

UNLICENSED SPECTRUM: THE PROBLEM OF SUCCESS

JEFFREY WESTLING*

INTRODUCTION	481
I. BACKGROUND	483
II. GLOBALSTAR PETITION.....	487
III. POSSIBLE SOLUTIONS	492
A. <i>Allocate the 2.4 GHz Band for Wi-Fi & Bluetooth</i>	492
B. <i>Relocate Wi-Fi and Bluetooth to Another Band</i>	494
C. <i>Leave the Band As Is</i>	496
IV. THE HYBRID APPROACH: THE MOST EFFECTIVE MODEL TO HANDLE THE INFLUX OF NEW TECHNOLOGIES ON THE UNLICENSED BANDS 497	
A. <i>Enforcement Concerns</i>	498
B. <i>Effect on Innovation</i>	500
C. <i>Departure from Existing Rules</i>	501
CONCLUSION	502

INTRODUCTION

After an hour of fighting through the white-gold tower, you and your guildmates finally come to find Molag Kena standing alone atop the tower. After countless deaths, the team has her on the ropes and will finally complete this difficult challenge. Unfortunately, the game stops; you can move around but everyone else is still. The screen goes black and then reads: “you have lost connection with the server.”

For those who have played online videogames, there are few things more frustrating than disconnection. The first instinct for many is to blame the cable company or the game’s designer, but as more systems are beginning to connect to the internet through wireless

* I would like to thank all of my friends, colleagues, and professors for their help through this entire process. In particular, I would like to thank Blake Reid for his guidance and insights regarding this topic. I would also like to thank Pierre de Vries, Phil Weiser, and Dale Hatfield for all the support they have provided over the past three years.

technology like Wi-Fi, the more likely culprit is interference from a neighbor's device.¹

Wi-Fi, as well as other technologies operating over unlicensed spectrum bands, such as Bluetooth, have become vital to the nation's economy.² In 2018, industry groups estimate that the number of Wi-Fi hotspots will increase to more than ten million.³ With the advent of the Internet of Things, the need for connectivity will increase, further straining existing frequency allocations and assignments.⁴ This technology has contributed billions of dollars annually to the U.S. economy and continues to provide a vital backbone to many applications that businesses and household users alike use daily.⁵

However, unlicensed technologies operate on spectrum bands open to any operator, subject to Federal Communications Commission (FCC or "Commission") operating restrictions.⁶ This essentially means that Wi-Fi users need to expect and account for potential interference from neighbors. Although users may accept this fact, many new technologies are moving into the unlicensed bands traditionally used by Wi-Fi.⁷

Therefore, the question becomes what the FCC should do with Wi-Fi and other successful technologies that operate over unlicensed bands but also desire regulatory protection from interference caused by other operators in the unlicensed bands. In other words, how do we balance incentivizing the growth of new technologies with the need for capitalizing and deploying these new technologies? One argument is that Wi-Fi manufacturers should either purchase "Wi-Fi spectrum" from the Commission or continue to accept interference in the

1. AT&T Network Interference Program, AT&T, <https://www.att.com/esupport/article.html#!/wireless/KM1050561> (last visited Jan. 29, 2018) [<https://perma.cc/F3EY-KRA4>].

2. Gary Shapiro, *Benefits of Unlicensed Spectrum*, THE HILL (June 16, 2014, 9:00 AM), <http://thehill.com/blogs/congress-blog/technology/209214-benefits-of-unlicensed-spectrum> [<https://perma.cc/EVM4-ZEQ8>].

3. Comments of Wi-Fi Alliance, *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks; Amendments to Rules for the Ancillary Terrestrial Component of Mobile Satellite Service Systems*, IB Dkt. No. 13-213, 3 (May 5, 2014), <https://ecfsapi.fcc.gov/file/7521111435.pdf> [hereinafter Wi-Fi Alliance Comments] (citing to Wi-Fi Alliance vision paper) [<https://perma.cc/FQ3Y-NYSR>].

4. *Id.* at 4. See generally Jeffrey Voas, *Network of 'Things'*, NAT'L INST. OF STANDARDS AND TECH. (July 2016), <http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-183.pdf> [<https://perma.cc/92KC-V6EC>].

5. Wi-Fi Alliance, *supra* note 3, at 3.

6. See Radio Frequency Devices, 47 C.F.R. §§ 15.1–15.717 (2017).

7. Jon Brodtkin, *LTE Over Wi-Fi Spectrum Sets Up Industry-Wide Fight Over Interference*, ARS TECHNICA (Aug. 27, 2015, 10:45 AM), <https://arstechnica.com/information-technology/2015/08/verizon-and-t-mobile-join-forces-in-fight-for-wi-fi-airwaves/> [<https://perma.cc/CBQ8-P592>].

unlicensed bands. On the other side, it may be best for the 2.4 GHz band (or another similar band) to be set aside for the use of Wi-Fi alone, with service rules tailored to the industry to protect against outside interference. This paper will examine these options, as well as how implementation of these proposals could be designed.

Section I examines the relevant background information that guides the legal and policy justifications for regulation in the field. Section II discusses the Globalstar petition for rulemaking, as well as the subsequent Notice of Proposed Rulemaking (“NPRM”), which exemplifies this issue. This docket at the Commission focuses narrowly on the question of Globalstar using the 2.4 GHz band, but raises the more important question of whether critical unlicensed devices should receive interference protection. Finally, Sections III and IV discuss possible solutions or regulations the FCC could implement to answer this question, as well as the author’s recommendation for what the FCC should do. This paper will demonstrate that the FCC should afford some protections to unlicensed technologies by restricting access to companies with existing, licensed spectrum, but not provide any individual rights for unlicensed operators.

I. BACKGROUND

The FCC monitors and regulates the public airwaves, including the 2.4 GHz unlicensed band that Wi-Fi operates on.⁸ To do this, the FCC goes through four steps: allocation, service rules, assignment, and enforcement.⁹

In the allocation phase, the Commission and the NTIA divide radio frequencies into different bands for different uses. For example, in the 2016 Spectrum Frontiers proceeding, the FCC explored different Very High and Extremely High Frequency bands to allocate for mobile service, mainly to accommodate for the incoming 5G transition.¹⁰ In the Final Order, the FCC allocated the 28 GHz, 37 GHz, and 39 GHz for flexible use, as well as the 64-71 GHz band for unlicensed use.¹¹

8. Communications Act of 1934, 47 U.S.C. § 151 (2012).

9. See NAT’L ACAD. OF SCI., ENG’G & MED., A STRATEGY FOR ACTIVE REMOTE SENSING AMID INCREASED DEMAND FOR RADIO SPECTRUM 147–60 (2015).

10. See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.*, GN Dkt. No. 14-177, IB Dkt. No. 15-256, RM-11664, WT Dkt. No. 10-112, IB Dkt. No. 97-95, Report & Order & Further Notice of Proposed Rulemaking, 31 FCC Rcd. 8014, 8020 (July 14, 2016) [hereinafter *Spectrum Frontiers Order*].

11. *Id.* at 8018–19.

Before the FCC can allow operators to broadcast over the newly allocated bands, the Commission needs to set up rules for individual operators to ensure efficient use of the spectrum. In the Spectrum Frontiers proceeding, these rules included creating geographic licenses, as well as technical rules and operability requirements for operators.¹²

Next, the FCC assigns rights to private operators, allowing them to use the spectrum without any legal interference. This can be done through a variety of methods. Traditionally, the FCC allowed the first person to request access to gain a license. However, as more operators needed access to the limited frequency ranges, the FCC moved away from the first-come-first-served model of assigning spectrum rights.¹³ Other methods of assigning spectrum included luck¹⁴ or merit,¹⁵ which have both fallen out of favor.

Today, the FCC primarily assigns spectrum rights by two methods. First, the Commission may hold an auction which allows interested parties to bid on the spectrum frequencies they wish to operate on.¹⁶ Auctions theoretically get the spectrum into the hands of parties that place the highest value on the spectrum bands.¹⁷ As a result, it is likely that the spectrum bands will be used efficiently.¹⁸ If the FCC is concerned about use, it can also create license rules, such as build-out requirements that require an operator to reach a certain amount of customers within the geographic license area.¹⁹ While this may lead to spectrum hoarding,²⁰ secondary market transactions allow

12. *Id.* at 8027–28.

13. Joseph M. Ward, *Secondary Markets in Spectrum: Making Spectrum Policy as Flexible as the Spectrum Market it Must Foster*, 10 *COMMLAW CONSPECTUS* 103, 106 (2001).

14. Luck normally meant a lottery in which qualified operators were randomly selected to gain a license if more than one operator wanted to use the spectrum. However, this did not consider how efficiently the spectrum would be used, and in many cases the winner of the license could simply sell the license to another party. *See id.* at 108–10.

15. Merit-based assignments attempted to get the spectrum into the hands of the operator(s) who could utilize the spectrum most efficiently. While this meant that the Commission had to expend resources on a comparative hearing to determine who should gain the license, ideally this would result in an operator utilizing the spectrum to its most efficient use. *See id.* at 109.

16. Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 107 Stat. 312 (1993). *See* Nicholas W. Allard, *The New Spectrum Auction Law*, 18 *SETON HALL LEGIS. J.* 13 (1993).

17. *See* R.H. Coase, *The Federal Communications Commissions*, 2 *J.L. & Econ.* 1, 17–24 (1959).

18. *Id.* at 25–35.

19. *See, e.g.*, FCC Safety and Special Radio Services, 47 C.F.R. § 101.1325(b) (2016).

20. Spectrum hoarding is the idea that a party will simply buy the spectrum to sell it later at a profit, or to foreclose other operators from gaining access to it. *See* Brian J. Love, David J. Love & James V. Krogmeier, *Like Deck Chairs on the Titanic: Why Spectrum Reallocation Won't Avert the Coming Data Crunch but Technology Might Keep the Wireless Industry Afloat*, 89 *WASH. U. L. REV.* 705, 715–17 (2012).

operators to sell operating rights to other parties.²¹ The FCC has recently relied more on auctions, both due to the efficient assignment of spectrum rights and, perhaps more importantly, Congressional support.²² When a bill needs funding, Congress can authorize the FCC to auction off spectrum and then use the proceeds to finance the bill.²³

In contrast to this auction-based assignment is the idea of the commons. Under a commons approach, anyone may gain access to the spectrum band to develop new technologies and test existing technologies, meaning the FCC does not actually assign the rights to an individual.²⁴ Wi-Fi is one of the most successful technologies to develop using unlicensed spectrum, and remains a constant example that unlicensed advocates point to for the need for more unlicensed spectrum.²⁵ As a result, many place great value on the unlicensed spectrum, and generally do not wish to see any portion of the unlicensed bands allocated for other purposes or exploited.²⁶

The devices that operate on unlicensed spectrum need to follow specific rules that attempt to ensure that no single device blocks access to other users, but the operators do not need to go to the Commission to get a license to operate.²⁷ The general conditions, including the

21. This idea is mainly derived from the work of Ronald Coase. The Coase theorem states that if trade-in is possible and there are sufficiently low transaction costs, then market forces and bargaining will lead to the "Pareto Efficient" outcome, even if the initial allocation of property did not create an efficient result. However, transaction costs may not always be low enough, and anti-competitive behavior may prevent a company from taking a short-term profit if it means that less competition in a given market exists. See Coase, *supra* note 17. See also Thomas W. Hazlett, David Porter & Vernon Smith, *Radio Spectrum and the Disruptive Clarity of Ronald Coase*, 54 J. L. & ECON. 125 (2011).

22. Coase, *supra* note 17, at 17–24.

23. Tom Wheeler & Greg Walden, *Spectrum Auction is Bipartisanship in Action*, THE HILL (Jan. 30, 2015, 8:00 AM), <http://thehill.com/opinion/op-ed/231196-spectrum-auction-is-bipartisanship-in-action> [<https://perma.cc/498E-HSS4>].

24. See Shapiro, *supra* note 2.

25. Wi-Fi Alliance Comments, *supra* note 3, at 2.

26. For example, one of the major points of debate that this paper will not dive into, but is similar to the Globalstar petition, is LTE-U. Wireless carriers suggest that portions of the unlicensed bands can be used to support LTE, but Wi-Fi proponents are worried about interference. For example, Michael Calabrese, director of New America's Open Technology Institute's Wireless Future Project stated that "[c]onsumer advocates are heartened to hear the Wi-Fi Alliance has completed its LTE-U coexistence test plan. However, it is alarming to hear that compromises on the test plan within this industry group could leave 50% of Wi-Fi connections at risk of disruption from LTE-U. It is also unfortunate that cellular industry proponents of using LTE on unlicensed spectrum are now threatening to pull back from Wi-Fi coexistence testing they initially proposed and supported." See *WiFu Statement on Wi-Fi Alliance LTE-U Coexistence Test Plan*, NEW AMERICA (Aug. 3, 2016), <https://www.newamerica.org/oti/press-releases/wifu-statement-wi-fi-alliance-lte-u-coexistence-test-plan/> [<https://perma.cc/N3KD-XQDC>].

27. "This part sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices." 47 C.F.R. § 15.1(a). "The operation of an intentional or

requirement that operators of unlicensed devices must accept interference, are codified in Part 15 of the Commission's rules ("Part 15 rules").²⁸ However, before a device can be sold and operated, the manufacturer must first get authorization from the Commission to ensure that the device complies with the relevant Part 15 rules.²⁹ The Commission also established general technical requirements that all unlicensed devices must comply with.³⁰ Despite these rules, the Commission accepts that harmful interference will still occur to authorized users, and unlicensed operators cannot interfere with licensed use, so the Commission established a rule encouraging manufacturers to only employ the minimum field strength necessary.³¹

While Wi-Fi operates on the 2.4 GHz band, which is a focus of this paper, it also operates on other unlicensed bands. Further, the problem this paper addresses encompasses more than just Wi-Fi—the issues with successful technologies requiring interference protection can apply in unlicensed bands regardless of the specific technology used in that band.

Finally, it is up to the Commission to actually enforce the rules that it promulgates and ensure that operators do not cause harmful interference to license holders. As recently put:

unintentional radiator that is not in accordance with the regulations in this part must be licensed pursuant to the provisions of section 301 of the Communications Act of 1934, as amended, unless otherwise exempted from the licensing requirements elsewhere in this chapter." *See id.* § 15.1(b).

28. "Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to § 90.35(g) of this chapter." *See id.* § 15.5(a). "Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator." *See id.* § 15.5(b). "The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected." *See id.* § 15.5(c). "Intentional radiators that produce Class B emissions (damped wave) are prohibited." *See id.* § 15.5(d).

29. *See id.* §§ 15.101, 15.201, 15.305, 15.607.

30. "An intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice. Emanations from the device shall be suppressed as much as practicable, but in no case shall the emanations exceed the levels specified in these rules." *See id.* § 15.15(a). "Except as follows, an intentional or unintentional radiator must be constructed such that the adjustments of any control that is readily accessible by or intended to be accessible to the user will not cause operation of the device in violation of the regulations. Access BPL equipment shall comply with the applicable standards at the control adjustment that is employed. The measurement report used in support of an application for Certification and the user instructions for Access BPL equipment shall clearly specify the user-or installer-control settings that are required for conformance with these regulations." *See id.* § 15.15(b).

31. *See id.* § 15.15(c).

Enforcement is a catch-all term that includes monitoring, complaint, adjudication, and remediation. Monitoring—by an injured party or the regulator—involves observing degradation in a service’s performance, and/or identifying signals that exceed permitted bounds. Once the interference has been identified, the party affected can bring a complaint to the regulator (which may lead to further monitoring), or the regulator can notify a party of an apparent violation. Adjudication involves determining who (if anyone) is at fault. In remediation, action is taken to ensure that harmful interference ceases; this can range from a rule change (thereby clarifying the scope of the relevant rights), to a notice of apparent liability (suggesting the sanctioning of a party for violating the rights of another operator), to an operator voluntarily changing system parameters (to avoid the alleged interference and end the basis for the dispute).³²

Without adequate enforcement of the rules, license holders will not be able to use the respective spectrum license to its fullest potential. While the Enforcement Bureau handles complaints that come before the Commission, many interference issues can normally be resolved among the parties.

II. GLOBALSTAR PETITION

License holders have begun looking to unlicensed frequency bands as an opportunity to supplement their own licenses and deploy new technologies. One such license holder is Globalstar, which provides satellite phone and low-speed data communications using its low Earth orbit satellite constellation.³³

In 2012, Globalstar petitioned the FCC to allow it to offer low-power terrestrial broadband service in the 2483.5-2495 MHz portion of the S band, which Globalstar’s Mobile Satellite Service system already licensed.³⁴ In addition, Globalstar would have also utilized the adjacent, 2473-2483.5 MHz band, which is designated for unlicensed

32. JEFFREY WESTLING, INTER-PARTY INTERFERENCE ADJUDICATION: REACTIONS FROM THE SPECTRUM COMMUNITY 1 (Aug. 2016), <https://siliconflatirons.org/wp-content/uploads/2016/08/Inter-party-interference-adjudication-reading.pdf> [hereinafter INTER-PARTY INTERFERENCE ADJUDICATION] [<https://perma.cc/3CYL-YWHH>].

33. See *Terrestrial Use of the 2473-2495 MHz band for Lower Power Broadband Networks et al.*, IB Dkt. No. 13-213 et al., Notice of Proposed Rulemaking, 28 FCC Rcd. 15,351 (2013) [hereinafter *Globalstar NPRM*].

34. *Globalstar, Inc. Petition for Rulemaking to Reform the Commission’s Regulatory Framework for Terrestrial Use of the Big LEO MSS Band*, RM Dkt. No. 11685, Petition for Rulemaking (Nov. 13, 2012), <https://ecfsapi.fcc.gov/file/7022079787.pdf> [hereinafter *Globalstar Petition*] [<https://perma.cc/3DCE-EFFZ>].

use.³⁵ This would allow Globalstar to access a continuous band of frequencies from 2473-2495 MHz, with the ultimate goal to deploy wireless services to consumers using this larger bandwidth, but operating at low enough power to comply with the Part 15 rules.³⁶

As to be expected, this petition resulted in significant pushback from existing device manufacturers in the 2.4 GHz band. For example, the Wi-Fi alliance stated:

[a]llowing Globalstar to make use of *any* part of the 2.4 GHz band for terrestrial operations is contrary to the Commission's requirement that Globalstar and other MSS [Mobile Satellite service] operators only make "ancillary" use of their allocated spectrum for terrestrial operations. Globalstar's use of the band for satellite services formed the basis of the Commission's assessment of how spectrum designated for MSS would affect adjacent and co-channel services. However, the Commission now proposes to waive certain gating requirements—specifically the demonstration requirement and the integrated services rule. It is therefore clear that Globalstar's proposed service will no longer be the "ancillary" operation that the FCC had in mind when it adopted its ATC [Ancillary Terrestrial Component] rules. The fact that the Commission proposes to license Globalstar's service under Part 25 rather than Part 27 does not make Globalstar's service any more ancillary.³⁷

Wi-Fi Alliance's argument was a legal one. The Commission had previously looked at the question of the terrestrial component to the MSS license, stating that their "decision to permit MSS ATC is based upon the premise that ATC remains 'ancillary' to a fully operational space-based MSS system."³⁸ Essentially this petition would change the license so that it is no longer a strict MSS operation, but instead a separate classification. In relevant part, Globalstar argued that:

Globalstar believes that the Commission should refer to the terrestrial wireless spectrum at 2483.5-2495 MHz as the "AWS-5" band. As described *infra*, the Commission's pro-consumer, pro-investment AWS-5 framework should:

35. *Id.* See also Wi-Fi Alliance Comments, *supra* note 3.

36. Globalstar Petition, *supra* note 34.

37. Wi-Fi Alliance Comments, *supra* note 3, at 12 (internal quotations omitted).

38. See *Flexibility for Delivery of Comms. by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands; Rev. of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Serv. Sys. in the 1.6/2.4 GHz Bands*, IB Docket Nos. 01-185, 02-364 Report & Order and Notice of Proposed Rulemaking, 18 FCC Rcd. 1962, 2000 (2003).

- Modify Globalstar’s Big LEO (Low Earth Orbit) license to include AWS-5 terrestrial authority, with common control of MSS and AWS-5 operations enabling intensive coordination to minimize interference to Globalstar’s MSS offerings;
- Eliminate existing ATC gating requirements, including the substantial satellite service requirement and the dual-mode equipment requirement;
- Adopt flexible technical and operational rules similar to those applied in other terrestrial wireless bands, thus allowing the use of various technologies in this band;
- Grant one national terrestrial authorization, rather than numerous geographic area licenses;
- Permit spectrum manager leases covering any volume of Big LEO spectrum and any geographic territory within the nationwide AWS-5 license area; and
- Adopt performance requirements similar to those adopted in analogous commercial wireless bands that only become effective once the Commission has granted LTE [Long-Term Evolution] uplink authority in the Lower Big LEO band.³⁹

Globalstar believes that the Commission should refer to the terrestrial wireless spectrum at 2483.5-2495 MHz as the “AWS-5” band. As described *infra*, the Commission’s pro-consumer, pro-investment AWS-5 framework should:

If approved, the Commission would essentially have changed its previously held position allowing an ancillary terrestrial component to the MSS. As Justice Scalia stated in *Fox Television*, to change its previously held position, the Commission needs only to show that the change is permissible under the statute, enacted for a good reason, and the FCC believes it to be better.⁴⁰ The argument for why the new policy is better is unnecessary as long as the new decision is not arbitrary and

39. *Globalstar Petition*, supra note 34, at 5.

40. *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

capricious.⁴¹ The Commission therefore has the authority to make this change, but has continuously failed to do so.

However, the legal argument did not seem to be the driving force of the inaction before the Commission.⁴² Rather, it appeared to be the impact that the proposed modification to the license would have on unlicensed devices operating in the 2.4 GHz band. For example, Bluetooth Special Interest group argued that:

Globalstar requests exclusive rights to 2473-2483.5 MHz and the interference into that band would appear to require Bluetooth devices to back off further as well as Wi-Fi devices that would have to cease the use of Channel 11. With the interference requirements it would in other words mean that additional congestion and further coexistence difficulties for Bluetooth since the traffic will need to be redeployed to the remainder of the band somehow. End user experience would suffer greatly.⁴³

This argument underscores the logic behind much of the opposition to the petition, which can be boiled down to two main points.

First, Globalstar operation in the band and in the ancillary MSS band would have degraded the service of the unlicensed devices.⁴⁴ However, as specifically stated in the Part 15 rules, devices operating in the unlicensed bands must accept and deal with interference caused by other devices in the unlicensed band.⁴⁵ Furthermore, if Globalstar has complied with the device certification rules, finding a legal justification to exclude them from the band is more problematic for the opposition.

Wi-Fi and other unlicensed technologies have become integral to consumers. As stated above, this technology has contributed billions of dollars annually to the U.S. economy and continues to provide vital

41. *Id.* at 516–17.

42. See generally *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks*, IB Docket No. 13-213, Report & Order, 31 FCC Rcd. 13,801 (2016), https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-181A1.pdf [hereinafter 2016 Report & Order] [<https://perma.cc/X9R2-BWXT>].

43. Comments of Bluetooth Special Int. Group, *Globalstar, Inc. Petition For Rulemaking to Reform the Commission's Reg. Framework for Terrestrial Use of the Big LEO MSS Band*, RM Dkt. No. 11685, 3 (Jan. 14, 2013), <https://ecfsapi.fcc.gov/file/7022104363.pdf> [<https://perma.cc/94HM-LLRW>].

44. *Id.*

45. "Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator." 47 C.F.R. § 15.5(b).

backbone to many applications that businesses and household users alike utilize daily.⁴⁶ Therefore, it appeared that the Commission was hesitant to move on this petition.⁴⁷ If it did, it would have directly harmed the consumer's ability to use Wi-Fi. With the limited political capital at the Commission, it might simply be that undertaking such an effort would limit its ability to pursue other regulations.

In November 2016, Globalstar stated that it would not seek to deploy these services within the 2.4 GHz unlicensed band, in apparent agreement with the Wi-Fi Alliance and other Wi-Fi/Bluetooth interest groups.⁴⁸

The second part of this argument, which is not generally stated by the opposition to the proposal, is that Globalstar would get a competitive advantage over unlicensed devices. As Globalstar described:

[u]nder its long-term plan for its licensed Big LEO spectrum, Globalstar in conjunction with future terrestrial wireless partners will deploy FDD [Frequency Division Duplex] LTE terrestrial wireless facilities in the paired Lower and Upper Big LEO bands on a widespread basis. Globalstar's Lower Big LEO band spectrum at 1610-1617.775 MHz will be used for terrestrial mobile device uplink operations, while its Upper Big LEO band spectrum at 2483.5-2495 MHz will be used for LTE base station downlink operations. Globalstar believes that such FDD LTE operations constitute the highest and best terrestrial use of the Big LEO band. Certainly, the development of LTE technology in the Big LEO band and elsewhere is a key component of America's broadband future.⁴⁹

This technology will likely directly compete with cable operators who provide broadband to homes, and the need for Wi-Fi would decrease. However, unlike Globalstar, the broadcast power of Wi-Fi devices would be limited because the unlicensed devices cannot interfere with licensed operators by rule.⁵⁰ Globalstar would not need to worry about out-of-band interference because they would be the operator in the adjacent band. If new technology came into this band,

46. Wi-Fi Alliance Comments, *supra* note 3, at 3.

47. The Commission issued an NPRM, but did not release a report and order until Globalstar amended its petition and agreed to stay out of the 2.4 GHz unlicensed band. *See Globalstar NPRM*, *supra* note 33. *See also* 2016 Report & Order, *supra* note 42.

48. Press Release, Globalstar, Statement Regarding Ex Parte for Revised Terrestrial Authority (Nov. 10, 2016), https://www.globalstar.com/en/ir/docs/Statement_11_10_16.pdf [<https://perma.cc/BH8T-PUV4>].

49. *Globalstar Petition*, *supra* note 34, at 14–15.

50. 47 C.F.R. § 15.5(c).

the unlicensed devices would need to move farther away from the border due to the out-of-band emissions that would leak over and potentially interfere.

Both of these arguments, however, hold little legal significance under the existing rules. The Commission's rules do not provide protection for unlicensed devices operating in the 2.4 GHz band. Despite this, the public policy justifications seem to have been persuasive to the Commission.⁵¹

While writing this paper, Globalstar appeared to reach an agreement with Wi-Fi/Bluetooth interest groups in which Globalstar agreed to stay out of the unlicensed band.⁵² As a result, the Commission finally approved Globalstar's petition.⁵³ Unfortunately for the Commission, the problem of how it should handle successful technologies operating on unlicensed spectrum still remains, as the question was never officially decided. Therefore, for the purposes of this paper, the focus will be on the original proposal and how a similar proposal could theoretically affect existing users. Furthermore, the paper will examine ways that the Commission could alleviate these concerns going forward.

III. POSSIBLE SOLUTIONS

A. Allocate the 2.4 GHz Band for Wi-Fi & Bluetooth

The first option available to the Commission is to simply reallocate the 2.4 GHz band for Wi-Fi, Bluetooth, and any other technology that the Commission deems in the public interest to protect—creating rights for individual users.⁵⁴ As noted above, this paper focuses on the Globalstar petition, and other unlicensed bands used by Wi-Fi devices may face similar issues down the line. If these technologies are as important to the consumer as indicated by the record in the Globalstar rulemaking, then it may make sense to grant rights to interference protections to Wi-Fi operators. There a few ways

51. Since the petition was first filed, the only action by the Commission has been the Notice of Proposed Rulemaking until the amendment. However, this remained one of the most active dockets at the Commission. Therefore, it appeared that the Commission was listening and agreeing with these arguments, but did not necessarily think that it can or should deny the petition.

52. See Ex Parte Notice from Globalstar, *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks*, IB Docket No. 13-213, (Nov. 9, 2017), <https://ecfsapi.fcc.gov/file/11092740307738/Globalstar%20Ex%20Parte%20Notice%20110916.pdf> [<https://perma.cc/FZ8C-H9ZZ>].

53. See 2016 Report & Order, *supra* note 42.

54. See Coase, *supra* note 17.

to establish these rights, but such an allocation would create a serious question about assignment.

The device manufacturer may be the first instinct, but this presents many challenges. Unlike traditional mobile service providers or other companies that use spectrum as a primary part of their business, Wi-Fi manufacturers merely build devices that utilize spectrum.⁵⁵ These companies do not set up and run networks in which the users are connected to. As a result, the manufacturer does not exercise control over any spectrum. If the Commission decided to assign spectrum to Wi-Fi manufacturers, these manufacturers would need to develop a way to enforce their rights and exercise control over the spectrum assigned to them. This is ultimately untenable due to the nature of the business; costs would likely be too high on these companies, and the entire industry would suffer as a result.⁵⁶

The Commission could also theoretically license individual users. This too would end in untenable results. While the individual users have control over the spectrum (i.e., they are the ones actually broadcasting and sending out a signal by operating the wireless device), licensing these users would be nearly impossible considering the vast number of users and the overlap between users geographically; Wi-Fi customers already interfere with one another, especially in locations where numerous Wi-Fi modems and in tight spatial areas, such as large apartment complexes.⁵⁷

Instead of allocating the 2.4 GHz band for Wi-Fi use with license assignments, the Commission would much more likely create interference protection Wi-Fi and Bluetooth by creating a Wi-Fi “zone” in the 2.4 GHz band—essentially an unlicensed band only for Wi-Fi, Bluetooth, and other low power devices currently allowed in the band.⁵⁸ In this scenario, the Commission would need to make a public

55. See *Wireless Manufacturers*, ACCESSWIRELESS, <http://www.accesswireless.org/Find/Manufacturers.aspx> (last visited Feb. 18, 2018) [<https://perma.cc/7CJR-URQL>].

56. For example, the AWS-3 auction resulted in over 44 billion dollars being spent on 1611 new licenses. *Auction 97: Advanced Wireless Services (AWS-3) Fact Sheet*, FCC, http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=97 (last visited Feb. 18, 2018) [<https://perma.cc/3HVD-VUWA>].

57. *Potential Sources of Wi-Fi and Bluetooth Interference*, APPLE, <https://support.apple.com/en-us/HT201542> (last visited Feb. 18, 2018) [<https://perma.cc/6DBU-V8TT>].

58. Establishing the bounds of this band could be very problematic. As of now, the Commission could deny Globalstar’s petition and prevent them from using their own licensed spectrum for their Sat-Fi technology. This would essentially prevent the bleed over into the unlicensed band, and deploying Sat-Fi in the 2.4 GHz band would not make sense technically and financially. However, as the premise of this note is to look forward, more devices are going to be using the 2.4 GHz that don’t have an easy opportunity for the

interest judgment regarding which technologies would be allowed to operate in the band. A Wi-Fi zone creates challenges for efficient and effective operations; however, it would also be much simpler for the regulator to implement and place less of a burden on the device manufacturers as well as the users who purchase or deploy these technologies.⁵⁹

B. Relocate Wi-Fi and Bluetooth to Another Band

A second option would be to move Wi-Fi and Bluetooth devices out of the 2.4 GHz band into another band allocated specifically for Wi-Fi and Bluetooth. Under the first option, the Commission would be placing access limits on the unlicensed band, which is generally a disfavored solution by engineers and public interest advocates who strongly support the open area of innovation.⁶⁰ This second option would alleviate these concerns because the Commission would make no changes to the unlicensed band, and companies like Globalstar could still utilize the frequencies, so long as they comply with the power limits and other rules associated with the band.⁶¹

The challenge with this option would be the costs of the transition and the spectrum management challenges of finding new spectrum for the devices. In establishing an entirely new band for Wi-Fi and Bluetooth, the Commission would need to find a new band that not only is compatible with these technologies, but either is also not already allocated to other uses or the operations already in the band can coexist with unlicensed operations.⁶² This isn't an easy proposition. Bandwidth is finite; only so much can be used at any

Commission to exclude by denying a license in another band. For example, with the rise of the Internet of Things and the vast amount of devices that will be using unlicensed spectrum, Wi-Fi users are going to face increased interference, creating the situation that the Commission is currently trying to avoid (i.e. consumers facing a degradation in service). Therefore, the solution of allocating the 2.4 GHz band for Wi-Fi and Bluetooth might come at the expense of other unlicensed technologies.

59. These challenges, discussed below, mainly stem from enforcement and carving up the unlicensed band, which would be strongly opposed by numerous parties and public interest groups.

60. See, e.g., *The Importance of Permissionless Innovation in Unlicensed Bands*, MOBILEFUTURE (Feb. 2016), <http://mobilefuture.org/wp-content/uploads/2016/02/Permissionless-Innovation.pdf> [<https://perma.cc/9RBP-3AQK>].

61. Once again, the parameters could change depending on the Commission's preference.

62. See 47 C.F.R. § 2.101 (2017) (subdividing the radio spectrum into nine frequency bands).

given time.⁶³ Furthermore, there are no entirely “open bands” still available for new allocations.⁶⁴

The Commission has recently tried to re-allocate more spectrum by employing the reverse incentive auction, which would essentially pay broadcasters to stop broadcasting and give up their spectrum licenses so that mobile providers could participate in a forward auction for access to these bands.⁶⁵ The Commission has also tried to open up new bands for mobile use by pushing the limits of the existing technologies and exploiting Extremely High Frequency bands in the recent Spectrum Frontiers proceeding.⁶⁶

Wi-Fi and Bluetooth device manufacturers would need to go through a similar process to find and obtain spectrum access rights for their devices. If these manufacturers wanted exclusive rights, then they would likely need to pay the costs of removing existing operators from potential Wi-Fi bands—similar to the incentive auctions. They could also try to push the limits of the existing technologies by deploying in bands not well suited for Wi-Fi and Bluetooth use, but this would ultimately create the same problem of customer expectations and service degradation.⁶⁷

Instead of trying to relocate incumbent users into a band dedicated to Wi-Fi, device manufacturers may do better by trying to share spectrum with an incumbent in a band that is not heavily used. For example, the Department of Defense (“DoD”) needed to find new spectrum, as they were being excluded from an existing band.⁶⁸ They found a home in a little-used broadcasting band that was mainly used for news gathering.⁶⁹ Because the relatively intermittent use by the existing news gatherers, as well as the geographically separate use of the band, both parties found that they could use the band without

63. See *id.* § 2.106 (showing a table of frequency allocations as defined by statute).

64. *Id.*

65. *Broadcast Incentive Auction and Post-Auction Transition*, FCC, <https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions> (last visited Feb. 18, 2018) [<https://perma.cc/63HH-XLK3>].

66. See *Spectrum Frontiers Order*, *supra* note 10.

67. *Id.*

68. John Eggerton, *Broadcasters, DoD Strike Deal on Sharing BAS Band*, BROADCASTING & CABLE (Nov. 25, 2013, 5:45 PM), <http://www.broadcastingcable.com/news/washington/broadcasters-dod-strike-deal-sharing-bas-band/125322> [<https://perma.cc/3R2T-FQ7D>].

69. JEFFREY WESTLING & ALEX VETAS, SPECTRUM: NEXT GENERATION INTERFERENCE RESOLUTION AND ENFORCEMENT 12 (Dec. 2016), <http://siliconflatirons.org/wp-content/uploads/2016/12/Spectrum-Enforcement-Conference-Report.pdf> [hereinafter *Spectrum Enforcement Report*] [<https://perma.cc/WN43-PVDC>].

interfering with one another.⁷⁰ Likewise, a sharing regime between Wi-Fi users and an incumbent licensee could theoretically allow more frequency bands to become available than requiring a band dedicated to Wi-Fi operation.

However, trying to force sharing between radio operations may cause problems on its own. The Commission previously attempted this with TV Whitespaces, and some suggest that this regime has failed to produce the promised benefits because of the mandated sharing.⁷¹ Much of the issue could be boiled down to the broadcasters not trusting unlicensed users in the TV Whitespaces, and they did not know who to complain to in the event of interference.⁷² Mandatory sharing can work, but the Commission needs to ensure that the parties are compatible and the regime is well designed.

C. *Leave the Band As Is*

Though very similar to the relocation in Subsection B, the Commission can also choose to do nothing and refuse to find new allocations for the Wi-Fi devices. Under a relocation model, the Commission would also do nothing with respect to the 2.4 GHz band. However, the Commission would expend resources to go through a proceeding to find a new home for successful technologies like Wi-Fi and Bluetooth. Under this model, the Commission could keep Wi-Fi and Bluetooth in the unlicensed bands, where they have been so successful in the past.⁷³

This model most narrowly tracks with the existing rules governing unlicensed spectrum. Unlicensed frequency bands are open to any operator who wishes to utilize them.⁷⁴ The existing users, such as Wi-Fi and Bluetooth, would have to expect and accept interference so long as the other devices in the band are operating within existing

70. It is important to consider incentives with this example. At the time, the Commission was looking for more spectrum that they could open up for other uses. Both the DoD and the broadcasters were worried that their spectrum would continue to be limited. Individually, they might not have enough political power to prevent their spectrum from being reallocated or reassigned. However, together, it would be difficult for the Commission to come in and remove them both from a band that they were utilizing effectively. For sharing to work with Wi-Fi, both parties would need to be interested in sharing. *Id.*

71. *Id.*

72. *Id.*

73. See Wi-Fi Alliance Comments, *supra* note 3.

74. Stephen Lawson, *FCC Asks How LTE Can Share the Airwaves with Wi-Fi*, PCWORLD (May 5, 2015, 2:55 PM), <https://www.pcworld.com/article/2919257/fcc-asks-how-lte-can-share-the-airwaves-with-wifi.html> [<https://perma.cc/QUS5-LKE9>].

power limits.⁷⁵ Unlicensed devices are designed to be low power, meaning they will not broadcast over a larger area and potentially interfere with numerous users.⁷⁶ However, Globalstar will not need to limit its power near the edge of the bands because it will be the neighbor in frequency to the unlicensed technologies. While the edges of the band may be problematic, the majority of the operations should not cause harmful interference with one another to a significant degree due to the constraints of the Part 15 rules.

This model would put the least amount of strain on Commission resources; however, the concern here will be with consumers. Wi-Fi and Bluetooth have become so ingrained in the lives of consumers that disruption would cause major damage. As the current NTIA Administrator David Redl explained at the Silicon Flatirons conference in September 2016, LTE-U has caused a major swell in consumer interest before Congress for simply that reason.⁷⁷ As a result, the consumers have put more pressure on the legislative and regulatory forces than previously experienced in this field.⁷⁸

IV. THE HYBRID APPROACH: THE MOST EFFECTIVE MODEL TO HANDLE THE INFLUX OF NEW TECHNOLOGIES ON THE UNLICENSED BANDS

To solve this problem, the regulator must find the balance between the value of allowing innovation to occur in the unlicensed bands and the value of protecting successful technologies that depend on access to unlicensed frequency bands. To achieve this balance, the Commission should utilize a hybrid of the ideas above. The Commission should not create a licensed band for Wi-Fi, Bluetooth, and other technologies that become highly successful in the future. However, that is not to say that no protections should be given at all to unlicensed technologies. While the Commission should not artificially create private operating rights for successful unlicensed wireless technologies, the Commission can prevent deployment of large scale operations from major companies that can leverage neighboring bands and further degrade the service of unlicensed

75. 47 C.F.R. § 15.15(c).

76. *See id.* § 15.15(a).

77. LTE-U presents similar problems to the Globalstar petition. Essentially, mobile broadband providers have deployed LTE technology and wish to utilize unlicensed spectrum to boost the capabilities of their service. However, many unlicensed users argue that this is not only unfair to the existing operators in the unlicensed bands, but also that it would defeat the purpose of the unlicensed bands: an area for open innovation and technological deployment. *See Spectrum Enforcement Report, supra* note 69, at 12.

78. *Id.*

technologies. In the case of the Globalstar petition, this would mean that the Commission would have denied the application and prevented the company from using its ancillary terrestrial component to deploy Sat-Fi in conjuncture with operations in the 2.4 GHz band.⁷⁹

As stated above, Globalstar has amended its petition to theoretically eliminate any interference concerns, and the Commission approved this amendment. This, however, does not solve the core problem. As more technologies are developed and deployed on unlicensed spectrum, there will undoubtedly be more interference. While the Commission cannot protect these technologies altogether, preventing these types of large scale operations is a simple solution that eases the burden on the existing unlicensed technologies while still allowing for innovation of new technologies.

The Commission should adopt this solution for a few reasons. First, and most importantly, enforcement would be untenable on a large scale if the Commission decided to create a “Wi-Fi” band. By creating rights for these technologies, the Commission would then have the responsibility to enforce these rights and protect users against interference. Second, this solution would allow for the most permissionless innovation. Finally, this solution remains consistent with Commission rules.

A. Enforcement Concerns

Wi-Fi and Bluetooth devices do not operate like traditional wireless networks or radio broadcasts. Wireless companies like AT&T and Verizon maintain their business by ensuring that the entire network operates reliably and without interference. Therefore, when an outside emitter broadcasts or otherwise cause harmful interference with the network, the company can either resolve the interference internally or go to the Commission for help. Likewise, broadcast television and radio face a similar problem: when consumers’ reception faces harmful interference, consumers change the channel. Therefore, the broadcaster must ensure that the broadcast is clear and clean to keep the viewers and listeners tuned in.

This is a matter of incentives and ease. Large companies and broadcasters ensure that their users face limited interference due to the financial implications that interference would cause. When

⁷⁹ This is similar to the outcome of the Globalstar petition, but the Commission never officially responded to or decided the question.

interference occurs, these companies generally can solve the issue themselves or have the relative expertise to go to the commission and get a resolution of the issue.⁸⁰ Unlicensed device manufacturers, however, do not have this same incentive. Once a device is sold to a consumer, the manufacturer no longer has the incentive to seek out and resolve harmful interference to their devices—the manufacturer has already realized the profit on the device.

While it is true that a free market might push these manufacturers to ensure reliable operation and incentivize future purchases from the consumers, interference concerns are generally not attributed to the manufacturer of the device nor the cable company.

Therefore, if a “Wi-Fi band” was created, the only party with significant incentives to resolve the interference would be the users themselves. Unfortunately, these users lack both the expertise to identify and resolve these issues, as well as the relative prioritization at the Commission’s field offices.

While there have been many strides taken in the automatization of enforcement, there is still little that an individual user, who is unsophisticated with identifying and locating harmful emitters, can do to resolve the issue themselves.⁸¹ Though some more experienced users will be able to do so, it is unrealistic to expect that consumers will be able to resolve interference issues themselves.

Therefore, it will be up to the Commission to resolve these disputes, as the users would now have some level of interference protection. Unfortunately, this would place too great a strain on Commission resources. Adequately protecting each individual household would likely be too much for the field offices to handle.⁸² At the same time, these devices are not necessarily on the top of the field office’s priority list, which also has to police spectrum use for public safety and major commercial interests.

Field offices have to ensure that all wireless technologies (that have protection rights) are free from interference. However, the field offices do not have unlimited resources, and therefore must be

80. See *Spectrum Enforcement Report*, *supra* note 69, at 2.

81. See generally *id.*

82. In 2015, the Commission closed eleven field offices, and further increased wireless use will only constrain Commission enforcement resources further. Press Release, FCC Adopts Plan to Modernize Field Operations, Federal Communications Commission (July 16, 2015), https://apps.fcc.gov/edocs_public/attachmatch/DOC-334393A1.pdf [<https://perma.cc/6YNJ-4CBV>].

selective about what they prioritize.⁸³ Furthermore, ideas such as the Inter-Party Interference Adjudication proposal from the Samuelson-Glushko Technology Law and Policy Clinic at the University of Colorado would fail to provide relief, as the individual Wi-Fi owners would need first identify the source of the harmful emissions, which as noted above would be unfeasible for the majority of Wi-Fi users.

While leaving Wi-Fi as is in the 2.4 GHz band would still expose the individual users to interference concerns, the Commission could limit these risks by preventing companies with existing licenses from entering, as well as increasing the buffer zone between the neighboring bands.

B. Effect on Innovation

Another major concern is the effect that allowing a large company to use both licensed and unlicensed spectrum to provide a service will be the effect that such an action will have on future innovation in the unlicensed bands. A simple fact cannot be avoided: the more technologies deploy in the unlicensed bands, the more interference these technologies will face.

Therefore, the Commission's role in this is not to prevent interference altogether; it never was. Instead, the Commission's role is to ensure that devices operate within the rules so that they can ensure the unlicensed bands are utilized as efficiently as possible. Wi-Fi and Bluetooth currently operate within the rules, but new technologies may come in and cause disruption in these bands.

Creating an exclusive right for technologies, such as Wi-Fi and Bluetooth, would further limit the innovations of new technologies, especially if the Commission decided to carve out existing unlicensed spectrum solely for these technologies. New technologies need more spectrum to continue to develop and grow on a larger scale, and it is vital that any Commission action does not prevent the deployment of these new technologies.

This tends to circle back to the main argument in favor of protecting Wi-Fi and Bluetooth: the unlicensed band worked, and now consumers expect these technologies to work. It is not clear, however,

83. Generally speaking, the field offices prioritize public safety above all else. Following public safety, the field offices focus on large commercial companies such as AT&T and Verizon as these companies provide service to millions of Americans, creating a strong economic incentive to resolve these issues. Amateur operators, meanwhile, are generally far down on the priority list. INTER-PARTY INTERFERENCE ADJUDICATION, *supra* note 32, at 3.

that we have seen the end of innovation. It is true that these technologies have been successful, but what is the next step in wireless technologies? What new innovation will turn our understanding of wireless on its head? It is vital that the Commission not foreclose the ability of innovators to find, develop, and deploy new technologies.

Further, under the proposed solution, Wi-Fi and Bluetooth manufacturers could always purchase a licensed/Wi-Fi band and operate with limited interference, though the enforcement concerns above would still be present and difficult to resolve. If these technologies are so vital and the interference concern so significant, the financial incentive will drive a private market solution, alleviating the Commission's burden of finding a solution themselves.

Finally, by excluding companies with existing licensed bands, the Commission can ensure that the sole purpose of these bands is development and deployment of new technologies. Large companies with existing spectrum can already utilize their resources to innovate, and already have the financial incentive to do so—assuming there is competition in the marketplace. Therefore, their deployment in the unlicensed bands is generally not for altogether new innovations, but rather building on existing ones. Though these can be innovative and hold significant benefits to the consumers and the public interest, there is not enough of a justification to entirely foreclose the ability of small, private developers to explore and develop new, potentially revolutionary technologies.

C. *Departure from Existing Rules*

An argument against the proposal outlined above is that, by excluding certain parties (in this case, those that already have existing licenses), the Commission would be departing from the existing rules. This is true. Unlicensed spectrum is designed to allow any user the opportunity to operate within the band.⁸⁴ This means that regardless of the financial power or outside existing licenses, so long as the devices are compliant with the technical rules, the user can operate within the band.

However, the rules are just that: rules. The Commission has the authority to go back and either interpret the rules if such rules are unclear or write new rules altogether.⁸⁵ Furthermore, if the

84. See 47 C.F.R. §§ 15.1–15.717.

85. See Administrative Procedure Act, 5 U.S.C. §§ 551–706 (2012).

Commission departs from an existing rule or previous interpretation, the Commission does not need to prove that the new rule is in any way better than the previous one.⁸⁶ Therefore, if the Commission decides that it is better to exclude certain operators that already have existing licenses, it would merely need to make a decision that is not arbitrary and capricious to get *Chevron* deference.⁸⁷

Furthermore, even though some limitations would be implemented, the core principles would be maintained. Unlicensed spectrum would remain open to most users, especially those who do not have the financial backing to buy a license. Therefore, innovation would continue in these bands.

This does mean, however, that such a proposal would likely not be created by simply denying the Globalstar petition. Instead, the Commission would likely need to go through a formal rulemaking. This would incur significant costs, as numerous parties would be interested in filing comments. The Commission must address all substantial arguments, and therefore significant resources would need to be devoted to such an endeavor.⁸⁸

As explained above, this would be a well justified use of Commission resources. This petition is just the tip of the iceberg, and other proposals, such as LTE-U, present similar problems and raise the same fundamental question: how should the Commission handle successful technologies in unlicensed spectrum? As more technologies begin to use wireless spectrum, interference will only continue to grow, as more radiators will be present. Therefore, it is critical that the Commission affirmatively decide and explain how these situations will be handled going forward. By going through such a rulemaking and establishing clear rules with regards to operations in the unlicensed bands, the Commission would limit the future costs of adjudicating these issues every time a new technology wishes to deploy.

CONCLUSION

While there is no silver bullet, the proposed solution best balances the interest of allowing for innovation while ensuring that consumer devices operate reliably and without interference. The fact of the matter is that no solution to this problem will be perfect, and some

86. See *Fox Television*, 556 U.S. at 515.

87. See *Chevron, U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837 (1984).

88. See 5 U.S.C. §§ 551–706.

parties' interests will be restricted. Therefore, it is crucial to balance these interests to come to a solution where both innovation and operability are as maxed out as possible.

Though both interests are crucial, it is vital that future innovation takes priority. New and revolutionary technologies that we cannot even fathom yet could theoretically be prevented by reducing the unlicensed spectrum available or allowing large companies to deploy widespread in the band, neighboring bands, or to bleed over as there is no interference protection for unlicensed technologies. While the proposed solution also takes steps to ensure reliable operation in the band, the focus on innovation creates the best environment for the continued growth and development of the unlicensed bands.

