1212 New York Ave., N.W.
Suite 900
Washington, DC 20005
202.525.5717

Free Markets. Real Solutions.
www.rstreet.org

In the Matter of	)	
Request for Comments on Developing a Sustainable Spectrum Strategy for America's Future	)	Docket No. 181130999-8999-01

Comments of R Street Institute

Respectfully submitted,

/s/

Joe Kane
Tech Policy Fellow

Tom Struble
Tech Policy Manager

Jeff Westling
Tech Policy Associate

January 22, 2019

Table of Contents

I. Introduction & Summary

The National Telecommunications and Information Administration (NTIA) seeks comment on the development of a national spectrum strategy, pursuant to a recent presidential memorandum on the subject.

NTIA plays a critical role in facilitating the use of spectrum by government users. Since useable radio frequencies are scarce, the agency inevitably influences private sector use of the airwaves. Striking the right balance between critical government missions and productivity in both the public and private sectors requires using markets to analyze tradeoffs and implementing the latest sharing technologies. To aid in the development of such a balance, the R Street Institute ("R Street" or "RSI") hereby submits the following comments.

II. Summary of RSI Work on Spectrum Issues

R Street's mission is to engage in policy research and outreach to promote free markets and limited, effective government. That mission includes policy research and outreach on issues relating to the allocation and use of radio frequencies. Because NTIA deals largely with federal users of spectrum, the challenges it must address differ somewhat from those the private sector faces. For instance, productivity is more difficult to judge and achieve when federal government missions are at stake. Furthermore, the government faces principal-agent problems and other difficulties in determining how to make government users account for the opportunity costs of their spectrum holdings. Still, NTIA can and should account for how its management of spectrum affects the private market and evaluate the extent to which lessons from commercial spectrum users can inform NTIA's

own mission. The Federal Communications Commission (FCC), for example, took a more invasive approach in steering commercial use of spectrum in the past but has since found a more market-driven approach to be more effective at facilitating productive outcomes.

For NTIA, the productive use of each frequency band ought to be the end goal. In the private sector, markets are adept at pushing spectrum to productive ends. Therefore, a national spectrum strategy should involve the government seeking to get out of the way of spectrum markets rather than micromanaging their development or operation.

The following sections summarize a selection of R Street's published works on spectrum policy, which are attached as appendices A–D.

A. Joe Kane, "The Role of Markets in Spectrum Policy," *R Street Institute*, June 18, 2018.

This policy study analyzes how today's spectrum policy is a product of its tortured history and a flawed understanding of the economics of spectrum allocation. Federal spectrum users have been making expansive claims over electromagnetic spectrum since its usefulness first became known. The study concludes that a resolute commitment to maximizing the role of markets as a means for allocating and assigning wireless operating rights—rather than command-and-control regulation—is the best way forward as we seek to correct the mistakes of the past.

B. Tom Struble and Joe Kane, "Reply Comments in the Matter of Promoting Investment in the 3550–3700 MHz Band," GN Docket No. 17-258, Jan. 29, 2018.

These FCC comments respond to the record in the 3.5 GHz proceeding, in which NTIA is also intimately involved. They describe the economic dynamics present in various

arrangements for the band and suggest how to best align the incentives of market participants with efficient outcomes.

R Street supports the three-tiered approach to protecting government incumbents while allowing licensed and licensed-by-rule use when the band is not otherwise occupied. This proceeding can and should be instructive for how to share spectrum as the airwaves become increasingly crowded. The centerpiece of success in 3.5 GHz is the large-scale rollout of spectrum access systems. These systems represent an important technological step toward making spectrum sharing, even with critical government assets, possible. At this point, however, the technologies remain unproven at scale, so NTIA should seek to facilitate the development of these and other technological solutions that can increase the spectrum available to the private sector.

C. Joe Kane, "The FCC's 3.7–4.2 GHz Spectrum Band Proceeding: Key Facts and Analysis," *R Street Institute*, Sept. 5, 2018.

This policy study details the challenges and opportunities presented by the repurposing of the lower C band for flexible use. NTIA should monitor the ongoing 3.7–4.2 GHz proceeding to derive lessons for how to handle spectrum reallocation with entrenched incumbent interests. While the private nature of the parties involved in that proceeding make the proceeding an inexact analogue, it can still provide an instructive comparison.

D. Joe Kane, Tom Struble, and Jeff Westling, "Comments in the Matter of Transforming the 2.5 GHz Band," WT Docket No. 18-120, July 30, 2018.

These FCC comments highlight the pitfalls of prescribing how spectrum should be used, rather than allowing for flexible use. The designation of the 2.5 GHz band for education

uses has proven to be a waste of resources that can be remedied by replacing government control with a market for flexible rights to operate in that band.

III. Conclusion

The Administration should be commended for launching this proceeding and seeking public comment on the development of a national spectrum strategy. We are pleased to contribute our work to this process and look forward to engaging further with the Administration, federal regulators, and other stakeholders as it proceeds.

Respectfully submitted,

/s/

Joe Kane
Tech Policy Fellow

Tom Struble
Tech Policy Manager

Jeff Westling
Tech Policy Associate

January 22, 2019

Free markets. Real solutions.

R STREET POLICY STUDY NO. 146
June 2018

THE ROLE OF MARKETS IN SPECTRUM POLICY

Joe Kane

CONTENTS

INTRODUCTION

Today, almost everyone depends on, or at least uses, a wireless device every day. We use our smartphones to stream videos and text friends, we fly on airplanes that navigate with radar and we look at weather maps constructed by satellites. The future of wireless devices is even more exciting and will include the expansion of the Internet of things, improved telemedicine and increasingly connected cars. But in order to reach the best possible wireless future, we must grapple with the technically difficult, legally complicated and politically contested medium of the electromagnetic spectrum.

Electromagnetic radiation has long been harnessed to engage in communications. Over time, we have increased the efficiency with which we use the spectrum of electromagnetic frequencies and the parts of the spectrum that are usable. The techniques and innovations that make wireless devices work both shape and depend on spectrum policy.

That policy has endured a checkered history—one characterized by invasive government control that is justified by mistaken economic reasoning. As a result, the role for markets has been minimized and this has held spectrum back from its maximum productivity. While the roots of these mistakes have been effectively refuted, their effects still persist in statutes and regulations.

By implementing further market-based reforms, the federal government can greatly increase the productive use of spectrum to the benefit of American consumers and entrepreneurs. To this end, improving the terms of spectrum licenses to incentivize innovation and efficiency, thinking critically about the role for both licensed and unlicensed spectrum and removing government regulation of speech over broadcast spectrum should be priorities for policymakers in every branch of government.

Accordingly, this paper discusses how wireless communication using spectrum works. It then recounts the history of spectrum regulation in the United States and the policy shortcomings that it created. Finally, it suggests a market-based lens through which to view future spectrum reforms and then applies that lens to several current policy issues.

USING SPECTRUM TO COMMUNICATE

The term "spectrum" applies to a range of frequencies of electromagnetic radiation. We interact with the spectrum all the time in the form of visible light, as the different colors our eyes perceive are the result of electromagnetic waves that vibrate at different frequencies and have different wavelengths. We can communicate through visible light, for example, by transmitting different frequencies of light to indicate meaning, as a colored flag would do, or modulating the amplitude or brightness of the light, as when the lights dim in a theater.

Wireless communications apply a similar principle, using waves too long for our eyes to perceive. These "radio waves" are generated and transmitted by sending an electric current through an antenna. These waves can then be received by an antenna at the other end of the transmission. Information is

encoded into the wave usually in a pattern that slightly varies its frequency or amplitude.

These wireless signals are sent and received as particular wavelengths, and each wavelength has unique characteristics for how signals travel and propagate. Longer wavelengths, for example, tend to travel farther and are better able to penetrate physical obstacles like walls or trees. Shorter wavelengths reach less far and are often limited by their physical surroundings, but they also have the ability to carry larger quantities of information more quickly than lower bands.

To account for these tradeoffs and other factors, constructing wireless networks requires clever engineering. For example, low band spectrum is necessary for over-the-air television signals that need to get through the walls of your home. But for a Wi-Fi network within your home, higher frequencies that do not propagate as far are necessary in order to limit interference with neighbors' signals. A combination of both low and high band spectrum can provide the coverage and capacity needed to construct a nationwide 5G network.[1]

While the number of electromagnetic frequencies is vast, the amount available for communication cannot, in practice, be divided infinitely because signals that are carried by waves too close together will interfere with one another. This results in messages not getting to their intended destinations. Harmful interference can be mitigated by various methods including technical protocols for how and when different users transmit signals and legal rules governing who can operate radio equipment in a particular way. Technological innovations can allow for more efficient use of spectrum and essentially can create "more" of it by allowing more information to be squeezed into narrower bands.

HISTORY OF SPECTRUM LICENSING

Not long after Marconi and Tesla started experimenting with "wireless telegraphy" in the late 1800s, the United States government took an interest in regulating spectrum use. A review of the history of the government's involvement in spectrum policy reveals a general shift in views, from treating spectrum as a scarce resource that merited substantial intervention in earlier years to a more economically oriented willingness to let markets play a greater role in allocating it.

Major regulatory efforts in the United States began in 1910 when the Department of the Navy alleged that spectrum use was characterized by rampant interference with almost no management over spectrum users or frequencies. At that time, the Navy issued a dire warning to the Senate Commerce Committee with respect to spectrum use: "There exists in many places a state of chaos [...] It is not putting the case too strongly to state that the situation is intolerable, and is continually growing worse."[2]

Congress attempted to remedy this "state of chaos" via the Radio Act of 1912.[3] Though the original impetus of the law was linked to the sinking of the *HMS Titanic*, it is most notable for its requirement that everyone using a radio apparatus do so under the terms of a license acquired from the Department of Commerce.[4] This began the policy of spectrum licensing in the United States that continues to this day.

Several years later, the Radio Act of 1927 moved the licensing authority from the Commerce Department to a newly created Federal Radio Commission (FRC) and provided more detailed rules.[5] The Commission's purpose was:

> to provide for the use of such channels, but not the ownership thereof, by individuals, firms, or corporations, for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license.[6]

The FRC was also charged with applying a "public interest" standard to spectrum use:

> If upon examination of any application for a station license [...] the licensing authority shall determine that public interest, convenience, or necessity would be served by the granting thereof, it shall authorize the issuance, renewal, or modification thereof.[7]

Rather than allowing markets to determine its most productive use, this broad government discretion over spectrum was the bedrock of future regulation and legislation until much more recently.

In 1934, President Franklin Roosevelt signed the Communications Act, which replaced the FRC with the Federal Communications Commission (FCC).[8] The Communications

1. Peter Rysavy, "Low Versus High Radio Spectrum," *High Tech Forum*, March 5, 2012. http://hightechforum.org/low-versus-high-radio-spectrum.

2. George von Lengerke Meyer, "House of Representative Report No. 924: Letter to Committee on the Merchant Marine and Fisheries," *Radio Communication*, March 30, 1910, p. 4. https://books.google.com/books?id=RmA3AQAAIAAJ&pg=RA1-PA168&lpg=RA1-PA168&dq#v=onepage&q&f=false.

3. S. 6412, An Act To regulate radio communication, 63rd Congress, 1912. http://legisworks.org/sal/37/stats/STATUTE-37-Pg302b.pdf.

4. Ibid. p. 303.

5. H.R. 9971, An Act For the regulation of radio communications, and for other purposes, 69th Congress, 1927. http://www.legisworks.org/congress/69/publaw-632.pdf.

6. Ibid. p. 1162.

7. Ibid., p. 1167.

8. 47 U.S.C. § 151. https://www.law.cornell.edu/uscode/text/47/151.

Act has been amended several times since then, but it still forms the basic foundation of U.S. communications policy. The FCC continued to perform licensing functions for the use of spectrum in comparative hearings, which became known as the "beauty contests."[9] Would-be licensees submitted applications for the use of certain frequencies, and the Commission would decide who got to use what frequencies and how the awardees could employ their allocations, based on the Commission's determination of whether the applicant would serve the "public interest, convenience, and necessity."[10] The FCC's role, therefore, went far beyond its original intention[11] merely to manage interference, instead literally determining if radio stations could play rock or classical music.[12]

Throughout this period, the rationale for such invasive government involvement was the same as it was in 1910: spectrum is a scarce resource, therefore, the government must control it and ensure that it is used in the "public interest."[13] And, the government leaned on its own discretion rather than on markets to decide how spectrum ought to be used.[14] Accordingly, the winners of "beauty contests" got the right to broadcast without paying for it. The absence of a price system to compare the relative opportunity costs of alternative uses necessarily resulted in spectrum being underutilized and less productive than it otherwise could have been.[15]

Enter Ronald Coase

A landmark shift in the old way of thinking began in 1959 when economist Ronald Coase, who would later win the Nobel Prize in economics, published a paper entitled simply "The Federal Communications Commission."[16] Coase challenged the very foundation of U.S. spectrum policy throughout its history. Spectrum is indeed scarce, he said, but that quality in itself is wholly irrelevant to whether government needs to control it.[17] After all, Coase explained, the whole point of market exchange is to rationally allocate scarce resources.[18] Therefore, as with other economic goods like land and paper, the most efficient way of allocating spectrum was, in Coase's view, to create a market for it rather than to give it away for free at the whims of the FCC.

At the time, Coase's proposal was far outside of mainstream communications policy and the scarcity rationale for government control of spectrum continued to dominate policy for decades. When the FCC had a chance to comment on the possibility of a market for spectrum in 1978, commissioners said that the odds of competitive bidding being implemented or improving upon beauty contests were tantamount to "those on the Easter Bunny in the Preakness."[19] Even if the FCC had been willing to consider a market for spectrum at the time, enabling legislation would be needed, yet Congress gave the idea of auctions an equally icy response. Indeed, some members fought to legislate against any possibility of spectrum markets throughout the 1980s.[20] The reluctance to adopt Coase's argument was doubtlessly fueled by the fact that policymakers (and incumbent licensees) preferred a regime that gave them more discretion over the outcomes. The command-and-control regime was never merely a necessary evil in response to spectrum's scarcity; it was a tool of social policy used to control the content of the airwaves.[21]

Eventually, however, the logic of Coase's argument carried the day. In 1993, Congress passed a law allowing the FCC to distribute licenses through competitive bidding.[22] The agency began conducting spectrum auctions in 1994 and has

9. Jonathan E. Nuechterlein and Philip J. Weiser, *Digital Crossroads: Telecommunications Law and Policy in the Internet Age* (MIT Press, 2013), p. 93. https://books.google.com/books?id=2aN5AAAAQBAJ&.

10. 47 U.S.C. § 309. https://www.law.cornell.edu/uscode/text/47/309.

11. At the outset of the FCC, individual commissioners may not have been intent on adjudicating the content of broadcasts but the lack of a price mechanism made that outcome inevitable as the Commission searched for a non-price rule to evaluate the "public interest." See, e.g., Louis G. Caldwell, "Freedom of Speech and Radio Broadcasting," *The Annals of the American Academy of Political and Social Science* 177 (Jan. 1935), pp. 197-202. https://www.jstor.org/stable/1019983?seq=1#page_scan_tab_contents.

12. *Citizens Comm. to Keep Progressive Rock v. FCC*, 478 F.2d 926, 930 (D.C. Cir. 1973). https://scholar.google.com/scholar_case?case=12200776955557677O6&hl=en&as_sdt=6&as_vis=1&oi=scholar.

13. 47 U.S.C. § 303. https://www.law.cornell.edu/uscode/text/47/303.

14. The courts explained that the FCC's authority under the Communications Act is rooted in the scarcity rationale in *NBC v. United States*, 319 U.S. 190 (1943), pp. 216-17. https://scholar.google.com/scholar_case?case=11254761392460211230.

15. For example, the FCC recently proposed to liberalize spectrum that it set aside for educational television in 1963 but that went largely unused: "Two decades later, nearly half of all states had zero ITFS licensees, even though we were essentially giving away licenses for free." *See, Statement of Commissioner Brendan Carr*, In the Matter of Transforming the 2.5 GHz Band, WT Docket No. 18-120, May 10, 2017. https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0510/FCC-18-59A4.pdf. Frequencies in the Ultra High Frequency (UHF) band have also been known to be underutilized for some time. See, e.g., Philip J. Weiser and Dale N. Hatfield, "Policing the Spectrum Commons," *Fordham Law Review* 74:2 (2005), p. 669. https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=4111&context=flr.

16. Ronald H. Coase, "The Federal Communications Commission," *Journal of Law and Economics* 2 (October 1959). https://www-journals-uchicago-edu.mutex.gmu.edu/doi/pdfplus/10.1086/674871.

17. Idid. p. 891.

18. Ibid. p. 894.

19. Glen O. Robinson, "The Federal Communications Commission: An Essay on Regulatory Watchdogs," *Virginia Law Review* 64:2 (March 1978) p. 243. https://www-jstor-org.mutex.gmu.edu/stable/1072617?origin=crossref&seq=1#page_scan_tab_contents.

20. Thomas W. Hazlett et al., "Radio Spectrum and the Disruptive Clarity of Ronald Coase," *Markets, Firms, and Property Rights: A Celebration of the Research of Ronald Coase Conference* (Dec. 2009), pp. 10-11. https://www.chapman.edu/ESI/wp/Porter-Smith-Hazlett-RadioSpectrum.pdf.

21. Brent Skorup and Joseph Kane, "The FCC and Quasi-Common Carriage," *Minnesota Journal of Law, Science & Technology* 18:2 (June 2017), p. 637. https://scholarship.law.umn.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1429&context=mjlst.

22. H.R. 2264, "Omnibus Budget Reconciliation Act of 1993" 103rd Congress. 47 U.S.C 309(j). https://www.law.cornell.edu/uscode/text/47/309.

completed around 100 since then.[23] Policy debates continue about the structure of FCC auctions, but spectrum's scarcity is now generally understood to make it ideal for market allocation rather than making such allocation impossible.[24]

THE USE OF MARKETS IN SPECTRUM POLICY

For decades, legislation and regulation had been based on the scarcity rationale, and that rationale has now been shown to be mistaken. It is true that there were interference problems in the early days of radio communication, but that state of affairs was the result not of private spectrum markets but of their absence. It is easy to see that, without property rights, competing uses for other resources, like land, would result in "interference" that reduces overall productivity. For example, if one person wants to use a piece of land for farming but another wants to use it for an office building, the two aims are obviously incompatible. Yet, they can be kept from "interfering" by defining tradable rights to the land in question.

For these reasons, the government should continue the process of reversing its mistaken rejection of tradable rights in spectrum and view new legal rules governing its use as analogous to those governing the use of land. Whether spectrum is, in fact, analogous to land is a matter of some debate[25] but as a matter of economic incentives, there is much to be said in favor of the comparison. For example, the owner of a piece of land can (among other things), divide it up, transfer it, use it in diverse ways and exclude others from using it. When property rights are assigned to land, the resulting opportunities for profit incentivize the owner to use the land productively. Likewise with spectrum: flexible, durable rights to operate in the spectrum promote productive use.[26]

While there may be divergent value judgements over the best social outcome from spectrum policy, many of them could be better realized through a free market. Insofar as free markets are desirable generally, the overall goal of spectrum policy should be to maximize its productive use. Importantly, this implies that, while mitigating interference is important, the goal is *not* to minimize interference at all costs.[27] Maximizing productivity may mean tolerating some interference or creating rules that are flexible enough to allow creative engineering to resolve problems. The FCC has made significant strides toward a more market-based approach to spectrum, but substantial policy issues remain before the above framework can be fully realized.

POLICY ISSUES

With wireless technologies becoming ubiquitous in more parts of people's everyday lives, spectrum policy has a growing impact on the public and the nation. Accordingly, several key questions that have come to the forefront of recent spectrum policy are outlined below. Each of these requires careful thought and consideration.

Flexible Use

As with any scarce resource with alternative uses, with spectrum, a flexible ability to change how it is used is essential to making it as productive as possible. Given the rapidly changing nature of technology and the economy, the FCC should not be expected to anticipate the best use of a given spectrum band for all time.

The FCC has been moving in the direction of flexible-use licensing, with clear benefits along the way. For example, commercial mobile radio services (CMRS), which include things like cell phones, utilize flexible-use spectrum. While quantifying the benefits of such spectrum is difficult, economist Tom Hazlett has estimated that the consumer surplus[28] from CMRS spectrum was over $81 billion in 2003.[29] Since that estimate predates most of the wireless devices in use today and future demands from ever-expanding connectivity will continue to grow, flexible-use spectrum certainly generates far greater amounts of consumer surplus today. This fact invites the important note that, while FCC spectrum auctions often raise large sums for the U.S. Treasury,[30] the main benefits of getting spectrum into the marketplace come from the uses to which it is put. These gains swamp the sums collected in initial auctions.

23. "Auctions Summary," Federal Communications Commission. http://wireless.fcc.gov/auctions/default.htm?job=auctions_all.

24. See, e.g., Gregory L. Rosston and Jeffrey S. Steinberg, "Using Market-Based Spectrum Policy to Promote the Public Interest," *Federal Communications Law Journal* 50:1 (1997), p. 92-99. https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?referer=https://scholar.google.com.au/&httpsredir=1&article=1147&context=fclj.

25. See generally Coase, pp. 891, 908-10. https://www-journals-uchicago-edu.mutex.gmu.edu/doi/pdfplus/10.1086/674871; Philip J. Weiser and Dale N. Hadfield, "Spectrum Policy Reform and the Next Frontier of Property Rights," *Colorado Law Legal Studies Research Paper Series* 8:8 (March 19, 2008). https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/6262/spectrum.pdf?sequence=1; Thomas W. Hazlett, "A law and economics approach to spectrum property rights: a response to Weiser and Hatfield [sic]," *George Mason Law Review* 15:4 (2008). https://goo.gl/MNwF1H; Thomas W. Merrill and Henry E. Smith, "Making Coasean Property More Coasean," *Journal of Law and Economics* 54:4 (November 2011). https://goo.gl/hqDFGc; J. Pierre de Vries and Jeffrey Westling, "Not a Scarce Natural Resource: Alternative to Spectrum-Think," Telecommunications Policy Research Conference, Oct. 2, 2017. https://goo.gl/mAqzkj.

26. Coase, pp. 897-98. https://www-journals-uchicago-edu.mutex.gmu.edu/doi/pdfplus/10.1086/674871; Thomas W. Hazlett and Evan T. Leo, "The Case for Liberal Spectrum Licenses: A Technical and Economic Perspective," *George Mason University Law and Economics Research Paper Series* (March 23, 2010), pp. 11-12. https://www.law.gmu.edu/assets/files/publications/working_papers/1019CaseforLiberalSpectrumLicenses20100412.pdf.

27. Coase, pp. 903-04. https://www-journals-uchicago-edu.mutex.gmu.edu/doi/pdfplus/10.1086/674871.

28. I.e. the difference between what consumers would be willing to pay and what they actually pay.

29. Thomas W. Hazlett, "Spectrum Tragedies," *Yale Journal on Regulation* 22:2 (2005), p. 251. https://www.manhattan-institute.org/pdf/cde5-17-04_hazlett.pdf.

30. For example, the 2014 AWS-3 Auction yielded over $44 billion in gross bids. "Auction 97: Advanced Wireless Services," Federal Communications Commission. http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=97.

Flexible-use licenses also allow market transactions to assemble contiguous blocks of spectrum for the same use. Such aggregation confers technical advantages, as contiguous channels allow for greater throughput than spreading transmissions over multiple channels. Having to work around bands that are restrictively licensed for different uses or attempting to reshuffle predefined uses through a bureaucratic process is more costly and time consuming than necessary.[31]

One potential shortcoming of this approach is the possibility of holdouts: precisely because contiguous frequencies are known to be complements, one or a few users situated in the middle of a band of frequencies could demand extraordinarily high rates to allow that band to be unified. This could result in a fragmentation that decreases the overall productivity in what is known as the "tragedy of the anticommons."[32] While this is a serious concern for private spectrum markets, two points should be borne in mind. First, one must consider the relevant alternative: The costs from holdouts may still be lower than the deadweight loss caused by the FCC defining the use of contiguous blocks of spectrum by regulation. That is, it is not obvious that the cost of buying out a holdout is higher than that which results from bureaucratic reallocation processes at the FCC.[33] A holdout that can be persuaded to move with enough cash is preferable to one that is unable to move because of regulatory rigidity. Second, the fact that the price of any spectrum license is high does not necessarily indicate a failure of the market. A so-called holdout's willingness to forgo buyout offers is itself an indication of that holdout's high valuation of the spectrum. It is unclear that the government ought to override the licensee's subjective valuation.

License flexibility is now an essential consideration whenever the FCC reevaluates the rules for spectrum bands. Many bands, however, still suffer from underutilization because of restrictions on the services that may be offered within them. Current proceedings on the 2.5,[34] 4.9[35] and 5.9 GHz[36] bands illustrate this fact. The FCC set aside these bands for particular uses that have not come to fruition, leaving the spectrum fallow. For this reason, the FCC has the opportunity to dramatically increase the productivity of those bands by designating them for flexible use. Flexible use is more important than ever in today's rapidly evolving technological landscape. The most productive use of particular frequencies may change rapidly and restrictive regulatory frameworks should not stand in the way of this dynamism.

License Size and Duration

Besides flexible use, other attributes of spectrum licenses can enhance the productive use of radio frequencies. The geographic area covered by a license has significant effects on how spectrum is utilized. Historically, the FCC has carved up the United States in a variety of different ways, including areas as large as the entire country and as small as census blocks. As with assembling contiguous frequencies, the ability of market transactions to efficiently aggregate or disaggregate licenses for particular areas is essential.

While interested parties will insist on their preferred geographic size, these preferences are not always economic necessities. Smaller companies, for example, sometimes fear they will be unable to gain access to larger licenses either in full (from the initial auction) or in part (on the secondary market). But spectrum policy should not bias outcomes in response to the preferences of companies, regardless of size. The goal is productivity and efficiency; and, when a secondary market is in place, the original size of license becomes, in itself, less relevant to that objective.

The real question becomes one of transaction costs. The relative transaction costs of the FCC facilitating more auctions for smaller license areas—compared to those for private companies conducting secondary-market transactions with larger licenses—is not evident *a priori* and will depend upon the economic factors present in the specific case.[37] For example, if a certain frequency is licensed using one size of geographic area, there may be efficiencies to preserve those same geographic areas for adjacent bands. Factors such as

31. See, e.g., the repack following the recent Incentive Auction, in which television spectrum was reallocated to alternative uses in Colin Gibbs, "FCC's repacking effort may far exceed 39 months: Guggenheim," *FierceWireless*, Aug. 25, 2017. https://www.fiercewireless.com/wireless/fcc-s-repacking-plan-may-far-exceed-39-months-guggenheim; and John Eggerton, "FCC Frees Up $742 Million More for Post-Incentive Auction Repack," *Broadcasting & Cable*, April 16, 2018. https://www.broadcastingcable.com/news/fcc-frees-up-742-million-more-for-post-incentive-auction-repack.

32. Michael A. Heller, "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets," *University of Michigan Law School Scholarship Repository* (1998). https://repository.law.umich.edu/cgi/viewcontent.cgi?article=1608&context=articles.

33. See, e.g., analysis of alternative methods considered by the FCC for reallocating the television band in Thomas W. Hazlett, "Reallocation with Hold-ups and Without Nirvana," *George Mason University Law and Economics Research Paper Series* 14:16 (2014). https://goo.gl/TZDEmm.

34. "In the Matter of Transforming the 2.5 GHz Band Notice of Proposed Rulemaking," Federal Communications Commission, WT Docket No. 18-120, April 19, 2018. https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0419/DOC-350331A1.pdf.

35. "In the Matter of Amendment to Part 90 of the Commission's Rules," Federal Communication Commission, WP Docket No. 07-100, March 1, 2018. https://apps.fcc.gov/edocs_public/attachmatch/DOC-349524A1.pdf.

36. Joe Kane, "For connected cars, let the best technology win," *R Street Blog*, Oct. 2, 2017. https://www.rstreet.org/2017/10/02/for-connected-cars-let-the-best-technology-win.

37. See, e.g., Tom Struble and Joe Kane, "Reply Comment of R Street Institute In the Matter of Promoting Investment in the 3550-3700 MHz Band," GN Docket No. 17-258, Jan. 29, 2018, pp. 11-13. https://ecfsapi.fcc.gov/file/10129084413708/3.5%20GHz%20Reply%20Comments.pdf.

population density in a given area will also contribute to whether aggregation or disaggregation are cheaper overall. It may make sense, for example, to ensure that an entire metropolitan area can be covered by a single license at the outset rather than incurring the transaction costs of assembling a contiguous license from small pieces. On the other hand, dense urban areas may provide sufficiently high revenue to overcome these transaction costs. Likewise in rural areas, smaller licenses may be preferable where use cases are more localized, but they also could be susceptible to anticommons tragedies that result from the difficulty in assembling a critical mass of customers in a sparsely populated area. The tradeoffs in each scenario must be evaluated on a case-by-case basis, however, as there is no universally superior license size.

Even more important than license area is license term length. In order for a robust market to efficiently allocate spectrum to productive uses, spectrum licenses must be characterized by terms long enough to justify long-term investments. In this respect, spectrum is, again, akin to land. The degree to which landowners will invest in improving land—and the types of improvements they build—will be skewed if the land were taken and auctioned by the government after only a few years. The reason people invest in long term projects that increase the value and productivity of land is that they expect to benefit from those investments for years to come.

There is good reason, therefore, to think that spectrum licenses ought to be perpetual. Auctions should be used once to get spectrum to market, but after it is in private hands, it is counterproductive for the government to repeat the process. As discussed above, the justification for limited-term licenses in the first place was based on the mistaken scarcity rationale. Licenses of limited duration now only artificially reduce the value of spectrum and distort its uses.

In this respect, the FCC has made less progress. Licenses are still granted for limited terms (albeit with renewal expectancy) and some recent proceedings have seen attempts to create terms as short as three years in order to make the licenses more affordable for smaller bidders.[38] However, this position seeks to substitute the continual FCC auctions—and the transaction costs they entail—for a robust secondary market in perpetual licenses, which could be leased for any period of time. Congress should harness the efficiencies of such markets by enacting legislation that directs the FCC to move toward perpetual licenses. Indeed, it is possible that the FCC will not be needed at all to manage spectrum. Economic history is replete with instances of resource allocation that might conventionally be thought to devolve into chaos but in which private rules and enforcement mechanisms emerge.[39] If applied properly, similar arrangements could prevail. Such creative, long-term solutions for spectrum policy are therefore worth serious consideration.

Government Spectrum

Another barrier to spectrum access is the extensive control of high-quality spectrum by government agencies. For example, more than half of so-called "beachfront"[40] spectrum is allocated to federal use.[41] This spectrum has simply been given to government users without a market mechanism.[42] While government users often perform important functions with their spectrum, the lack of market prices means there is little incentive for the government to economize on its use and no way to calculate whether it could be put to better use by the private sector.

Many government actions have recognized and sought to ameliorate the need for additional spectrum by addressing federal holdings. The Spectrum Pipeline Act of 2015,[43] for example, directed both the FCC and National Telecommunications and Information Administration to identify spectrum that could be cleared and auctioned for commercial use. Another option would be for the FCC to auction overlay licenses that facilitate the ability of private users to buyout government ones.[44]

Government agencies may have legitimate concerns that critical services could suffer if they are deprived of access to spectrum, and, in some cases, sharing with the private sector may be preferable to removing government users. Innovative sharing arrangements, like the pending Citizens' Broadband Radio Service in the 3.5 GHz band,[45] can allow for private use of underused federal bands. More work is needed, however, to implement such efforts and develop new solutions to

38. "In the Matter of Promoting Investment in the 3550-3700 MHz Band," Federal Communications Commission, Notice of Proposed Rulemaking, GN Docket No. 17-258, Oct. 24, 2017, p. 5. https://ecfsapi.fcc.gov/file/1024196454861/FCC-17-134A1.pdf.

39. See, e.g., Edward Peter Stringham, *Private Governance: Creating Order in Economic and Social Life* (Oxford University Press, 2016); Terry L. Anderson and Peter J. Hill, *The Not So Wild, Wild West: Property Rights on the Frontier* (Stanford Economics & Finance, 2004).

40. This is generally considered to be roughly between 200 MHz and 3,7000 MHz.

41. Brent Skorup, "The Importance of Spectrum Access to the Future of Innovation," *Mercatus Center*, December 2016, p. 2. https://www.mercatus.org/system/files/skorup-spectrum-access-future-innovation-mop-v2.pdf.

42. Agencies pay only a small fee that falls far short of the market value of their spectrum. See, e.g., "Spectrum Management: Incentives Opportunities, and Testing Needed to Enhance Spectrum Sharing," Government Accountability Office, November 2012, p. 11. https://www.gao.gov/assets/660/650019.pdf.

43. H.R. 1314 "Bipartisan Budget Act of 2015, Title IX," 114th Congress. https://www.congress.gov/bill/114th-congress/house-bill/1314.

44. See, e.g., Brent Skorup, "Sweeten the Deal: Transfer of Federal Spectrum through Overlay Licenses," *Mercatus Center*, August 2015. https://www.mercatus.org/system/files/Skorup-Spectrum-Overlay-Licenses.pdf.

45. "In the Matter of Promoting Investment in the 3550-3700 MHz Band," Federal Communications Commission, Notice of Proposed Rulemaking, GN Docket No. 17-258, Oct. 24, 2017. https://ecfsapi.fcc.gov/file/1024196454861/FCC-17-134A1.pdf.

ensure that government spectrum is used just as efficiently as spectrum in private hands.

At any rate, getting spectrum into the marketplace is more pressing now than ever. Developments such as the Internet of things and 5G wireless standards will greatly increase the possible applications of wireless technologies, but spectrum availability could be a bottleneck for innovation. So while government uses of spectrum are often important, that importance should be communicated through market prices that reflect its actual scarcity. Policymakers should ensure that outdated rules and free-riding by government are not the source of an artificial shortage.

Licensed vs. Unlicensed

Although it has been heavily influenced by its ambiguous economic and legal history, licensing is the method of management for much of the spectrum. But licensing is not the only way to manage spectrum use. Unlicensed spectrum has been and continues to be used to great effect. The most familiar unlicensed bands are those at 2.4 and 5 GHz, which are used for applications like Wi-Fi and Bluetooth. Operations in these bands have solved the tragedy of the anticommons by using relatively-low power levels and relatively-high frequencies, such that signals are limited in their range. Interference, therefore, is mitigated by the characteristics of the spectrum and the standards in use rather than by granting licenses. But even with these measures, unlicensed spectrum has sometimes become congested in areas where the number and density of users overwhelms even sophisticated traffic management tools.[46]

Additionally, unlicensed users have sometimes tried to have it both ways: seeking the benefits of licensed spectrum without having to pay for them.[47] Such actions are problematic for two reasons. First, the essence of the unlicensed spectrum bargain is that anyone is allowed to access it but they must also accept interference. Unlicensed spectrum should, therefore, be treated as what it is, and those seeking access to more valuable, exclusive rights should expect to pay for them. Second, asking for licensed-like privileges in unlicensed spectrum compromises efficient allocation. When assigning exclusive rights and absent a market mechanism in which competing uses bid against each other, there is no way of knowing whether a given band is more valuable when used for Wi-Fi than for, say, mobile data. However, some unlicensed spectrum can still be compatible within an overall policy of otherwise exclusive rights, just as public parks complement our largely private-property regime for land.

While the lack of a market mechanism in unlicensed spectrum is a significant concern, many believe that new sharing policies combined with innovative technology—such as dynamic frequency sharing through automated databases[48]—can allow unlicensed spectrum to play an increasingly significant role in our wireless future. Moreover, the existence of unlicensed spectrum could incentivize development of more innovative methods of dealing with interference on shared frequencies that could increase the productivity of unlicensed spectrum and also be applied elsewhere. Making unlicensed spectrum an avenue of consistent productivity rather than a giveaway to interest groups is an ongoing challenge. Policymakers should seek to balance the positive incentives created by exclusive licensing with the benefits of unlicensed spectrum, which can complement it.

Free Speech and Content Regulation

One of the most troubling legacies of the federal government's mistaken twentieth-century spectrum policy is the legal ability of the FCC to regulate the content of communications over the electromagnetic spectrum. While this power seems obviously opposed to constitutional protections of free speech and a free press, courts gave it their blessing for reasons firmly rooted in the scarcity rationale.

In the 1943 case of *NBC v. United States*, for example, the Supreme Court recognized that Congress had given the FCC the right to regulate the content of the airwaves and said that such a delegation was permissible because "[t]he facilities of radio are not large enough to accommodate all who wish to use them."[49]

Similarly, in the 1969 case of *Red Lion Broadcasting v. FCC*, the Court found that: "Because of the scarcity of radio frequencies, the Government is permitted to put restraints on licensees in favor of others whose views should be expressed on this unique medium."[50] On this basis, the Court held that the FCC could regulate political speech of broadcasts, despite the fact that the scarcity rationale was shown to be vacuous in 1959.

46. Terry Ngo, "Why Wi-Fi Stinks—and How to Fix It," IEEE Spectrum, June 28, 2016. https://spectrum.ieee.org/telecom/wireless/why-wifi-stinksand-how-to-fix-it.

47. This happened, for example, when proponents of Wi-Fi fought the introduction of LTE-U, which sought to use unlicensed spectrum to facilitate mobile traffic. Wi-Fi advocates alleged (likely incorrectly) that LTE-U would create interference that would harm Wi-Fi even though unlicensed users are not entitled to interference protection. See Brent Skorup, "Spectrum NIMBYs and the Return of FCC Beauty Contests," *Technology Liberation Front*, July 23, 2015. https://techliberation.com/2015/07/23/spectrum-nimbys-and-the-return-of-fcc-beauty-contests.

48. As in the pending 3.5 GHz proceeding. See "In the Matter of Promoting Investment in the 3550-3700 MHz Band," Federal Communications Commission, Notice of Proposed Rulemaking, GN Docket No. 17-258, Oct. 24, 2017. https://ecfsapi.fcc.gov/file/1024196454861/FCC-17-134A1.pdf.

49. *NBC v. United States*, 319 U.S. 190 (1943), pp. 216-17. https://scholar.google.com/scholar_case?case=11254761392460211230.

50. *Red Lion Broadcasting v. FCC*, 395 U.S. 367 (1969). p. 390. https://scholar.google.com/scholar_case?case=7640733876913500692.

Since these cases were decided, Justices from across the ideological spectrum have questioned their legitimacy.[51] Nevertheless, both sides of the aisle have recently renewed calls for the FCC to exercise its power to censor content.[52] It is time for Congress or the Court to reverse mistaken, outdated precedents and make clear that the First Amendment applies equally to all media.

CONCLUSION

Despite living in an increasingly wireless world, it is easy to forget that the devices and connections we take for granted are limited by spectrum. Getting spectrum policy right is essential to provide the tools for technological innovation throughout the 21st century. Policy mistakes in the past have limited the productivity of spectrum, but it is not too late to reverse them and continue advancing on the path to rational, market-based allocation rather than expansive regulation. The federal government should now seek to foster the market for spectrum. Wireless technological advances in telemedicine, 5G and the Internet of things are on the horizon. Accordingly, we must ensure that spectrum policy is not the limiting factor to this future.

ABOUT THE AUTHOR

Joe Kane is a technology policy fellow with the R Street Institute, where he works primarily on Internet, telecommunications, antitrust and intellectual property issues, arguing for regulatory frameworks that will promote long-term innovation. He previously was a graduate research fellow at Mercatus Center, where he worked with the tech policy team on issues like telecommunications, intellectual property and space policy. Joe has a bachelor's degree in political science from Grove City College and a master's degree in economics from George Mason University.

51. In his concurrence to *FCC v. Fox Television Stations*, Justice Thomas, for example, has argued that even if the scarcity rationale were true, it would not make discriminatory treatment of different media constitutional. He then goes on to say that the scarcity rationale is, in fact, flawed. 129 S.Ct. 1800 (2009), pp. 1820-21. https://scholar.google.com/scholar_case?case=6114044271141802936. Justice Ginsburg expressed a similar opinion regarding the related case of *FCC v. Pacifica* in her concurrence to a second *FCC v. Fox Television Stations* decision. 132 S.Ct. 2307 (2012), p. 2321. https://scholar.google.com/scholar_case?case=9187101700166207966.

52. Joe Kane, "'News Distortion' Is Not Grounds for Violating the First Amendment," Morning Consult, April 19, 2018. https://morningconsult.com/opinions/news-distortion-is-not-grounds-for-violating-the-first-amendment; John Eggerton, "Sen. Manchin Bemoans Demise of Fairness Doctrine," *Broadcasting & Cable*, May 18, 2018. https://www.broadcastingcable.com/news/sen-manchin-bemoans-demise-of-fairness-doctrine.

1212 New York Ave., N.W.
Suite 900
Washington, DC 20005
202.525.5717

Free Markets. Real Solutions.
www.rstreet.org

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

Reply Comments of R Street Institute

Respectfully submitted,

/s/

Tom Struble
Technology Policy Manager

Joe Kane
Technology Policy Associate

January 29, 2018

Table of Contents

I. Introduction & Summary

The Federal Communications Commission ("FCC" or "Commission") has been working to develop a Citizens Broadband Radio Service ("CBRS") in the 3550–3700 MHz spectrum band ("3.5 GHz band") since the President's Council of Advisors on Science and Technology ("PCAST") first proposed a three-tiered spectrum hierarchy for the band in 2012.[1] This proposal was revolutionary in at least two ways. First, by using a spectrum access system ("SAS") to dynamically manage wireless operations in real time, the FCC could enable private use of the 3.5 GHz band without interfering with incumbent operations or having to incur the substantial costs of first moving those incumbents to other spectrum bands.[2] Second, by layering exclusive Priority Access Licenses ("PALs") on top of unlicensed General Authorized Access ("GAA"), the FCC could commingle licensed and unlicensed operations in the same band and allow the market to dictate how the 3.5 GHz band will be used based on consumer demand and the nature of different wireless service offerings.[3]

This revolutionary proposal is as promising today as it was when first devised in 2012. For that reason, the R Street Institute ("R Street") joined a coalition effort opposing T-Mobile's petition to turn the entire 3.5 GHz band into PALs.[4] Since 2012, it has become

[1] *See* President's Council of Advisors on Sci. & Tech., Exec. Office of the President, *Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, 22–27 (July 2012) [hereinafter 2012 PCAST Report], https://goo.gl/8ujmqa.

[2] *See id.*

[3] *See id.*

[4] *See* Letter from Center for Rural Strategies et al. to Chairman Ajit Pai et al., Federal Communications Commission, *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550–3650 MHz Band*, GN Docket No. 12-354 (June 19, 2017)

increasingly clear that the wireless industry views the 3.5 GHz band as a key component in mobile 5G service offerings going forward.[5] However, T-Mobile's approach would have effectively removed one of the most important features of the CBRS framework.[6] Instead of turning the 3.5 GHz band into merely a 5G band, the FCC should maintain a flexible approach that can accommodate various services and business models.

However, investment in the 3.5 GHz band is vital for its long-term success, and there are concerns that the current PAL rules are inadequate to foster such investment.[7] PAL rules that restrict investment in the licensed tier of spectrum risk turning the 3.5 GHz band into merely another unlicensed band.[8] For the 3.5 GHz band to truly live up to the promise

---

[hereinafter CBRS Coalition Letter], https://goo.gl/5C22z7; *see also* Petition of T-Mobile USA, Inc. for Rulemaking to Maximize Deployment of 5G Technologies in the Citizens Broadband Radio Service, RM-11798, 9–11 (June 19, 2017) [hereinafter T-Mobile Petition], https://goo.gl/5HDVfN.

[5] *See, e.g.*, T-Mobile Petition, *supra* note 4, at 5 ("Notably, spectrum in the 3.5 GHz band is the *only* mid-band spectrum available for 5G in the U.S. spectrum pipeline."); *id*. at 6 ("Moreover, 5G in the 3 GHz band is a global race. Other regions and countries have already begun to act to make spectrum in the 3 GHz band, including the 3.5 GHz band, available for 5G operations[.]").

[6] *See* CBRS Coalition Letter, *supra* note 4, at 3–4.

[7] *See, e.g.*, Petition of CTIA for Rulemaking to Amend the Commission's Rules Regarding the Citizens Broadband Radio Service in the 3550–3700 MHz Band, RM-11788, 2–9 (June 16, 2017) [hereinafter CTIA Petition], https://goo.gl/FprVo9 (describing the investment risks posed by the existing PAL rules).

[8] Indeed, without the PAL tier, the CBRS framework in the 3.5 GHz band would be similar to the FCC's framework for television white spaces ("TVWS"), which has been heavily criticized for generating little investment and allowing valuable low-band spectrum to go under-utilized for years, imposing substantial opportunity costs upon the American people. *See, e.g.*, Dorothy Robyn, Charles Jackson & Coleman Bazelon, *Unlicensed Operations in the Lower Spectrum Bands: Why is No One Using the TV White Space and What Does That Mean for the FCC's Order on the 600 MHz Guard Bands?*, TPRC 43: THE 43RD RES. CONF. ON COMM., INFO. & INTERNET POL'Y (Apr. 1, 2015), https://goo.gl/asU6Ji.

of the original PCAST proposal, the CBRS framework must foster strong investment in PALs while also leaving ample spectrum available for opportunistic GAA use.[9] Therefore, R Street commends the FCC for launching this notice of proposed rulemaking ("NPRM") and seeking comment on potential ways to encourage investment in PALs and, ultimately, utilization of CBRS throughout the 3.5 GHz band.[10]

In these reply comments, we address four aspects of the PAL licensing rules and respond to arguments raised on both sides of each. First, on the issue of geographic license areas for PALs, the Commission should adopt a hybrid approach that utilizes larger license areas for urban areas while maintaining smaller ones for rural areas. Second, on the issue of term lengths and renewability, the Commission should adopt longer term lengths and a renewal regime designed both to maximize efficient use of the 3.5 GHz band and to stimulate secondary-market transactions among PALs. Third, on the issue of how many PALs will be auctioned in each license area, the Commission should eliminate the N-1 rule and make seven PALs available in each license area. Finally, on the issue of specific-channel bidding, the Commission should weigh the costs and benefits of the proposal, and perhaps seek further comment, as it is unclear whether the benefits of implementing specific-channel bidding would outweigh the associated costs.

---

[9] *See* 2012 PCAST Report, *supra* note 1, at 23.

[10] *See* Notice of Proposed Rulemaking and Order Terminating Petitions, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258 (Oct. 24, 2017) [hereinafter NPRM], https://goo.gl/XVEBXo; *see also* R St. Inst. Notice of Ex Parte, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258 (Oct. 18, 2017), https://goo.gl/W9ATiY (commending the FCC for launching this NPRM to examine proposed changes to the PALs in order to promote investment in the 3.5 GHz band).

II. Right-size PAL License Areas

In 2015, the Commission established a PAL framework with geographic license areas that corresponded to census tracts.[11] Many commenters expressed concerns about these relatively small license areas for PALs,[12] while others insisted that larger license areas would frustrate many potential use cases and business models.[13] A hybrid approach that right-sizes PALs based on the characteristics of the license area should allay both sets

[11] *See* NPRM, *supra* note 10, ¶¶ 20–27; Report and Order and Second Further Notice of Proposed Rulemaking, *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550–3650 MHz Band*, GN Docket No. 12-354, ¶ 96 (Apr. 21, 2015) [hereinafter 2015 CBRS Order], https://goo.gl/bJZvUB ("We adopt census tracts as the appropriate geographic license size for PALs."); Order on Reconsideration and Second Report and Order, *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550–3650 MHz Band*, GN Docket 12-354, ¶ 15 (May 2, 2016) [hereinafter 2016 CBRS Order], https://goo.gl/RcFWvd ("A PAL is defined as a non-renewable authorization to use a 10 megahertz channel in a single census tract for three years.").

[12] *See, e.g.*, Comments of AT&T Servs., Inc., *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 5–7 (Dec. 28, 2017) [hereinafter AT&T Comments], https://goo.gl/9evHv5; Comments of CTIA, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 8–10 (Dec. 28, 2017) [hereinafter CTIA Comments], https://goo.gl/BkTfgN; Comments of NCTA—The Internet & Television Ass'n, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 3–11 (Dec. 28, 2017) [hereinafter NCTA Comments], https://goo.gl/ccX6yw; Comments of T-Mobile USA, Inc., *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 8–10 (Dec. 28, 2017) [hereinafter T-Mobile Comments], https://goo.gl/6a1VvT; Comments of Verizon, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 8–14 (Dec. 28, 2017) [hereinafter Verizon Comments], https://goo.gl/Cdf1HY.

[13] *See, e.g.*, Comments of Google LLC, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 5–14 (Dec. 28, 2017) [hereinafter Google Comments], https://goo.gl/QBNndY; Comments of Open Tech. Inst. & Pub. Knowledge, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 19–29 (Dec. 28, 2017) [hereinafter OTI/PK Comments], https://goo.gl/zGiS3r; Comments of Microsoft Corp., *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 4–6 (Dec. 28, 2017) [hereinafter Microsoft Comments], https://goo.gl/Bj19M2; Comments of Wireless Internet Serv. Providers Ass'n, *Promoting Investment in the 3550–3700 MHz Band*, GN Docket No. 17-258, 24–38 (Dec. 28, 2017) [hereinafter WISPA Comments], https://goo.gl/pbtZiQ.

of fears. To wit, the Commission should use partial economic areas ("PEAs") for PALs in urban and suburban areas, but census tracts for PALs in rural areas.

A. Census Tract PALs Would Likely Cause Problems in Urban Areas

Census tracts as license areas for all PALs would likely cause problems, particularly in urban areas, where access to infrastructure is more difficult and expensive, and where environmental factors may create interference problems that substantially reduce the utility of the 3.5 GHz band. Bigger license areas, like PEAs, would reduce transaction costs, stimulate deployment, and promote productive use of CBRS. Additionally, the alleged benefits of using census tracts are overstated. Thus, the Commission should change the license area for PALs in urban areas to use PEAs instead.

A first problem with census tract PALs is their sheer number.[14] 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.[15] 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

[14] *See, e.g.*, Verizon Comments at 10 ("At the census tract level, the 3.5 GHz band would contain over 74,000 license areas that, within themselves, contain more than 518,000 PALs.").

[15] *See e.g.*, *Id.* ("This cluttered and chaotic environment could create substantial interference risks and thus necessitate operational adjustments or 'buffering zones' that would significantly limit the utility of the band and result in less efficient and intensive use").

larger license areas, they are multiplied by the more numerous borders that census tract PAL license areas necessitate.

Supporters of census tract PAL license areas argue that owners of individual venues, like hotels or factories, would be harmed by the use of PEAs because they would be unable to buy PEA-sized PALs but would be able buy smaller PALs specifically for their venues.[16] However, census tract license areas do not solve this problem, as they are often still too large to cover only a single venue, meaning a venue owner seeking to obtain its own PAL would still have to buy a larger license than needed to cover the venue.[17]

B. Larger License Areas Would Offer Substantial Benefits

When combined with secondary markets, larger PAL license areas would address the concerns commenters have raised and also offer substantial benefits. Therefore, larger license areas—such as PEAs—are preferable in many cases, especially in densely populated urban areas. Arguments that increasing license sizes will harm small businesses or individual venues do not adequately account for market mechanisms that would make larger sizes *more* advantageous to such operators.

In addition to the reduction in transaction costs that would be achieved by limiting the sheer number of licenses, larger license areas will also be more effective at facilitating the development of secondary markets. For example, if a larger carrier buys a PEA-sized

[16] *See, e.g.*, Google Comments at 12; OTI/PK Comments at 26–29.

[17] For example, in the District of Columbia, Census Tract 49.02 contains both the Washington Convention Center and the Marriott Marquis hotel. *See Census Tract 49.02, District of Columbia, District of Columbia*, USBOUNDARY.COM (last visited Jan. 29, 2018), https://goo.gl/n9Pajm.

license, the Commission's proposal would allow it to disaggregate that license and lease or sell to smaller venue owners exactly the area they need.[18] Secondary markets allow operators to cheaply reconcile the mismatch between demand and the unit of supply. In this sense, census tract license areas are analogous to eight-packs of hotdog buns that accompany a six-pack of hotdogs. PEA license areas are more like one firm buying many hotdog buns in bulk and selling six of them to the hotdog owner. Likewise, selling sections of a larger license that exactly match the needs of smaller venues would benefit both parties. This would likely result in more productive use of the spectrum since license areas could be tailored to suit the individual needs of small operators more easily than with a blunt, one-size-fits-all approach of census-tract PALs nationwide.

Supporters of census tract license areas argue that disaggregation of licenses on the secondary market will not meet the needs of small operators, claiming that such operators have been unsuccessful at acquiring spectrum in other secondary markets in the past.[19] However, these claims incorrectly assume that an operator who failed to secure a block of spectrum in a secondary market would successfully have done so if that block were auctioned as a smaller license. On the contrary, we should expect the buyer to lose the auction for the spectrum it could not get on the secondary market.

Consider the following example: Suppose a hotel owner wants to buy a subset of a large carrier's PEA-sized license that covers her hotel. The hotel owner will offer the carrier

[18] *See* NPRM ¶¶ 31–32.

[19] *See, e.g.*, WISPA Comments at 43–44; Google Comments at 20–21; *but see* Mobile Future, *FCC Spectrum Auctions and Secondary Market Policies: An Assessment of the Distribution of Spectrum Resources Under the Spectrum Screen*, iii (Nov. 2013), https://goo.gl/TetBDX ("Both non-nationwide and nationwide operators have secured substantial spectrum resources through secondary market license assignment and transfer transactions").

a price up to the marginal benefit she expects from the spectrum. If the carrier declines the offer, this action demonstrates that, for whatever reason, the carrier values that spectrum more than the hotel owner was willing to pay for it. In other words, the carrier is willing to give up at least that amount of money to keep that block of spectrum.

If supporters of census-tract license sizes got their wish, however, the outcome would be the same: The hotel owner would bid on the census tract in which the hotel is situated,[20] and it will bid a dollar amount up to the marginal benefit it expects from the spectrum—the same amount it offered to the carrier in the previous scenario. Also, since the larger carrier could also bid in this auction, and we already know that it is willing to give up more than the hotel is to possess that block of spectrum, the carrier will outbid the hotel owner and win the auction. Smaller license areas, therefore, will not necessarily result in PALs going to small operators more often than they would in the secondary market of PEA-sized PALs. The fact that some firms have been unable to secure spectrum they want in the past does not indicate that secondary markets have failed or that they are inefficient. It indicates only that the spectrum sought by such players could be used more productively by others.

More specifically, Google argues that the use of unlicensed spectrum by small businesses who were unable to buy spectrum licenses in secondary markets indicates that such markets are "not sufficient to create the meaningful spectrum opportunities for businesses outside the telecommunications industry."[21] Such an inference is unwarranted.

[20] An area that is likely larger than what it needs since it is the whole census tract rather than a custom-tailored section carved out of a PEA. This fact alone may be enough to price the hotel out of the auction.

[21] Google Comments at 20–21.

The example of unlicensed use shows only that small businesses were willing to deploy some form of broadband infrastructure when the price was lower—indeed, the monetary price of accessing unlicensed spectrum is zero. And while Google is surely correct that there is demand among small businesses for higher-quality, licensed spectrum, the existence of that demand does not mean that small businesses' use of such spectrum would be more productive than alternative uses. The preferences of different potential users, as demonstrated by their actions to buy or sell at particular prices, actually suggest the opposite.

WISPA further argues that secondary markets will be ineffective "[b]ecause secondary market transactions are voluntary," and "there often may be no incentive for a licensee to engage in secondary market transactions[.]"[22] This claim is difficult to support. Large-area licensees would leave money on the table if they do not engage in secondary-market transactions that would be profitable to them. And if a proposed secondary-market transaction is not profitable to the licensee, then, by the economic logic explained above, we should expect that same licensee to also win the auction for a smaller area by itself anyway.

C. Reducing Transaction Costs Would Facilitate Secondary Markets

To be sure, transaction costs abound in the spectrum market as much as in any other, so the initial conditions of the market are highly relevant to the outcome.[23] Both large and small license areas would generate transaction costs. For example, it is costly for

[22] WISPA Comments at 43.

[23] *See, e.g.*, Ronald Coase, *The Problem of Social Cost*, 3 J. OF L. & ECON. 1, 15 (Oct., 1960), https://goo.gl/CWmC6R.

the FCC to run auctions, and as a government agency it has little incentive or ability to cut costs. On the other hand, there is good reason to think that private parties in secondary markets would be better at mitigating transaction costs, mostly because they can gain profit by doing so.

Secondary markets would work to the benefit of large and small players alike, as holders of large PALs have an incentive to make it easy for small businesses to buy PAL subsets that cover their particular area of interest.[24] It is also likely that large carriers owning PALs in the same area would compete to give small businesses the best deal for a subset of that PAL, and this process will further promote the efficiency of the secondary market and, ultimately, the productive use of the 3.5 GHz band.

Moreover, secondary markets can work both ways: They can disaggregate large licenses into smaller ones or aggregate smaller licenses into bigger ones. We suspect that the transaction costs associated with aggregating small licenses—plus the losses from interference concerns at the boundaries of the more numerous areas—outweigh the transaction costs associated with disaggregation by private parties who have strong incentives to facilitate those transactions. Therefore, merely allowing aggregation of census tract PALs on the secondary market would not resolve concerns over transaction costs and allocation inefficiencies.[25]

[24] Assuming the small businesses value the spectrum more than the PAL holder does.

[25] Aggregating census tract PALs in the first instance, through package bidding, could alleviate some transaction costs, NPRM ¶ 25, but that is essentially no different from our hybrid proposal of using PEAs for urban areas and census tracts in rural areas.

Also, in any case, the fact that even areas as small as census tracts would frequently be too large for individual venues means that disaggregation would often still be necessary even if all PALs were auctioned in census tracts.[26] Thus, the Commission should allow both aggregation and disaggregation of PALs and reduce transaction costs as much as possible in order to stimulate the secondary market.[27]

III. Offer Long-Term Licenses with Potential for Renewal

The Commission should promote investment in PALs by enabling greater long-term certainty for licensees. The best way to provide that certainty is to offer long-term PALs with the potential to renew licenses at the expiry of their terms.[28] The record shows that using three-year PAL terms without renewal is likely to severely hamstring investment, as well as productive use of the 3.5 GHz band.[29] Lengthening the PAL license term to 10 years and allowing for renewal would surely be a more productive arrangement.

If operators can expect to profit from their investments for the foreseeable future, rather than face triennial uncertainty about their ability to recoup costs, they will be more willing to invest in PALs and CBRS infrastructure. Under three-year licenses without renewal expectancy, investment decisions would be skewed toward more short-term projects rather than more capital-intensive ones that may provide greater consumer benefits in the long run. In this sense, spectrum licenses are akin to real property. We would expect a landowner to undertake the projects that contribute most to the value of

[26] *See, e.g.*, *Census Tract 49.02*, *supra* note 17.

[27] NPRM ¶ 31.

[28] *See id.* ¶ 17.

[29] *See, e.g.*, CTIA Petition, *supra* note 7, at 2–9.

her land when she expects to be able to profit from those improvements for many years to come. It would be nonsensical and economically destructive for the federal government to reclaim all land every three years and auction it to the highest bidder. It makes no better sense to do so in the case of spectrum licensing.

Some commenters express concern that longer licenses would be too expensive for small businesses and would make CBRS spectrum unresponsive to changing conditions or needs.[30] As with concerns about license areas being too big, these concerns could also be addressed through disaggregation and robust secondary markets. If a small business wants a shorter-term license, it can lease it from a holder of a longer license. Claims that PALs with longer terms will fetch higher prices at auction and will, therefore, be out of reach for small businesses do not adequately account for this fact. Moreover, while the upfront cost may be higher, the price per year will likely be the same (or even lower, given the possibility of second-degree price discrimination). Three-year PALs simply make the owner pay the 10-year price incrementally over multiple auctions. The main difference in that case is the added cost of administering those additional auctions.

Likewise, if economic conditions change such that innovative and different uses for a given PAL are more valuable than its original use, those wishing to implement the change will purchase the right to do so from the original licensee. As in the discussion of license areas, if the secondary market transaction does not take place, it will be because the

[30] *See, e.g.*, OTI/PK Comments at 29; Comments of Google Inc. and Alphabet Access, *Petitions for Rulemaking Regarding the Citizens Broadband Radio Service*, GN Docket No. 12-354, 26 (July 24, 2017), https://goo.gl/GPXRKp (discounting the promise of secondary markets in light of "incumbent carriers' buy-and-hold behavior in other bands"); Microsoft Comments at 3.

alternative was not really as valuable as another use. The Commission should not assume that licensees would leave money on the table by declining an offer that they value more than they value holding their existing license. Given this, the incumbent would likely outbid the new entrant in a triennial auction, so the uncertainty and other costs to investment would likely not even result in beneficial side effects.

These reasons also explain why strict buildout requirements are not necessary to ensure efficient use of spectrum. Opportunistic GAA use throughout the 3.5 GHz band means that spectrum can be utilized regardless of whether a PAL licensee actively deploys service in the whole license area. The Commission is required to include performance requirements with its spectrum licenses,[31] but requiring PAL licensees to maintain an active registration in the SAS and threatening them with penalties for interfering with incumbent users should be adequate to comply with the text of the Communications Act.

Even if buildout requirements did exist and stripped licensees of their PALs for failing to adequately deploy service, the future outcomes will not improve the situation for the same reasons present in the license size and length discussions: If someone else could have used the spectrum more productively, they would have bought it in the secondary market. The fact that such offers failed to materialize, or at least were not accepted, demonstrates that the current licensee is willing to pay more than anyone else for the

[31] *See* 47 U.S.C. § 309(j)(4)(B) ("In prescribing regulations [for spectrum auctions] the Commission shall—….include performance requirements, such as appropriate deadlines and penalties for performance failures, to ensure prompt delivery of service to rural areas, to prevent stockpiling or warehousing of spectrum by licensees or permittees, and to promote investment in and rapid deployment of new technologies and services").

license, so that licensee would simply win the auction when its "unused" spectrum goes back on the block.

The secondary market essentially functions as a continuous auction in which anyone who values a PAL more than its current user can outbid her by making a voluntary deal on the secondary market. Indeed, Professor Paul Milgrom proposes slight modifications to the triennial auctions so that they "create something resembling an active secondary market for licenses[.]"[32] The Commission, however, need not settle for "something resembling" a secondary market; it can have the real thing.[33]

IV. Eliminate The N-1 Rule & PAL Aggregation Limit

The Commission should eliminate the N-1 rule, which limited the number of PALs auctioned to one less than the number of bidders in a license area, with no PALs being auctioned if there is only one bidder.[34] As licensed spectrum, the value of PALs derives largely from their interference protection. The fact that there may be only one or a few operators who desire this protection for their services does not mean that such protection is not valuable. There may be many GAA users in a given license area, but only one or two willing to pay for interference protection. There is no economic reason to limit the number of PALs those operators can acquire at market rates, even if those market rates for PALs

[32] Letter from Paul Milgrom, Auctionomics, to Ms. Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-354, 6 (Aug. 7, 2017), https://goo.gl/ChFavT

[33] *See also* Verizon Comments at 6 ("Rather than attempt to simulate the effects of a well-functioning secondary market with a new and untried economic instrument, Verizon encourages the Commission to use more established mechanisms that can take advantage of the opportunities offered by the secondary market itself.").

[34] NPRM ¶ 42.

are quite low in some areas. That demand, and therefore price, varies in different contexts is an aspect of markets actually functioning in the real world, not a reason to restrict their functioning.

In the 2016 Second Report and Order, the Commission made an exception to this N-1 rule for "Rural Areas that may exhibit lower demand than other areas."[35] This exception indicates that the Commission both has the statutory authority to allocate a number of PALs greater than or equal to the number of bidders and that it recognizes the benefits of licensed spectrum even in locations with relatively low demand. These benefits are not dependent on whether the spectrum is located in a rural or more urban area; low demand is low demand no matter where it occurs. The same logic that led the Commission to make an exception for rural areas should lead it to not restrict the number of PALs in any area regardless of the number of bidders.

While restricting the number of available PALs could generate higher auction returns, which could be used for deficit reduction and the like, raising more money for the treasury is not a cognizable interest for the FCC under the Communications Act.[36] Additionally, eliminating the current spectrum aggregation limit of 40 MHz—or four of the seven 10 MHz PALs available in each market—would allow for substantial rivalry and competition during PAL auctions even in markets with few bidders.[37] In such a scenario, the low number of bidders would not necessarily mean a lack of competitive bidding, nor would it mean that the spectrum will be used inefficiently or unproductively. The

[35] 2015 CBRS Order, *supra* note 11, ¶ 50.

[36] 47 U.S.C. § 309(j)(7)(B).

[37] NPRM ¶ 27.

Commission should simply sell as many PALs as possible, to however many bidders are willing to purchase them.

V. Weigh the Costs and Benefits of Specific-Channel Bidding

Given the increased throughput and other technical benefits associated with wide spectrum channels, licensees that hold multiple PALs in a single area should be allowed to operate on contiguous frequencies when possible. As Microsoft points out,[38] the existing rules already call for the SAS to assign channels contiguously both for multiple channels held by the same licensee in a single PAL area,[39] and for channels held by the same licensee between contiguous license areas.[40] However, some commenters still argue that the Commission should adopt specific-channel bidding.[41]

Specific-channel bidding could provide PAL bidders with greater long-term certainty, thereby increasing investment, but it is unclear whether that added benefit (greater investment in some PALs, but potentially less investment in others) would outweigh the added costs of running a second auction. Specific-channel bidding could also create potential conflicts with regard to how licensees who have paid for a particular channel will interact with incumbent federal users.[42] This could potentially lead to an interoperability challenge similar to what happened with the lower 700 MHz band.[43] The

[38] Microsoft Comments at 8–9.

[39] 47 C.F.R. §§ 96.25(b)(2)(i), 96.59(b).

[40] 47 C.F.R. § 96.59(b).

[41] *See, e.g.*, AT&T Comments at 11–12.

[42] *See, e.g.*, OTI/PK Comments at 35.

[43] *See* Report and Order and Order of Proposed Modification, *Promoting Interoperability in the 700 MHz Commercial Spectrum*, WT Docket No. 12-69 (Oct. 29, 2013), https://goo.gl/AQPW2y.

benefits from specific-channel bidding may outweigh all of these costs, however, particularly if regulations are in place to preempt any interference or interoperability challenges like those just described, but it remains unclear. The question may warrant further consideration. While CBRS in the 3.5 GHz band has already been more than five years in the making, it is still more important to get the licensing framework and auction design done right than it is to get it done soon.

VI. Conclusion

Once again, we thank the Commission for launching this proceeding and seeking input on potential changes to the PAL framework and auction design that may promote investment in the 3.5 GHz band. We look forward to engaging further with the Commission and other commenters on these issues in the future.

Respectfully submitted,

/s/

Tom Struble
Technology Policy Manager

Joe Kane
Technology Policy Associate

January 29, 2018

Free markets. Real solutions.

R STREET POLICY STUDY NO. 150
September 2018

THE FCC'S 3.7–4.2 GHZ SPECTRUM BAND PROCEEDING: KEY FACTS AND ANALYSIS

Joe Kane

CONTENTS

INTRODUCTION

The Federal Communications Commission is considering proposals to expand flexible use of the 3.7–4.2 GHz spectrum band,[1] initiating debate about how this band should be used. Accordingly, the present study seeks to explain why the band is important, discuss why its allocation has become a matter of debate and evaluate proposals for its better allocation.

Briefly, the 3.7–4.2 GHz, a subset of the "C" band, is an excellent range of spectrum for a variety of communications services, such as cell phones or fixed-wireless broadband Internet access. Currently, however, it cannot be used for those services because it is mostly allocated to satellite operations, such as carrying television content. Despite the fact that not every frequency is being received in every area all the time, the band is allocated to satellite operators in such a way as it cannot be subdivided. More extensive use of the band should be possible, but allowing others to use it could result in harmful interference with existing satellite operators. To solve such problems of competing interests, various proposals have been suggested to allow for sharing or reallocation of the band.

As explained in a prior study on spectrum policy, economic analysis is especially effective for understanding spectrum allocation because spectrum rights behave similarly to property rights.[2] Accordingly, this paper applies an economic framework to proposals for sharing of the C-band to identify the benefits and drawbacks of each.

BACKGROUND

The portion of the spectrum in question is the 3.7–4.2 GHz band, which is attractive for a variety of uses and for a number of reasons. First, at 500 MHz wide, it is one of the largest contiguous blocks of spectrum in the country. Contiguous frequencies are beneficial because they allow for the operation of bandwidth-intensive services that are increasingly prevalent in the wireless economy. Second, the frequency range is well suited to modern communications uses. Lower frequencies were traditionally considered "beachfront" in the past because they could travel farther and better penetrate walls, but higher-frequency spectrum is necessary for future dense networks that will send larger amounts of data over shorter distances. 3.7-4.2 GHz is mid-band spectrum

1. "In the Matter of Expanding Flexible Use of the 3.7 to 4.2 GHz Band," Federal Communications Commission, GN Docket No. 18-122, July 12, 2018. https://ecfsapi.fcc.gov/file/07131575002139/FCC-18-91A1.pdf.

2. Joe Kane, "The Role of Markets in Spectrum Policy," *R Street Policy Study* No. 146, June 2018. https://2o9ub0417chl2lg6m43em6psi2i-wpengine.netdna-ssl.com/wp-content/uploads/2018/06/Final-No.-146-for-posting.pdf.

and has some properties of both high and low frequencies. As such, it is attractive to companies like mobile carriers and fixed-wireless broadband providers who would like to have wide channels of mid-band spectrum to provide consumers with fast, reliable service and to upgrade to 5G networks.

Current Allocation

In order to get access to the spectrum, potential new users must deal with incumbents who are already using it. The current users of the 3.7–4.2 GHz band are mostly satellite downlink providers, that is, they send content—generally TV and radio signals—from space to earth. These signals arrive at satellites from places such as a distant studio or a live sporting event. The content is then received back on Earth by cable television "head-ends" or central locations where it is gathered before being sent out to customers.[3]

Changes in the wireless ecosystem, however, make it likely that this spectrum is not currently allocated productively and at least some portion of it would be better used for increased fixed-wireless broadband or mobile service. This is because traditional modes of television viewership are being replaced with over-the-top distribution channels or consumers are switching away from traditional TV altogether. Either way, that video market is converging to IP-based distribution is increasingly the reality in the video market and this likely impacts the optimal allocation of spectrum rights.

Normally, markets for flexible rights in this band could remedy any misallocation relatively easily. For example, businesses that want to use the band for something new could approach the current users and offer to buy access. Such deals would be beneficial to both parties and would likely increase the productivity of the frequencies in question: If the incumbent accepts the offer, this would indicate that the new user expects to make greater profit than the old user. This entails offering consumers services they prefer at lower prices.

However, this band is currently managed in a manner that makes reallocation to efficient uses particularly difficult. Ranges of frequencies are not assigned to individual licensees with only one party holding the right to operate in each one. Rather, the band in governed by a "full-band, full-arc" policy, which means that satellites have the right to transmit over the entire 500 MHz of the band and earth stations can point their dishes at any satellite along the geostationary arc.[4] Thus, at any point, there are many signals from many satellites transmitting over the entire band all over the country.

The result of this arrangement is an "anticommons tragedy," which is defined as an inefficient outcome that results because control over a resource is fragmented or spread out over too many people. As a result, negotiations and mutually beneficial deals cannot be reached because the transaction costs are too high to make them worthwhile.[5] In this case, efficient use of the band is hampered by the fact that property rights are numerous but not clearly delineated. As a result, no entity is able to easily trade away its rights to someone else who wants to use them differently, even if both parties would benefit. For example, if a mobile carrier wanted to purchase the right to transmit on a frequency in this band, it would have to negotiate with every satellite provider, not just one. This causes significant frictions in the bargaining process that preclude the deal from being completed. Solving this problem presents complex economic and technical issues that require serious discussion.

Risks of Interference

The main challenge in repurposing an already-used band is harmful interference with incumbent services. This problem is similar to multiple people having a conversation in the same space:

> If someone is speaking too loudly, information will not reach its intended audience. Likewise, radio signals can overpower each other resulting in service interruptions. In this band, that may look like television or radio station signals dropping out as they encounter interference when they get to a receiver on Earth.[6]

Interference concerns are especially acute in this band because the satellites are in geostationary orbit. This means they do not move relative to the surface of the earth. This

3. "In the Matter of Expanding Flexible Use of the 3.7 to 4.2 GHz Band," p. 6. https://ecfsapi.fcc.gov/file/07131575002139/FCC-18-91A1.pdf. This band is not used for direct-to-consumer satellite television. It sends content to a distributor, which then sends it to the end consumer via cable, fiber or terrestrial over-the-air signals.

4. As viewed from the ground on earth, the orbit of geostationary satellites forms an arc across the sky and geostationary satellites are located every two degrees along this arc. Satellite dishes are oriented at a satellite by a specified elevation, pitch around a horizontal axis and azimuth or the direction they point around a vertical axis. The full-arc policy allows satellite users to utilize any elevation and azimuth rather than single, pre-registered ones. What frequencies are actually in use is managed from the perspective of earth stations, which focus their antenna such that they receive a particular satellite's transmission and then tune-in to the particular channels in that transmission that carry the earth-station operator's content. So, while the satellite is likely sending content on all 500 MHz over the entire country, any given earth station does not "listen to" all satellites at once.

5. Michael A. Heller, "The Tragedy of the Anticommons: Property in the Transition from Marx to Markets," University of Michigan Law School Scholarship Repository (1998). https://repository.law.umich.edu/cgi/viewcontent.cgi?article=1608&context=articles.

6. NCTA – The Internet & Television Association, "Comments In the Matter of Expanding Flexible Use of the 3.7–4.2 GHz Band," GN Docket No. 18-122, May 31, 2018, p. 2 and 11. https://ecfsapi.fcc.gov/file/105318181229999/053118%2018-122%20Comments.pdf.

is advantageous for consistent contact between space and Earth, but it also means that, as a matter of physics, the satellites must be about 22,200 miles away. As such, the signals are relatively faint by the time they get to the ground and they are consequently very sensitive to nearby terrestrial signals of much greater power.[7]

While mitigating harmful interference is an important challenge in this case, minimizing interference at all costs is not and should not be the final goal.[8] No party actually wants to incur the costs that would be necessary to be completely interference free all the time. Instead, the level of interference should be balanced with productivity by means of market transactions. For example, satellite providers may be willing to tolerate more interference if mobile carriers pay them enough to cover or mitigate the costs that result. If this band is actually more valuable for mobile or fixed-wireless broadband than it is for its current use, then new users will eventually buy enough access to provide those services. If the incumbent users turn down such offers, this would indicate that they value it more highly than the newcomers do. In this case, creating the conditions for such a market should be the primary goal of the FCC.

POTENTIAL NEW USES

There are two main uses for the 3.7–4.2 GHz band that would likely be more valuable, on the margin, than the status quo:[9] fixed wireless and mobile. This section describes those uses and the particular problems they face with respect to interference with existing satellite operators.

Fixed-Wireless Broadband

Fixed-wireless service involves providing broadband via towers that send data between stationary points. The word "fixed" refers to the fact that the transmitters and receivers are usually stationary, akin to a television or radio antenna affixed to a roof.

Fixed service already has a limited presence in this band and the challenges presented by its coexistence with satellite users are not extreme. Since both fixed-wireless transceivers and satellite earth stations are generally in static, known positions, fixed services can usually aim their signals to keep out of the way of signals coming from space.

The word "generally," however, conceals a lot. The situation is complicated by the fact that not all earth stations are registered and thus their locations are not always known. A proliferation of fixed services in this band has the potential to interfere with earth stations simply because the fixed providers are unaware of them.

Incumbent satellite users also stress that not all earth stations are immobile.[10] Some move from place to place between, for example, sports stadia.[11] These characteristics further emphasize the need for timely registration and also provide a potential use-case for a database that can be updated with near-real-time location data to allow for more intensive use of frequencies in all geographic areas without interfering with incumbent users. This system would be similar to those proposed for the 3.5 GHz band[12] and TV white spaces in the 600 MHz band.[13]

Mobile Broadband

A more difficult challenge is posed by mobile services in the 3.7–4.2 GHz band. As the name implies, mobile devices move frequently, so the path between them and a radio antenna cannot help but cross through—and likely interfere with—a space-to-earth satellite transmission. For this reason, using the band for mobile services will likely require clearing satellite users out of at least a portion of it so that it can then be dedicated to mobile or similar services.

Here, however, the anticommons tragedy once again applies. Coordinating such a clearance with multiple rights owners presents high transaction costs and the risk of holdups.[14] Even if almost all satellite users can agree on a price to clear a portion of spectrum, one or a handful can hold up the deal by demanding exorbitant prices for themselves. Accordingly, any solution designed to facilitate mobile services in the 3.7–4.2 GHz band must confront this possibility.

7. Satellite Industry Association, "Comments In the Matter of Expanding Flexible Use of the 3.7–4.2 GHz Band," GN Docket No. 17-183, Oct. 2, 2017, p. 36. https://ecfsapi.fcc.gov/file/10022703505533/SIA%20Comments%20on%20Mid-Band%20NOI%202%20Oct%202017.pdf.

8. Ronald H. Coase, "The Federal Communications Commission," *Journal of Law and Economics* 2 (October 1959), p. 27. https://www.jstor.org/stable/724927?seq=1#page_scan_tab_contents.

9. I.e. the next units allocated to fixed wireless or mobile are more valuable than the first units of satellite spectrum that would be cleared.

10. Satellite Industry Association, p. 31. http://www.intelsat.com/wp-content/uploads/2017/10/SIA-Comments-on-Mid-Band-NOI-2-Oct-2017.pdf.

11. Since this band is used for downlink, however, the main, outgoing video feed from a sporting event does not use it. That feed is being sent up to space from the venue using a different portion of the C-band. The 3.7–4.2 GHz band would be used, for example, by an earth station at the site of the event to monitor the feed that was already sent up and to make sure there are no problems with it. But since this function could be performed by other means (e.g. at a central studio elsewhere), one may question whether such rights should be allowed to persist without payment if they preclude other uses of the band.

12. Federal Communications Commission, "Notice of Proposed Rulemaking in the Matter of Promoting Investment in the 3550-3700 MHz Band," GN Docket No. 17-258, Oct. 24, 2017, p. 3. https://ecfsapi.fcc.gov/file/1024196454861/FCC-17-134A1.pdf.

13. Federal Communications Commission, "White Space Database Administration," 2018. https://www.fcc.gov/general/white-space-database-administration.

14. Peter Cramton and Evan Kwerel, "Efficient Relocation of Spectrum Incumbents," *The Journal of Law and Economics* 41:52, (October 1998), pp. 649 and 655. https://www.jstor.org/stable/10.1086/467407?seq=1#page_scan_tab_contents.

EVALUATION OF PROPOSALS FOR REALLOCATION

For the aforementioned reasons, balancing the interests of satellite providers and potential new users requires creative solutions. In light of this, the present section reviews some of those proposals from an economic perspective.

Requiring Registration of Satellite Earth Stations

Knowing the location of operational earth stations is a prerequisite for any revitalization proposal in the 3.7–4.2 GHz band. Registration of receiving earth stations is not currently mandatory under FCC rules, and to do so involves a nine-page form that smaller users may have difficulty understanding and completing.[15] Therefore, the FCC should streamline the registration process to require only the bare minimum of information necessary to identify the location of active earth stations and to adequately protect them. Alternatively, the agency could solicit the help of satellite providers themselves to identify the positions of earth stations. This approach has the advantage of dealing with fewer parties who are likely more sophisticated than the average, unregistered earth-station operator. Either way, registration should be mandatory and after a sufficient grace period, unregistered stations should not receive interference protection.

Creating a Satellite Industry Negotiating Consortium

A classic analysis of tradable rights indicates that when there are significant transaction costs, the initial allocation is important to the ultimate outcome of bargaining.[16] And, in this case, transaction costs are quite significant. But, since scrapping the current allocation framework by regulatory fiat is likely untenable for political and legal reasons, the FCC should aim to reduce transaction costs for rights to operate in the 3.7–4.2 GHz band. This would allow bargaining to clear a portion for mobile service.

A potential solution to the hold-up and anticommons problems has been proposed by members of the satellite industry who suggest that the FCC should empower a consortium of current users to act on behalf of all of them and negotiate deals to clear spectrum for mobile use.[17] This proposal would replace the disparate owners with a single body that is easily identifiable to potential buyers or lessees, thus reducing transaction costs and, hopefully, enabling mutually beneficial trades.

The consortium proposal does have potential shortcomings, however. As a government-granted monopoly over the band, it would have a tendency to bring to market a smaller portion of the band at a higher price than that which would prevail in a competitive market. Moving directly to a competitive market in this band is likely not a viable option at this point, however. Such a move would trigger delays from technical and legal problems that would likely bog down the transition for so long that they could outweigh the inefficiencies of alternative proposals. All stakeholders should therefore avoid rejecting a viable alternative simply because it is imperfect. There are no perfect solutions, only tradeoffs.

The consortium proposal estimates that it could clear 100 MHz for new users with an additional 50 MHz "guard band" necessary to adequately separate mobile users from incumbents to avoid interference.[18] Many interested parties have suggested that this number is too low and argue that up to 400 MHz could be cleared.[19] This issue would be solved by markets in a competitive setting: The seller would supply all the spectrum for which buyers were willing to pay a mutually agreeable price. But since the monopoly consortium will tend to undersupply cleared spectrum, it may be advantageous for the FCC to grant the consortium control over clearing the band, but require it to clear only a minimum range of frequencies—perhaps 300 MHz.

Other Factors That Determine Optimal Clearing

Innovations in incumbent services are another important consideration in determining the optimal amount of spectrum to clear. New compression technologies are gradually being implemented in this band.[20] Such development means that the same content can be transmitted with less spectrum, leaving more available to repurpose for mobile. But compression also improves the quality of current uses of the band. In turn, since they can now receive higher resolution content more cheaply, this could increase the quantity of those services, like video, that downstream users demand. In short, compression technologies have an ambiguous effect on the future use of this band, so market transactions are necessary to reveal the most productive alternatives.

15. Federal Communications Commission, "Sample Application for License of New Earth Station (C-Band Transmit/Receive using U.S. licensed satellites)." https://transition.fcc.gov/ib/sd/se/s312tr.pdf.

16. See Ronald H. Coase, "The Problem of Social Cost," *The Journal of Law and Economics* 3 (October 1960). https://www.law.uchicago.edu/files/file/coase-problem.pdf.

17. Intelsat License LLC and Intel Corp., "Joint Comments In the Matter of Expanding Flexible Use in the Mid-Band Spectrum Between 3.7 and 24 GHz," GN Docket No. 17-183, Oct. 2, 2017, pp. 6-9. https://ecfsapi.fcc.gov/file/1002726526846/Joint%20Comments%20of%20Intelsat%20License%20LLC%20and%20Intel%20Corporation.pdf.

18. Caleb Henry, "SES, Intelsat plead for an extension for C-band dish registration," *SpaceNews*, June 19, 2018. https://spacenews.com/ses-intelsat-plead-for-an-extension-for-c-band-dish-registration.

19. "Statement of Commissioner Michael O' Rielly Re: Expanding Flexible Use of the 3.7 to 4.2 GHz Band," GN Docket No. 18-122, July 13, 2018, p. 2. https://ecfsapi.fcc.gov/file/07131575002139/FCC-18-91A3.pdf; Verizon "Ex Parte Re: Expanding Flexible Use of the 3.7 to 4.2 GHz Band," May 16, 2018, p. 1. https://ecfsapi.fcc.gov/file/10516106415285/2018%2005%2016%20Verizon%205G%20ex%20parte.pdf.

20. "Is There a Better Way to Maximize the Throughput of my Satellite Capacity?", Intelsat, 2018. http://www.intelsat.com/tools-resources/library/satellite-101/digital-compression.

There is also not necessarily a linear progression to the cost of clearing more frequencies. Satellite companies are limited by the characteristics of their hardware and beyond a certain point, they may have to, for example, launch new satellites. This process would result in a sharp jump in the cost of clearing spectrum, and even if that cost is willingly paid by carriers, it could significantly increase the time that clearing takes.

As a practical matter, therefore, there may be good reason to think that a smaller portion of the band will be cleared first with more coming to market as technology and network hardware evolve. In any case, both the FCC and interested private parties should seek to foster an ongoing market in this band rather than treating the current proceeding as a one-time affair.

Reforming the Full-band, Full-arc Policy

It is likely that the current full-band, full-arc arrangement is not conducive to maximally productive use in this band. Since satellite dishes are often only tuning in to a limited range of frequencies from one satellite at a time, the remaining frequencies and positions along the geostationary arc could be put to other uses without meaningfully disrupting current operations.

Incumbents claim that they need these expansive rights in order to have greater flexibility in their provision of service.[21] For example, they may wish to point their receiver at a different satellite or tune in to different frequencies in the future. However, these are rights that are not frequently used by the parties.[22] Most earth stations will persistently receive from only one satellite and use a consistent fraction of the 500 MHz in the band. It would, therefore, be advantageous to make these current uses explicit rather than to pretend that the entire width of the band is being used at every earth station that could point at a different satellite at any moment. Being clear about how this band is actually being used will allow for the utilization of unused frequencies in particular areas.

How to move away from the inefficiencies of full-band, full-arc coordination is, however, a delicate matter. It would be most efficient for the FCC to simply codify the existing frequency and directional uses of the band and open unused portions to the rest of the market. This route, however, may present political and legal obstacles that make it untenable. Incumbent users are not eager to have their expansive rights curtailed and they would likely resist such a change, perhaps as a regulatory taking. Whether or not such a case would have merit, the delays presented by prolonged litigation may end up being more costly to timely broadband deployment than attempting to reform the full-band, full-arc policy by an alternative means.

Such an alternative could take the form of simply increasing the flexibility of incumbents to sell unused capacity in the secondary market. If it is true that full-band, full-arc results in satellite incumbents maintaining rights to spectrum that goes persistently unused, then the incumbents ought to be willing to sell or lease that capacity. Satellite users could keep all their rights, but they would face opportunity costs for doing so. For example, the choice to maintain access to the full band and the full arc would mean turning down the revenue from offers to lease unused frequencies. If they do turn down such offers, that fact would demonstrate that maintaining access to the flexibility afforded by full-band, full-arc is more valuable than the alternative use.

This reform would accomplish a similar result as revoking the full-band, full-arc rights but without the delays and costs associated with litigation. This route would, of course, present its own delays and transaction costs associated with setting up and operating the secondary market. Evaluating the tradeoffs of each alternative will take serious study by the FCC.

Holding an Incentive Auction

Another way of repurposing the 3.7–4.2 GHz band would be to hold an incentive auction. This process was used in 2016 to clear parts of the 600 MHz TV band.[23] In an incentive auction, the FCC solicits bids from incumbents on how much money it would take for them to willingly clear a certain amount of spectrum. A second auction then solicits bids for the potentially cleared spectrum until a mutually agreeable price and quantity is reached. It is not clear, however, that this process would be superior to merely enhancing the flexibility of existing licenses and allowing private parties, including the proposed consortium, to make deals on their own.

21. American Cable Association, National Association of Broadcasters, National Public Radio Inc., NCTA - The Internet & Television Association, "Ex Parte Re: Expanding Flexible Use of the 3.7 to 4.2 GHz Band," GN Docket No. 18-122, June 15, 2018, pp. 4-5. https://ecfsapi.fcc.gov/file/10615344709012/061518%2017-183%2018-122%20ACA%20NAB%20NCTA%20NPR%20ex%20parte.pdf; Satellite Industry Association, "Comments In the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7-24 GHz," GN Docket No. 17-183, Oct. 2, 2017, pp. 25-31. https://ecfsapi.fcc.gov/file/10022703505533/SIA%20Comments%20on%20Mid-Band%20NOI%202%20Oct%202017.pdf.

22. Google LLC, "Comments in the Matter of Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz," GN Docket No. 18-122, May 31, 2018, pp. 7-8. https://ecfsapi.fcc.gov/file/105312950814240/2018-05-31%20Google%20Comments%20(GN%2018-122).pdf; Broadband Access Coalition, "Comments in the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz," GN Docket No. 17-183, Oct. 2, 2017, pp. 6-7. https://ecfsapi.fcc.gov/file/1002768614835/Mid-Band%20NOI%20--%20BAC%20Comments%20--%20FINAL2%20with%20Attachment%20--%2010.02.17.pdf.

23. Federal Communications Commission, "Broadcast Incentive Auction and Post-Auction Transition," May 9, 2017. https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions.

The choice between these approaches ought to be merely a matter of comparative transaction costs: the market mechanism that can maximize the ease of voluntary transactions will result in the most efficient outcome. Imposing the FCC as a middleman may delay the process more than a situation in which profit-driven parties deal with each other directly.

Auctioning Overlay Licenses

Another alternative is for the FCC to auction overlay licenses. These essentially give their buyers the right to use frequencies in a way that does not interfere with incumbents. The practical result would be that the overlay licensee negotiates with the incumbent to clear some or all of the licensed frequencies.

The full-band, full-arc characteristics of this band, however, make this option no better than a market for the whole band through something like a consortium model. Because current users can access the entire band, the overlay licensee would need to negotiate with all of them to be sure the desired frequency is actually cleared. The anticommons tragedy will befall such attempts to bargain for individual sections of the band. A solution to this problem, for example, through the consortium model, must be implemented before more efficient deals can be negotiated.

Effect on Downstream Services

Some parties have expressed concern about potential disruptions to downstream services that could result from repurposing portions of the band but those concerns can be incorporated into the economic models discussed above.[24] The current satellite incumbents are a content delivery service and they should be able to sell off some of their assets as dictated by market conditions. Certainly their consumers may prefer to maintain access to satellite service in this band, but the proper result in such a case would be for them to pay more for the delivery service, thereby changing the market conditions and signaling the relative value of satellite service compared to alternative uses.

Additionally, reconsideration of the 3.7–4.2 GHz band's allocation is an opportunity for downstream companies to weigh alternatives, such as fiber or other wireless service on other frequencies. These may be more expensive but again, the fact that certain factors of production become more expensive to certain companies is not, in itself, grounds for government intervention.

The opportunity for reconsidering services is important because there are consumers on both sides of the coin here. It is true that losing some satellite transmission capacity could increase prices or disrupt service for downstream consumers of TV or radio. But the new uses for mobile or fixed-wireless broadband will provide other, or perhaps the same, consumers with better broadband service. Given trends in consumption of media and communications services, it is likely that the overall effect will be a net positive. Changes in price driven by changes in supply and demand are signs of a healthy market, not problems in need of regulatory solutions.

CONCLUSION

We all want our TVs and radios to work, but we also want faster, more reliable Internet that works at home and on the move. The 3.7–4.2 GHz band is an ideal candidate to provide all these services but tradeoffs are omnipresent. The question before the FCC, then, is how to balance the changing demands for satellite downlink and wireless broadband. While past policy frameworks have complicated rights in this band, the agency should seek to rearrange rights in a way that minimizes transaction costs and allows markets to direct spectrum to productive uses.

ABOUT THE AUTHOR

Joe Kane is a technology policy fellow with the R Street Institute, where he works primarily on Internet, telecommunications, antitrust and intellectual property issues, arguing for regulatory frameworks that promote long-term innovation. He previously was a graduate research fellow at the Mercatus Center, where he worked with the tech policy team on issues like telecommunications, intellectual property and space policy. Joe has a bachelor's degree in political science from Grove City College and a master's degree in economics from George Mason University.

24. NCTA – The Internet & Television Association, pp. 2 and 11. https://ecfsapi.fcc.gov/file/10531818122999/053118%2018-122%20Comments.pdf; American Cable Association, "Comments in the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz. GN Docket No. 17-183, pp. 4-16. https://ecfsapi.fcc.gov/file/10032114823976/ACA%20Mid-Band%20NOI%20Comments%20171002.pdf.

1212 New York Ave., N.W.
Suite 900
Washington, DC 20005
202.525.5717

Free Markets. Real Solutions.
www.rstreet.org

In the Matter of	)	
	)	WT Docket No. 18-120
Transforming the 2.5 GHz Band	)	

Comments of R Street Institute

Respectfully submitted,

/s/

Joe Kane
Tech Policy Fellow

Tom Struble
Tech Policy Manager

Jeff Westling
Tech Policy Associate

July 30, 2018

Table of Contents

I. Introduction & Summary

In this proceeding, the Federal Communications Commission ("FCC" or "Commission") seeks to transform the 2.5 GHz band (2496–2690 MHz), which has been assigned to Educational Broadband Service ("EBS") and subject to strict regulatory constraints for decades.[1] Today, the 2.5 GHz band is "the single largest band of contiguous spectrum below 3 gigahertz and has been identified as prime spectrum for next generational mobile operations," and yet it "currently lie[s] fallow across approximately one-half of the United States, primarily in rural areas."[2] It therefore presents a tremendous opportunity for the FCC to pursue its statutory mandate to "generally encourage the larger and more effective use of radio in the public interest[.]"[3]

To encourage more effective use of the 2.5 GHz band, the Commission should take several steps. First, it should rationalize the geographic areas for 2.5 GHz licenses by using standard geographic service areas ("GSAs") defined along census tract boundaries. Second, the Commission should maximize flexibility in the 2.5 GHz band by expanding license eligibility, removing educational-use requirements, and eliminating arbitrary term lengths that stifle long-term investment in the band. Third, it should move directly to auction EBS spectrum without any priority access windows. Fourth, the Commission should avoid placing any strict performance requirements on EBS licensees. Finally, the Commission should give due consideration to alternative approaches to managing EBS spectrum,

[1] Transforming the 2.5 GHz Band, *Notice of Proposed Rulemaking*, WT Docket No. 18-120, ¶1 (May 10, 2018) [hereinafter "NPRM"], https://goo.gl/qPmkzr.

[2] *Id.*

[3] 47 U.S.C. § 303(g).

including incentive and overlay auctions, so long as it takes a realistic view of the transaction costs involved.

II. License Areas Should Aim to Maximize Productivity

The Commission is right to rationalize licenses in the 2.5 GHz band by utilizing regular GSAs.[4] The goal of this rationalization is not to favor incumbents in the band, but to optimize the areas available for auction. Utilizing GSAs, defined along census tract boundaries (though not necessarily limited to individual census tracts), furthers that goal by reducing transaction costs. Specifically, because tract borders are defined by on-the-ground conditionals rather than arbitrary geometric shapes, these rationalized boundaries would reduce transaction costs by making it easier for bidders to decide which areas to cover and upon which licenses to bid.

In deciding how to rationalize current GSAs, the Commission should recall the history of the band, which has shown that EBS licensees have little expertise in using this spectrum. The fact that so much of it has lain fallow for so long suggests that incumbents are likely not the most productive users.[5] Over time, the initial giveaway of EBS spectrum has proven to be a mistake, and the Commission should not amplify that mistake by giving away more valuable spectrum to educational users.

Moreover, EBS incumbents have little expertise transacting in secondary markets, which can drive productive spectrum use on an ongoing basis.[6] Indeed, the fact that EBS

[4] NPRM ¶ 11.

[5] *Id.* ¶ 1.

[6] Joe Kane, *The Role of Markets in Spectrum Policy*, R Street Institute (June 2018), p. 4. https://goo.gl/5BfuQr.

licensees are non-profits or government users means that they lack the same economic incentives of private industry to pursue profitable secondary-market transactions. The Commission should, therefore, only expand an EBS incumbent's license into a GSA if the existing license covers a majority of the relevant census tract.[7] Otherwise, the Commission should make that census tract available for auction, as doing so will ultimately maximize productive use of the 2.5 GHz band.[8]

III. License Flexibility Should be Maximized

One of the main failures of the EBS giveaway is the lack of flexibility in the licenses.[9] Spectrum capacity would not have been wasted to the same extent if licensees were able to repurpose or lease their spectrum for more productive uses. While the Commission has increased the flexibility of EBS licenses over time,[10] there is still room for more flexibility, which is essential to ensure productive use of the 2.5 GHz band in the future.[11]

To maximize EBS license flexibility, the Commission should first allow all licensees to lease or transfer their rights to any other users by removing the restrictions on what entities may hold a license in this band. Second, the Commission should remove the current educational-use requirements for the band. Designating particular bands for particular uses is antithetical to flexibility, and it hamstrings the ability of markets to direct spectrum to its most productive use. The Commission simply cannot expect to know the most productive

[7] *Id*. ¶ 14.

[8] *Id.*

[9] *See* Kane *supra note 6*; NPRM ¶ 1.

[10] NPRM ¶ 4.

[11] *Id*. ¶¶ 5–7.

use of every frequency band at all times. Top-down directives, therefore, would only repeat the mistakes that resulted in this band's disuse in the first place.

While the Commission's proposal acknowledges this fact, it also asks "who is better positioned to determine the highest and best use of 2.5 GHz spectrum, the Commission or licensees?"[12] The answer to this question is: "neither." The most productive use of spectrum is not known to any party a priori. It depends upon the subjective valuations of that spectrum in rivalrous alternative uses, and that information can only be discovered through the market process. Given this, the licensees will know before the Commission whether the spectrum is being used productively because they are closer to the markets in which the discovery process takes place. The FCC should, therefore, rely on the market process, rather than attempting to plan spectrum use from the top down.

While educational uses of spectrum may be worthy goals of social policy, they must be compared with alternatives that may yield even greater benefits to consumers. This would be true even if the 2.5 GHz band were being extensively used for educational purposes. That fact alone would not demonstrate that the spectrum could not be put to an even more productive use. That the 2.5 GHz band has been so underused for so long only emphasizes the necessity of markets in determining the best use of spectrum.

The Commission should also eliminate the limitation on the term length of leased licenses.[13] The secondary market for EBS licenses is skewed by these restrictions as lessees who may be able to put the spectrum to a productive, long-term use face uncertainty about

[12] *Id.* ¶ 22.

[13] *Id.* ¶ 23.

whether their plans can be realized. Indeed, insofar as it is authorized by the statute, the Commission should consider making primary EBS licenses perpetual.[14] The same distortions that result from limited terms in the secondary market also affect the primary market in ways that would be intolerable for other scarce resources. For example, it is easy to see that a regime in which one's land faced a renewal process—or even seizure and re-auction—every few years would reduce investment in improving the land and would make the land less productive than it could otherwise be.[15]

Likewise, for spectrum licenses, the degree to which one is willing to invest in a given band will be conditioned by how certain the licensee is of realizing future revenues, and limited terms distort those investments toward shorter term projects.[16] The United States needs long-term spectrum investment and the Commission can facilitate that by extending—and effectively making perpetual—the terms of licenses in this band.

IV. Priority Access Windows Would Reduce Productive Spectrum Use

The Commission should not create priority access windows for various interested groups in local areas. Even if the Commission is correct that local authorities have special insight into what is best for the educational needs of their communities,[17] that fact does not require giving them priority access to spectrum. The challenge, for local education as for all policy objectives, is how to optimize outcomes given the constraints imposed by other worthy uses of the same resources. Markets are the only way to learn the most productive of

[14] *See* 47 U.S.C. §§ 307(c)(1); 309(j)(4)(B).

[15] Kane, *supra* note 9, at 6.

[16] *Id*.

[17] *See* NPRM ¶ 26.

rivalrous options. Granting special privileges to certain potential users distorts the market and amounts to the Commission picking winners and losers. Such preferential treatment among spectrum users was still commonplace in 1985 when the Commission openly "expressed a 'strong preference' for local applicants in the [EBS] licensing process[,]"[18] but that type of harmful central planning should be left in the past.

The Commission explains its proposal by saying that "granting certain entities local priority filing windows is premised on the idea that such entities are uniquely qualified to hold spectrum licenses and ensures that the licenses are put to their highest and best use[.]"[19] Yet if this is true, then priority access would not be necessary to ensure that such entities get access to EBS licenses. If they truly are uniquely positioned to make the most productive use of spectrum, then they would prevail in a fair auction for such licenses.

Giving certain entities special treatment to pursue social goals detracts from economical and productive use of spectrum, and also requires a host of bureaucratic micromanagement to ensure those goals are met. Such efforts would certainly include the proposed holding periods,[20] buildout requirements,[21] checks against unjust enrichment,[22] and in-depth review of which entities have a bona fide relationship to the Commission's social objective.[23] The need for all of these expensive and restrictive measures would, however, be

[18] *Id.*

[19] *Id.* ¶ 47.

[20] *Id*.

[21] *Id.* ¶ 54.

[22] *Id.* ¶ 47.

[23] *Id.*

obviated by allowing markets to direct spectrum to its most productive use rather than a government-imposed alternative goal.

The Commission is right to resolve mutually exclusive license applications through competitive bidding, but this bidding should be an auction open to all potential users, not only a special subset.[24] The Commission rightly explains that the logic of competitive bidding is found in the fact that it directs spectrum to those users who value it most highly.[25] That process cannot work, however, if users that could potentially be the highest bidder are excluded from the auction.

Giving away spectrum to certain groups does not result in its productive use. The very reason for the current proceeding is that previous attempts to do so in this band have failed.[26] The Commission should, therefore, reverse course and rely on the market mechanism rather than doubling down on government design, and "mov[e] directly to auction for this spectrum, rather than open priority filing windows for certain entities[.]"[27]

V. Strict Performance Requirements are Unnecessary and Counterproductive

To the extent permissible, new EBS licenses should not include strict performance requirements, as they are unnecessary and have the effect of skewing investment in and use of the spectrum. The Commission has come to realize that dictating *how* a particular band is used hampers the market's ability to put spectrum to its most productive use. In the same way, dictating *whether* a band has enough use is also detrimental to the long-term productive

[24] *Id.* ¶ 45.

[25] *Id*.

[26] *Id*. ¶ 1.

[27] *Id.* ¶ 61.

use of spectrum. When a robust secondary market exists, licensees face opportunity costs if they do not use spectrum at a given time. That is, someone else who wants to put the spectrum to use might seek to buy access to it, and the fact that it remains with the original licensee indicates that the offer was (or would be) declined, as the licensee gave up the opportunity to have that money in order to keep the license. This is a real cost that will incentivize licensees not to use spectrum only when failure to use it now will lead to greater productivity later.

Again, as in the case of land, one should not assume that because a landowner is not currently using a piece of property that it should, therefore, be taken by the government. There may be many reasons why leaving a piece of land vacant for a time contributes to long-term productivity. Likewise with spectrum, the failure to use some portion of one's spectrum does not *per se* indicate a market failure in need of regulatory correction. The Commission should, therefore, focus on facilitating a robust, competitive secondary market for spectrum licenses rather than micromanaging how much of its allocated spectrum a licensee is using.

The Communications Act requires that the Commission establish performance requirements "to ensure prompt delivery of service to rural areas, to prevent stockpiling or warehousing of spectrum by licensees or permittees, and to promote investment in and rapid deployment of new technologies and services[.]"[28] However, deadlines and penalties for performance failures are merely listed in the statutory text as examples of what the Commission *could* do. How the performance requirements are designed is ultimately left to the Commission's discretion. Simple transparency regulations — for example, requiring that

[28] 47 U.S.C. 309(j)(4)(B).

licensees maintain up-to-date contact information in order to facilitate exchanges on the secondary market with prospective buyers — would arguably be enough performance requirements for any licensee, including EBS ones.

VI. The Commission Should Consider Alternative Approaches and Take a Realistic View of Transaction Costs

The Commission also raises the possibility of holding an incentive auction or overlay auction for the entire 2.5 GHz band.[29] Either of these would be superior to the Commission continuing to choose winners and losers in the EBS band, but the Commission should not overestimate the benefits of an incentive auction compared to those of an overlay auction with subsequent bilateral negotiations.

Many of the same transaction costs thought to prevail in overlay auctions are also present in incentive auctions, and Congress may have taken an asymmetric view of these costs in directing the Commission to pursue an incentive auction for the 600 MHz band.[30] Indeed, the case for holding an overlay auction is likely even stronger in the EBS band because it has fewer active incumbents and less extensive use than the TV broadcast band. However, because this was given only brief consideration, further notice and comment may be needed for the Commission to pursue such a proposal.

[29] NPRM ¶ 61.

[30] Thomas W. Hazlett, "Efficient Spectrum Reallocation With Hold-ups and Without Nirvana," *George Mason University Law and Economics Research Paper Series* 14:16 (May 21, 2014). https://goo.gl/wE1gnG.

Respectfully submitted,

/s/
Joe Kane
Tech Policy Fellow

Tom Struble
Tech Policy Manager

Jeff Westling
Tech Policy Associate

July 30, 2018