioned solely to fit the business model of wide-area network operators. Quite the opposite is the case and, our groups believe, rightly so. The CBRS concept of making spectrum available on a “localized” and “targeted” basis is user- and industry-neutral. As the *CBRS Order* stated, the intention is to make PALs available and affordable to the largest possible number of users, including rural WISPs, private “neutral host” LTE networks, office complexes, factories customizing machine-to-machine networks, utilities, airports, shopping malls, college campuses, and sporting arenas (such as the NASCAR innovation described below). These localized and third-party uses may or may not have the same *capabilities* as a mobile carrier “5G” offering from the user’s perspective. That is a judgment the Commission should leave to the marketplace – as the *CBRS Order* wisely did – rather than adopt an industrial policy fashioned by an incumbent industry segment to foreclose diversity, innovation and choice.

Of course, the *CBRS Order* did not seek to exclude incumbent mobile carriers, which the Commission expected to be one of many industry segments benefitting from more localized and targeted access to high-capacity spectrum.”¹¹ But, at the same time, the Commission wisely

⁹ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, 31 FCC Rcd 5011 (2016) (“*CBRS Recon Order*”), at ¶ 45.

¹⁰ *Id.* at ¶ 44.

¹¹ “Carriers can avail themselves of ‘success-based’ license acquisition, deploying small cells on a GAA basis where they need additional capacity and paying for the surety of license protection only in targeted locations where they find a demonstrable need for more interference protection.” *CBRS Order* at 3962.

adopted an industry- and technology-neutral approach that also looked ahead to the wide variety of high-capacity wireless networking solutions that are likely to be component parts of a future “5G” ecosystem -- including connectivity solutions customized and deployed by end users themselves, much as Wi-Fi is today. As the next section details, the *CBRS Order* correctly predicted that if mid-band, small area, and affordable PALs – together with additional GAA spectrum – are made available, innovative new users and use cases will emerge:

This regulatory adaptability should make the 3.5 GHz Band hospitable to a wide variety of users, deployment models, and business cases, including some solutions to market needs not adequately served by our conventional licensed or unlicensed rules. . . . Real estate owners can deploy neutral host systems in high-traffic venues, allowing for cost-effective network sharing among multiple wireless providers and their customers. Manufacturers, utilities, and other large industries can construct private wireless broadband networks to automate *processes that require some measure of interference protection and yet are not appropriately outsourced to a commercial cellular network*. Smart grid, rural broadband, small cell backhaul, and other point-to-multipoint networks can potentially access three times more bandwidth than was available under our previous 3650-3700 MHz band rules. All of these applications could share common wireless technologies, providing economies of scale and facilitating intensive use of the spectrum.¹²

Notably, as the highlighted sentence above suggests, the Commission specifically intended that PAL spectrum licensed for relatively localized geographic areas (census tracts) would allow a wide variety of industries and smaller operators to acquire “some measure of interference protection” for deployments that “are not appropriately outsourced to a commercial cellular network.” Unfortunately, these use cases – which the Commission anticipated could not rely on either GAA spectrum alone, or on off-the-shelf mobile carrier offerings – would be crippled by the CTIA and T-Mobile proposals to turn PALs into expensive and permanent licenses covering enormous geographic areas.

Finally, it’s also important to realize that the wide variety of new uses and users the Commission sought to facilitate with its unique PAL licensing framework will also be far less

¹² *CBRS Order* at 3962 (emphasis added).

likely to leverage the GAA half of the band if CTIA and T-Mobile succeed in their effort to effectively foreclose access to PALs. First, the enterprises that would need to rely on PALs to ensure interference protection, or quality of service, for at least a portion of their activities would not deploy at all – and so would also forsake the ability to leverage GAA spectrum for added capacity. And even the enterprises (and schools, libraries and other institutional venues) that felt comfortable relying entirely on GAA spectrum would likely face a diminished and considerably more expensive market for hardware and services. While a diverse and intensive use of PAL *and* GAA spectrum would likely fuel a mass market for off-the-shelf access points and other gear – much as Wi-Fi did on the unlicensed bands – a market geared initially and primarily to serve the proprietary needs of a few large mobile carriers would likely leave that potential mass market under-developed, if not dead in the water. And, no doubt, that would be a bonus for CTIA’s members, who would then have most GAA spectrum for their own free use as well.

B. Investment and Innovation by New Users and for New Uses is Emerging, Facilitated by the Unique CBRS Framework

The underutilized 3550-3700 MHz band is already attracting substantial investment based on the technical and regulatory rules adopted by the Commission in the 2015 *CBRS Order*. The new framework’s combination of small area, short-term licensing (Priority Access Licenses) and band-wide opportunistic access, open to anyone (General Authorized Access), has so far stimulated interest, investment activity and innovative use cases that exceed expectations. The 47 companies participating in the Wireless Innovation Forum have spent tens of thousands of hours developing technical standards to implement CBRS, while 55 companies – including chipmakers, mobile carriers, cable companies, equipment manufacturers and more – have joined

the CBRS Alliance.¹³ Multiple companies have applied for certification as SAS and/or sensing system (ESC) providers, while at least a dozen firms have obtained experimental authorizations to trial equipment and technology in the band. Many of the investments and innovations already being deployed or tested by small operators and by chip and equipment makers suggest that the non-traditional approach to licensing in this small cell band will promote the public interest by facilitating a wide variety of new users and use cases.

The CBRS framework allows even the smallest rural operators, market entrants and individual venues to access this small cell spectrum to pioneer or implement innovative new services. Changing the rules would substantially impede the investment and innovation that has already started. Even reopening the rulemaking process would create uncertainty throughout the ecosystem, imposing a “chilling effect” on investment and interest in innovating in the space. The current, uniquely accessible and settled CBRS framework has motivated rural WISPs, utilities and enterprise users to deploy, or prepare to deploy, on CBRS spectrum; equipment makers are beginning to manufacture and sell the gear necessary to deploy current and next-generation networks; and institutional venues are experimenting with the technology for localized networks in preparation for the data-intensive wireless future.¹⁴

Rural areas are uniquely poised to benefit from advancements in the band. Rise Broadband, the largest fixed wireless internet service provider (WISP), is using its \$16.9 million grant from the FCC under the agency’s Rural Broadband Experiment program to deploy base stations today that are capable, once the Commission authorizes operations below 3650 MHz, of

¹³ CBRS Alliance membership is available at <https://www.cbسالliance.org/>.

¹⁴ In the Wireless Innovation Forum, 47 companies are developing CBRS standards and 52 companies from a “broad range of wireless industry sectors have joined” the CBRS Alliance to develop certification procedures, standards, and business opportunities for LTE-based CBRS systems, a group of companies wrote in a WifiForward letter to FCC Commissioners in June 2017.

operating across the entire 3.5 GHz band.¹⁵ This investment will fund ten projects in five states.¹⁶ As the WISP Association (WISPA) has reported, many other rural WISPs are poised to replicate this approach to build out fixed wireless networks capable of extending broadband into unserved and underserved rural, small town and exurban areas.¹⁷

Investments in deployments based on the current CBRS spectrum framework is also targeting the market for private LTE and “neutral host” mobile service indoors and in hard-to-serve locations. Sercomm Corporation has developed products in cooperation with Federated Wireless that will deliver robust, in-home LTE network services using the 3.5 GHz band.¹⁸ Hotel and other venue owners can “deploy LTE via the CBRS band at a fraction of the cost of installing a DAS network in the same location—which is the current preferred method of in-building deployments for cellular networks.”¹⁹ Ericsson has already successfully tested its Radio System Architecture with Federated Wireless’ Spectrum Access Systems product.²⁰

Another leading solution developed specifically around both small area PAL and GAA access to CBRS spectrum is Ruckus Wireless’s OpenG small cell product. Ruckus has collaborated with Qualcomm to use the 3.5 GHz band by “combining coordinated shared spectrum . . . with neutral host-capable small cells to enable cost-effective, ubiquitous in-building

¹⁵ Joan Engebretson, *Rise Broadband Exec: Broadband Wireless Economics Are Better Than Ever*, Telecompetitor (April 14, 2016), available at <http://www.telecompetitor.com/rise-broadband-exec-broadband-wireless-economics-are-better-than-ever/> (crediting Rise Broadband Co-founder Jeff Kohler as asserting the CBRS band “could be a game changer . . . [t]hat type of spectrum [supports] faster speeds and can operate at slightly higher power”).

¹⁶ See Letter from Stephen E. Coran, WISPA Counsel, to Marlene H. Dortch, FCC Secretary, GN Docket No. 12-354 (filed Apr. 7, 2017) (“WISPA Ex Parte Letter”).

¹⁷ *Ibid.*

¹⁸ TekStadium Website, “Sercomm Corporation,” available at <https://www.tekstadium.com/vendor/sercomm-corporation/> (accessed July 24, 2017).

¹⁹ Mike Dano, *Verizon, T-Mobile, Sprint join AT&T in eyeing LTE deployments in 3.5 GHz CBRS band*, Fierce Wireless (Mar. 1, 2017), available at <http://www.fiercewireless.com/tech/verizon-t-mobile-sprint-join-at-t-eyeing-lte-deployments-3-5-ghz-cbrs-band> (quoting Paul Challoner, vice president at Ericsson).

²⁰ *Ibid.*

cellular coverage.”²¹ As the companies explained in their release, the strategy will make it “easy to deploy and provide an attractive total cost of ownership (TCO) while improving coverage and performance.”²² These neutral host LTE networks, whether indoor or outdoor, can be both complementary and, at the end user’s option, competitive with mobile carrier service. Ruckus Wireless asserts the OpenG small cells will be generally available in the third quarter of 2017.²³

The current CBRS framework is also creating manufacturing, industrial, and Internet-of-Things (IoT) use cases. GE Digital, alongside Nokia and Qualcomm, developed a private LTE network for Industrial IoT using the CBRS band.²⁴ The companies will be integrating 3.5 GHz supported products into their Predix platform, which will serve as one of the pre-eminent architectures for the Industrial Internet.²⁵ A standalone LTE network that networks devices within a localized area has the power to improve performance and reliability for these industrial settings. Private, user-controlled networks relying on a combination of PAL and GAA spectrum can also be customized to serve factory automation and other end-user needs without the necessity of relying on what may turn out to be a less-than-optimal large mobile carrier offering. Telrad Networks, another CBRS Alliance member, announced in March introduced a new LTE

²¹ See Ruckus Wireless, “Ruckus Wireless Shares Vision for the Future of In-Building Cellular,” (Feb. 18, 2016), available at <https://www.ruckuswireless.com/press/releases/20160218-ruckus-wireless-shares-vision-future-building-cellular> (“Ruckus Press Release”).

²² *Ibid.*

²³ Sue Marek, “Why the 3.5 GHz CBRS Band Could Be a Breakthrough for 5G,” *SDX Central* (Mar. 10, 2017), available at <https://www.sdxcentral.com/articles/news/3-5-ghz-cbrs-band-breakthrough-5g/2017/03/> (“March SDX Central Article”).

²⁴ Qualcomm Press Release, “GE, Nokia and Qualcomm Unveil First Private LTE-based Trial Network Customized for Industrial IoT,” (Feb. 22, 2017), available at <https://www.qualcomm.com/news/releases/2017/02/22/ge-nokia-and-qualcomm-unveil-first-private-lte-based-trial-network> (“Qualcomm Press Release”).

²⁵ *Ibid.*; see also *March SDX Central Article*, supra note 24.

Customer Premises Equipment offering that it noted is “especially suited for the CBRS band in the United States.”²⁶

Commitment to the current CBRS framework is especially important for equipment manufacturers and software companies with current investments and commitments. CBRS in 3.5 GHz band “fits perfectly with what we do with neutral-host cellular and Wi-Fi networks that we’ve been deploying,” asserts Derek Peterson, CTO of Boingo Wireless.²⁷ According to Boingo Wireless, the 3.5 GHz CBRS spectrum bands are “yet another innovative cycle for us to be able to take bandwidth and be able to find new ways to take advantage of neutral host bandwidth . . . There are a lot of new venue opportunities that we can take advantage that were kind of closed to us before where we were trying to use Wi-Fi to fill them.”²⁸

Small cell company Accelleran has developed hardware that is specifically designed for the CBRS rules as they currently stand.²⁹ Qualcomm announced in February 2017 that its Snapdragon X20 modem will support CBRS spectrum, including neutral host LTE networking

²⁶ Telrad Press Release, “Telrad Networks Announces New Customer Premises Equipment for LTE Networks,” (Mar. 15, 2017), available at <http://www.telrad.com/announces-new-lte-cpe/>.

²⁷ Monica Paolini, “Analyst Angle: A stronger appeal for a neutral-host model with CBRS,” *RCR Wireless* (Apr. 12, 2017), available at <http://www.rcrwireless.com/20170412/analyst-angle/analyst-angle-stronger-appeal-neutral-host-model-cbrs> (“April RCR Wireless Article”).

²⁸ *Ibid.* Derek Peterson, CTO of Boingo Wireless, is quoted regarding the CBRS band:

There have been so many opportunities here for us that we’re excited about. We’ve got venues that we’ve worked with traditionally to get those rights where we’ve had challenges finding the right monetization or the right technical strategy to meet some of the needs of the venues. So I want to provide public safety services through an LTE network, but the only way to do today was you had to go work with an operator to try to lease a part of their spectrum, now with shared spectrum or unlicensed spectrum models with LTE, you don’t have to go lease that spectrum to meet those business needs.)

²⁹ See Accelarn Press Release, “Accelleran Brings Live 3.5GHz Small Cell Solution to MWC2017 and Announces New Small Cell Products,” (Feb. 27, 2017), available at <http://www.acceleran.com/acceleran-brings-live-3-5ghz-small-cell-solution-to-mwc2017-and-announces-new-small-cell-products/>. Accelleran CEO Frédéric Van Durme says the company “is at the forefront of the 3.5 GHz innovation band and preparing the future with its virtualized software framework, ready for future mobile network architectures.” *Ibid.*

gear produced by OEMs such as Ruckus.³⁰ Huawei announced last year it plans to invest in CBRS and provide the gear for 3.5 GHz service.³¹

Business leaders at Ruckus Wireless and Rise Broadband are concerned the Commission might open up the rules in the 3.5 GHz band, which they described as good for small business, but also crucial to maintain because the 3.55 to 3.65 GHz band is used worldwide, meaning there are equipment makers across the globe making the gear for the band of spectrum for reasonable prices in which wireless companies have already begun investing.³² “We get nervous when they’re thinking about changing the rules,” said Jeff Kohler of JAB Wireless, who does business as Rise Broadband.³³ David Wright, director of regulatory affairs and network standards at Ruckus, stated “[m]ajor changes would upset expectations and undermine investment.”³⁴ Wright said Ruckus has been actively developing product for the 3.5 GHz band for the past two to three years and has conducted trials with various service provider and enterprise customers.³⁵

Finally, innovative network deployment has advanced under the current framework, and service providers will continue to innovate in the band given regulatory certainty. This February, Nokia, Alphabet's Access Group and Qualcomm, in a partnership with NASCAR, used the CBRS spectrum band to build a “virtual reality zone inside stock car race cars,” streaming a 360-

³⁰ See *March SDX Central Article*, supra note 24.

³¹ See Monica Allevan, “Huawei ready to supply 3.5 GHz gear when operators need it,” *FierceWireless* (Sep. 26, 2016), available at <http://www.fiercewireless.com/tech/huawei-ready-to-supply-3-5-ghz-gear-when-operators-need-it>.

³² See Monica Allevan, *Ruckus, Rise Broadband cite concerns about potential 3.5 GHz CBRS rule changes*, *Fierce Wireless* (Apr. 13, 2017), available at <http://www.fiercewireless.com/wireless/ruckus-rise-broadband-cite-concerns-about-potential-3-5-ghz-cbrs-rule-changes>. Jeff Kohler, CEO of Rise Broadband, is quoted stating: “We thought they struck the appropriate balance in the first set of the rules, and we have, as have other small companies, invested a lot of money in equipment in the 3.65 band [that can also be used in the in the 3.5 band.]”

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ See generally Testimony of David A. Wright, “Facilitating the 21st Century Wireless Economy,” U.S. House of Representatives, Subcommittee on Communications and Technology (April 5, 2017).

degree video streaming through YouTube Live Events in real-time.³⁶ The companies broadcast the event live in high-definition over a private LTE network relying entirely on the 3.5 GHz band. The companies wanted the trial “to act as a catalyst for carriers and enterprises to start thinking about leveraging this band for new applications.”³⁷

The use of CBRS spectrum in the 3.5 GHz band has not only been tested, but is being looked at as a foundation for enterprises, campuses, venues and other groups to deploy private LTE networks. Nokia has also already built an LTE Small Cell product called Flexizone that is specifically tailored to the CBRS band for enterprises, venues and the hospitality industry.³⁸ This sort of innovative use of the 3.5 GHz band of spectrum shows precisely why the sharing structure of the CBRS rules was so key to helping companies in the space.

Many companies and coalitions are in the process of investing in future technologies using the CBRS spectrum-sharing rules. To date, Federated Wireless has been involved in 40 trials, ranging from technology trials to operational pilots, and expects to receive FCC certification for its 3.5 GHz CBRS product before the end of 2017.³⁹ Federated Wireless has finished more than half of the trials and others are ongoing.⁴⁰

³⁶ Qualcomm Press Release, “Nokia, Alphabet’s Access Group and Qualcomm showcase first live demo of a private LTE network over CBRS shared spectrum providing a 360° race car experience” (Feb. 7, 2017), available at <https://www.qualcomm.com/news/releases/2017/02/07/nokia-alphabets-access-group-and-qualcomm-showcase-first-live-demo-private>.

³⁷ *Ibid.* (attributing this quote to Chris Stark, head of strategy and business development in North America for Nokia).

³⁸ Nokia Press Release, “Nokia expands Flexi Zone small cell portfolio, boosting performance and simplifying deployment for operators and enterprises,” (Sep. 8, 2016), available at http://www.nokia.com/en_int/node/2096.

³⁹ Monica Allevan, “Federated Wireless racks up 40 trials for 3.5 GHz CBRS spectrum sharing system,” Fierce Wireless (June 19, 2017), available at <http://www.fiercewireless.com/wireless/federated-wireless-racks-up-40-trials-for-3-5-ghz-cbrs-spectrum-sharing-system>.

⁴⁰ *Ibid.* “Currently, trials revolve around things like integrating with an operator lab or collecting operational requirements from a carrier, but [Federated Wireless CEO Iyad] Tarazi stopped short of naming names, saying more information is likely to become public near the end of the year.”

Alphabet has also made investments in the CBRS space. The company has “helped address two of three requirements for the CBRS band to be ‘ready for prime time’ – including hardware development and development of a spectrum access system.”⁴¹ Alphabet had completed an “end-to-end test of consumer devices connecting to CBRS base stations and formed a ‘trusted tester program’ designed to ensure interoperability between CBRS base stations and the spectrum access system set to manage resources.”⁴² Nokia, Juniper, ZTE, Sercomm, Ericsson and Ruckus Wireless were among the companies to participate in the first set of tests with the Access SAS platform. In October of 2016, CBRS Alliance member SpiderCloud Wireless introduced what it touted as “the industry’s first enterprise small cell system that simultaneously offers LTE services on licensed spectrum and on the 3.5 GHz CBRS band.”⁴³ The company’s “dual-mode” system allows mobile operators and neutral host operators to “build a footprint of CBRS small cells before CBRS capable connected devices are widely available.”⁴⁴

II. PROPOSED CHANGES TO PRIORITY ACCESS LICENSING RULES WOULD EXCLUDE COMPETING AND INNOVATIVE USERS AND USE CASES AND SHOULD BE REJECTED

A. Large License Areas Will Exclude Localized, Smaller and New Users, Undermining the Value of the CBRS Framework

⁴¹ Joan Engerbretson, “Private LTE Could Be Coming Soon, Thanks to Google CBRS Band Efforts,” *Telecompetitor* (Feb. 26, 2017), available at <http://www.telecompetitor.com/private-lte-could-be-coming-soon-thanks-to-google-cbrs-band-efforts/>.

⁴² Dan Meyer, *Google division touts milestones in CBRS 3.5 GHz SAS tests, only deployments left*, *RCR Wireless* (Feb. 24, 2017), available at <http://www.rcrwireless.com/20170224/policy/Google+division-touts-milestones-in-cbrs-3-5-ghz-sas-tests-only-deployments-left-tag2>.

⁴³ SpiderCloud Wireless Press Release, “SpiderCloud Wireless Announces Industry’s First Dual-Mode CBRS System,” (Oct. 11, 2016), available at <http://www.spidercloud.com/news/press-release/spidercloud-wireless-announces-industry%E2%80%99s-first-dual-mode-cbrs-system>.

⁴⁴ *Ibid.*

Auctioning licenses with coverage areas larger than census tracts would undermine the purpose of this small cell innovation band. In rural and other very low-density areas, auctioning PALs the size of PEAs or even counties would make the licenses unaffordable for rural broadband providers or any wireless service other than a deep-pocketed wide-area cellular provider. This foreclosure effect would be compounded by Petitioners' proposals to make PALs effectively permanent licenses through a combination of ten-year terms, automatic renewal, and limited or no build-out requirements. Even if there were build-out requirements, if they are based on population, mobile carriers would satisfy them (a decade hence) by building out almost solely in high-density and/or high-ARPU areas where the economic returns justify putting the spectrum to work. Since mobile carriers already have coverage spectrum and networks, the use of 3.5 GHz to densify networks with additional capacity would almost certainly be targeted at – and limited to – urban core and other high-traffic and high-ARPU locations.

1. Large PAL Areas Will Foreclose Small ISPs Serving Rural, Small Town Areas

Auctioning PALs as large as Partial Economic Areas, or even counties, will make the licenses prohibitively expensive for smaller and more locally-focused wireless providers (e.g., WISPs) seeking to offer service to smaller, more targeted areas. WISPs and other smaller operators do not have the capital or the economic business case to outbid national or regional wide-area cellular providers for licenses that often cover hundreds of square miles, millions of people, and/or very diverse areas including urban, suburban, rural and small town communities. Providers seeking a license to offer service to a targeted area, such as a campus or shopping mall, would face a similar dilemma.

The most desirable PEAs from the perspective of a national mobile carrier typically include not only major metropolitan areas, but hundreds of square miles of diverse non-urban

areas with substantially varying conditions. There are only 416 PEAs nationwide, 62 of which have populations in excess of 1 million.⁴⁵ Many (including New York and Los Angeles) include a major metropolitan market, but then extend more than a hundred miles inland as well, encompassing rural areas and hundreds of small towns where WISPs – but probably not national mobile carriers – could deploy on a targeted basis using 3.5 GHz spectrum. The PEA that includes the City of Los Angeles (population 3,976,322),⁴⁶ stretches east all the way across California to border the PEA for Las Vegas, Nevada. It also borders the PEA for Saint George, Utah. If a WISP or other service provider needs PALs to serve small towns or rural areas between Los Angeles and Las Vegas, it would be faced with the daunting prospect of paying many millions of dollars upfront for a license valued almost entirely by the fact it covers the City and County of Los Angeles.

The mismatch between PEAs and the use cases (and investment capital) of potential licensees other than major cellular carriers is not limited to PEAs that include major cities. Overall, 337 of the 416 PEAs cover an area with a population of more than 100,000 Americans. By comparison, the average population of census tracts, according to the Census Bureau, is 4,000 people.⁴⁷ For example, virtually the entire state of Maine is a single PEA. The state of Montana has six PEAs, but it also contains 271 census tracts. Another example is Puerto Rico, which is included in a single PEA.⁴⁸ Puerto Rico has a population of 3.4 million people⁴⁹ and a land area

⁴⁵ See Federal Communications Commission, “List of Partial Economic Areas with Corresponding Economic Areas” (“*FCC PEA Boundaries*”), available at https://apps.fcc.gov/edocs_public/attachmatch/DA-14-759A2.pdf.

⁴⁶ See United States Census Bureau, *QuickFacts*, Los Angeles (city), California (“*Census QuickFacts*”), available at <https://www.census.gov/quickfacts/losangelescitocalifornia>.

⁴⁷ See United States Census Bureau, “Geographic Terms and Concepts– Census Tracts,” available at https://www.census.gov/geo/reference/gtc/gtc_ct.html

⁴⁸ See *FCC PEA Boundaries*, *supra* note 45.

⁴⁹ See *Census QuickFacts*, *supra*, Puerto Rico, available at <https://www.census.gov/quickfacts/PR>.

of 3,421 square miles.⁵⁰ While PEA licensing is good policy for wide-area coverage spectrum – such as the recent TV Incentive Auction – it is not good policy for low power, capacity spectrum with variable use cases. While large mobile carriers may be interested in PAL licenses to add capacity to their networks in San Juan or other coastal towns and resorts, most of Puerto Rico contains rural areas and villages. Local operators or other users could not possibly purchase a license for the entire island.

2. Large PAL Areas Will Foreclose Localized Users and Use Cases

More broadly, the foreclosure effect of large license areas – and expensive licenses – would be even more noticeable in metro markets. A traditional licensing scheme based on exclusive access to very large geographic areas for inherently small cell deployments would not allow the largest possible number of businesses, individuals, nonprofit institutions and other entities the ability to self-provision capacity for mobile data offload, for neutral host LTE networks, or to customize highly-localized networks for machine-to-machine, smart city and other connectivity needs. The opportunity loss and spectrum inefficiency inherent in auctioning very large geographic area licenses for a small cell band is particularly true for *indoor use*, where the connectivity needs of a wide variety of enterprise applications may not be well suited to commercial mobile network offerings, a reality the Commission acknowledged in its Spectrum Frontiers *NPRM*.⁵¹

⁵⁰ See The Office of the Government of the Commonwealth of Puerto Rico, “Puerto Rico Facts and History,” *available at* <https://web.archive.org/web/20071212041552/http://www.prfaa.com/aboutpr.asp?id=30>.

⁵¹ The Commission has stated it would be “highly efficient” to allocate some spectrum to “enable flexibility to facilitate a third type of network deployment: privately deployed networks that can provide 5G communications for advanced enterprise and industrial applications not suited to unlicensed spectrum or public network services.” *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Notice of Proposed Rulemaking (rel. October 23, 2015), at ¶ 100.

Very large area and expensive licenses are not a good fit for small cell, high-capacity use cases. Because CBRS is a low-power, small cell band, it is a near-certainty that the vast majority of “5G” mobile carrier deployments will be small or microcell-sized. As a result, coverage areas for each cell will be small, with deployments by licensed providers likely focused in urban areas and within buildings. Licensing these bands on an exclusive basis across broad geographic areas, as desired by Petitioners, will ensure that residents and competitors will not be able to deploy 5G services in those areas not rapidly served by the licensees, or even to self-provision complementary or alternative high-bandwidth networks.

License areas as large as PEAs, or even as large as counties, are likely to leave the spectrum unused for many years, and perhaps indefinitely, in low-density and hence low-ARPU environments outside of central urban areas, shopping districts and well-trafficked venues. In contrast, the model proven to achieve the highest rates of spectrum re-use – and both fast and affordable connectivity indoors – is the open access *by both operators and end users* to low-power and small cell spectrum currently exemplified by Wi-Fi. At least in urban areas, where the CBRS technical rules limit PALs to very low power and small cell deployments, investment at the edge – for data offload, neutral host LTE networks, IoT and myriad other purposes – is, like Wi-Fi, far more likely to make widespread and more intensive re-use of the band than would result from exclusive control of PAL spectrum by a handful of national or regional wide-area operators.

At the same time, we acknowledge the concern of T-Mobile and other potential wide-area operators who do not want to end up with “coverage holes” (and reliance on GAA spectrum) for use as part of a service they market as a quality-of-service offering. Although wide-area operators have legitimate (if purely hypothetical) concerns about “exposure risk” if they are out-

bid on most or all PALs in a few critical locations (e.g., Wall Street in Manhattan), we believe this rationale is overblown for at least two reasons: First, CTIA’s members, including T-Mobile, will not be relying entirely on PAL spectrum for their gigabit-capacity 5G service. Carriers will aggregate PAL capacity, along with other bands, including (presumably) LTE over unlicensed mid-band spectrum at 5 GHz (which is also not guaranteed for QOS). A particular census tract may simply lose that limited capacity. Second, an auction of census tracts is the best market test of the highest and best use of a PAL is a particular community.

Nonetheless, if the Commission decides to propose enlarging PAL licensing areas, rather than completely foreclose PALs for localized users and uses, the Commission could reconsider package bidding for a limited number of PAL licenses. In the 2014 *FNPRM*, the Commission asked if it should adopt package bidding if it adopts “census tracts, or something smaller, as the appropriate geographic license area.”⁵² Our groups opposed package bidding at that time, expressing the concern it could completely negate the benefits of small licensing areas. Most obviously, package bidding could deny even a single license to local entities seeking one or more PALs for very localized purposes (e.g., covering a college campus, an office park or neighborhood) tailored to their need even if they were willing to bid more for that particular license than a large regional operator.

Therefore, as an alternative to large license areas, if the Commission proposes that package bidding is in the public interest, we suggest that package bids be limited to three or at most four of the PALs (30-40 megahertz) in each census tract. This compromise could ensure that one or more licensees can achieve area-wide (even regional) quality of service, for at least a

⁵² *Ibid.*

certain level of capacity, while in most cases leaving at least some PA spectrum available for more localized or small-area operators seeking only a single or small number of licenses.

B. Longer PAL License Terms and Automatic Renewal Create Expensive, Permanent Licenses that Foreclose the Ability of Market Forces to Easily Accommodate New Users and Technologies

The CTIA and T-Mobile Petitions compound the foreclosure effect of their proposal to license only very large geographies by also proposing to replace limited-term PALs with 10-year license terms that renew automatically, creating virtually permanent license rights. Converting PAL licenses into traditional cellular industry licenses, as CTIA proposes, would make PALs prohibitively expensive and uneconomic for all but the largest wide-area mobile carriers in several respects.

First, the cost of each PAL would be higher, perhaps by a factor of 100-to-200 (based on the average number of POPs in PEAs and census tracts) and by a far higher multiple in the top 60 PEAs, each of which covers more than one million POPs. For example, as noted above, the PEA containing the City and County of Los Angeles – which stretches east and north to the borders of Nevada and Utah – has nearly 20 million people. This means that this single PEA – which would be purchased primarily based on its value in L.A. County – contains nearly 5,000 census tracts. Thus, a small wireless provider or other alternative user that would deploy in, for example, 100 census tracts, would need to be able and willing to pay at least 50 times as much per POP as it might if it could acquire spectrum in smaller increments.

Second, these much higher spectrum costs would be entirely frontloaded. The current PAL rules manage to help both *smaller companies and taxpayers* by effectively leasing PAL spectrum for shorter intervals. This lowers the upfront capital costs for market entrants and small operators, while ensuring a continuing return to the public in the form of periodic auction

revenue that continues indefinitely. Periodic payments to the public will not only net more revenue over the long run, it will also match the amount paid at recurring auctions to the current value and use case of the band. This balance is not only a win-win for investment and taxpayers, but it boosts the economy longer term by encouraging more innovation and ensuring that spectrum assignments do not fossilize into under-performing public assets (as most bands allocated decades ago do today). The Commission wisely anticipated this market-based and competitive refreshing of the CBRS band over time in the *CBRS Order*, stating:

Non-renewable, short-term licenses are an essential component of the overall framework. . . . permitting periodic, market-based reassignment of these rights in response to changes in local conditions and operator needs.⁵³

Third, while census tracts cover a uniform number of POPs – and are thus far larger in rural than in urban areas – PEAs are highly variable, both in terms of population and geography. As the Commission’s listing of PEAs indicates at a glance, although there are 416 PEAs in total, the 10 largest PEAs include more than 100 million Americans because they are centered on (but extend in some cases hundreds of miles beyond) the very largest metropolitan markets (e.g., New York, L.A., Chicago). The population covered by those 10 range from nearly 6 million (Houston) to more than 25 million (New York City). As a result, *any* aspiring PAL holder in the top 10 PEAs, or even in the top 60 PEAs (all of which include more than 1 million POPs), will need an enormous amount of upfront capital and a use case to justify that expense. Not surprisingly, the only wireless operators fitting that description are the Petitioners.

Together, long and perpetual license terms, combined with large license areas, will do their intended job of driving small operators, start-ups, market entrants, innovators and individual enterprises and local institutions (such as schools, libraries, public parks, harbors, et

⁵³ *CBRS Order* at ¶ 44.

al.) out of the PAL market, except perhaps for the lucky few that *might* find a mobile carrier willing to do a leasing deal in an area where it has no interest in building out.

Exacerbating the opportunity loss to American business and consumers from losing access to PAL spectrum, CTIA and T-Mobile do not propose strict use-it-or-lose-it build-out requirements. The Commission correctly concluded in the *CBRS Order* that “our decision not to impose specific construction requirements for PALs further increases the flexibility and fungibility of these licenses and reduces the barriers to fluid movement between service tiers.”⁵⁴ However, that decision presupposed small-area licenses that would not automatically renew after an initial three- or (at the initial licensee’s option) six-year term. If the license terms become longer, permanent and affordable only to large mobile carriers, then CTIA and T-Mobile should also embrace strict build-out requirements.

The Public Interest Organizations propose that *if* the Commission incorporates any of the Petitioners’ proposed PAL changes in a NPRM, that the agency also propose short and strict build-out requirements *by census tract*. The only legitimate rationale that CTIA’s members have for its proposed licensing changes is a fear that they may be outbid in certain census tracts and face a “coverage gap” with respect to a wide-area deployment. Given this rationale – and CTIA’s insistence that having multiple PALs in *every* census tract is vital – the Commission should hold them to it by requiring deployment in *every* census tract. Any census tract not served after the initial license term should be returned for auction as a small area PAL – which, in any case, would be a far better fit with the small cell nature of the band and useful to other entities.

⁵⁴ *Ibid.*

III. THE COMMISSION SHOULD SUMMARILY REJECT T-MOBILE’S PROPOSAL TO RELITIGATE THE MERITS OF A BALANCE BETWEEN LICENSED AND UNLICENSED USE OF THE 3.5 GHZ BAND

While CTIA limits its proposed changes to ensuring that mobile carriers will be the only companies with the economic incentive or capital to acquire PAL licenses, T-Mobile ups the ante, perhaps intentionally playing “bad cop” so that its extreme proposal allows CTIA’s proposed spectrum industrial policy seem reasonable by comparison. T-Mobile effectively asks the Commission to reverse the CBRS framework in its entirety, eliminate the GAA allocation, and exclusively auction the entire 150 megahertz for exclusive use by a handful of national or regional carriers. All of this is in the service of promising “5G,” a catch-all term for what will most productively encompass a variety of high-capacity wireless networking solutions – including many (if not most) that will be fueled by access to mid-band GAA spectrum.

The Commission should summarily reject T-Mobile’s proposal to disrupt the balance the Commission struck between licensed and effectively unlicensed access to this mid-band spectrum. T-Mobile’s extreme proposal would also pull the rug out from under rural WISPs and the many innovative use cases and market entrants that are already well along in their plans to intensively use the band to meet a myriad of local needs, as described in the sections above.

A. A Balance Between Licensed and GAA Access to the Band Benefits Consumers and the Entire Wireless Ecosystem

Among the many flaws in T-Mobile’s reasoning, its proposal to reverse the GAA allocation ignores the fact that open access, low-power spectrum has proven to be a uniquely positive complement to licensed carrier spectrum, benefitting consumers by making mobile device connectivity more available, fast and affordable. Although OTI and PK do not believe that the utility of small cell GAA across the 3550-3700 MHz band is limited to offloading traffic

from mobile broadband devices, even for that purpose it should be clear from trends in Wi-Fi offload that both consumers and the wireless industry (overall) would benefit if every individual consumer, business and public space had the option to incorporate additional open access bandwidth into a small cell network that could be accessed by almost any device. Since Wi-Fi is small cell by definition, one of the proven benefits is that it facilitates spectrum frequency re-use over very small areas (a home, business, or school). Because of its efficiency and low cost, unlicensed spectrum carries far more data traffic than do licensed carrier bands. Recent estimates suggest Wi-Fi carries 80% of mobile device data traffic.⁵⁵

There is no reason to believe that the open and effectively unlicensed GAA spectrum in the 3.5 GHz CBRS will not play a similar, complementary role in the wireless ecosystem. Indeed, that is exactly the model that characterizes the private “neutral host” LTE access points developed by Ruckus and Qualcomm, which allow any indoor venue to provide high-capacity LTE connectivity to the customers of any mobile carrier network.

In the future, open access spectrum (whether GAA or unlicensed under Part 15 rules) will be even more important for U.S. economic growth. According to Cisco, by 2020, the Internet of Things will connect 50 billion devices, with an economic impact estimated at \$19 trillion.⁵⁶ Similarly, McKinsey has estimated that IoT applications could have an economic impact of up to

⁵⁵ Sean Kinney, *Analyst: Wi-Fi Carries 80% of Mobile Data Traffic* RCR Wireless News (Jul. 7, 2016), <http://www.rcrwireless.com/20160707/network-infrastructure/wi-fi/analyst-wi-fi-carriers-80-mobile-data-tag17>. Mobidia, which measures the actual usage of tens of thousands of consumers, reported that Wi-Fi is already carrying an average of 80 percent of total mobile device data traffic as of year-end 2014. *See* Mobidia, “Network Usage Insights: Average Data Usage for LTE, 3G and Wi-Fi of Wireless Subscribers in the USA, Q3 2014” (Nov. 2014).

⁵⁶ Olga Kharif, *Cisco CEO Pegs Internet of Things as \$19 Trillion Market*, BLOOMBERG BUSINESS (Jan. 8, 2014), <http://www.bloomberg.com/news/articles/2014-01-08/cisco-ceo-pegs-internet-of-things-as-19-trillion-market>.

\$33 trillion by 2025.⁵⁷ The vast majority of IoT traffic already travels over unlicensed spectrum, and that will continue to be true. It is in the economic interest of both the carriers, and the public interest more broadly, for unlicensed spectrum to be allocated in generous amounts to facilitate the deployment of next-generation unlicensed technologies upon which consumers, competitors, and the carriers themselves, will inevitably rely.

It is also telling that T-Mobile's proposal to auction the GAA portion of the band is tied to a proposed 50 megahertz spectrum cap. Although T-Mobile seems to be telegraphing its expectation that the Commission will approve a merger resulting in a three-carrier mobile marketplace – and is trying to guarantee it will end up with one third of the band at a lower cost than an unrestricted auction of small area PALs would generate – even the company's purported attempt to preserve a bit of competition is unlikely to survive inevitable Verizon and AT&T opposition to *any* spectrum aggregation limit, particularly a band-specific cap.

B. The Commission Should Retain Dynamic Channel Assignment

The Public Interest Organizations strongly oppose T-Mobile's proposal to replace dynamic channel assignment, managed by the Spectrum Access System to protect Naval operations, with specific and static channel assignments. Apparently this proposal presupposes the elimination of GAA spectrum and the exclusive auction of PALs across the CBRS band's entire 150 megahertz. If so, it serves primarily to highlight yet another flaw in T-Mobile's misguided attempt to remake CBRS as a band designed exclusively for three large incumbent mobile carriers. Under the current rules, Navy radar is ensured protection (both technically and

⁵⁷ Mohana Ravindranath, *Cisco CEO at CES 2014: Internet of Things is a \$19 trillion opportunity*, The Washington Post (Jan. 8, 2014), http://www.washingtonpost.com/business/on-it/cisco-ceo-at-ces-2014-internet-of-things-is-a-19-trillion-opportunity/2014/01/08/8d456fba-789b-11e3-8963-b4b654bcc9b2_story.html.

politically) in part because when a PAL holder is notified it must clear off its licensed channel to protect military operations, the SAS temporarily relocates that licensee to GAA spectrum. There is no interruption of what the PAL holder expected to be quality of service spectrum. However, under T-Mobile's proposal, PAL holders would have no GAA spectrum to use when and where the SAS requires them to vacate one or more channels to accommodate Naval radar operations. Presumably T-Mobile expects that if the Commission adopts its proposal, the mobile industry can then go to Congress and put pressure on the Navy to vacate the band.

IV. CBSD REGISTRATION INFORMATION MUST BE PUBLICLY AVAILABLE TO OPTIMIZE PRODUCTIVE USE OF THE BAND AND HOLD SAS OPERATORS ACCOUNTABLE

The Public Interest Organizations strongly oppose the proposals by CTIA and T-Mobile to rescind public disclosure of the CBSD registration information used by SAS operators to calculate protection areas both between PALs and for the purpose of facilitating access to vacant PAL spectrum on a GAA basis. Under the current rules, Section 96.55(a)(3) makes basic CBSD registration information publicly available while obfuscating the identities of the licensees providing the information. This rule is, in fact, less transparent than the similar publicly-available information in the TV Bands Database, which includes a similar site-based registration requirement for access points; and it is less transparent than the Commission's other publicly-viewable (and accountable) databases for site-based licenses, including ULS, which typically includes not only location information, but the name and contact information of licensees.

It is readily apparent that because CTIA and T-Mobile did not prevail in their previous efforts to preclude opportunistic access to vacant PAL spectrum, they are seeking secrecy as a backdoor means of undermining more efficient and intensive use of the entire CBRS band. The SAS, of course, needs to know the location of deployments to protect incumbent users (the Navy,

primarily, but also FSS), to avoid harmful interference between PAL holders, and to facilitate efficient and intensive use of vacant PAL spectrum by either approving or denying GAA requests to operate on PAL spectrum. In its *Second Report and Order*, the Commission facilitated opportunistic access to unused PAL spectrum (so-called use-it-or-share-it), in lieu of build-out requirements, by defining “use” of PAL frequencies on an engineering basis that established default and maximum (and, we believe, conservative) protection contours around PAL deployments.⁵⁸

There are many productive reasons why users of the band benefit by database transparency, particularly with respect to what PAL spectrum is actually in use. By keeping site-based deployments secret, CTIA and T-Mobile make it nearly impossible for WISPs and other operators to assess whether there is enough vacant PAL spectrum in an area to support a deployment. Secrecy would also make it difficult for PAL holders to assess on their own why they might be experiencing interference, or to assess whether certain PALs are more likely to be available for auction because licensees have not built out.

Finally, incumbents and public advocacy groups can also play a productive role in holding the SAS operators and other stakeholders accountable – but only if there is a meaningful level of transparency concerning the band’s actual use. The public should not need to trust a “black box” process controlled by competing SAS operators, some of which will be sponsored by consortia of PAL holders (e.g., CTIA) or under financial pressure to please the PAL holders that choose to use them (and pay them fees, including for value-added services).

For a well-known example of why public transparency and accountability is important when the Commission delegates its spectrum management authority to competing private database operators, look no further than the TV Bands Database. The National Association of

⁵⁸ See *CBRS Recon Order and 2d Report and Order* at ¶¶ 174-179, 185-191.

Broadcasters has used the transparency of the TVBD to hold SAS operators (and some registrants) accountable for erroneous or expired registration entries which – if not corrected – could make the band sharing regime less efficient and even prone to heightened interference risk. The public interest stakes for transparency and accountability are far greater for CBRS, where it is military radar that needs to be protected by accurate registrations and where very valuable PAL spectrum could lie fallow indefinitely if there is no way to question potentially erroneous or expired SAS registrations.

V. CONCLUSION

Our groups urge the Commission to summarily dismiss the CTIA and T-Mobile proposals and focus on an expedited implementation of the rules as adopted in 2015 and 2016. The uncertainty and delay inherent in re-opening the rules for the benefit of one particular group of companies would not serve the broader public interest in our view. The CBRS is designed to promote innovation, competition, rural broadband access and consumer choice. The CTIA and T-Mobile proposals to tailor licensing rules to better fit the carriers' wide-area business model will needlessly foreclose localized and potentially competing new users and uses. We urge the Commission to reject any effort to backtrack on this unique achievement in forward-thinking spectrum policy.

Respectfully submitted,

/s/ Harold Feld
Public Knowledge
1818 N Street NW, Suite 410
Washington, D.C. 20036

/s/ Michael Calabrese
New America's Open Technology Institute
740 15th Street NW, Suite 900
Washington, D.C. 20005

July 24, 2017