

**Before the**  
**FEDERAL COMMUNICATIONS COMMISSION**  
**Washington, DC 20554**

In the matter of )  
 )  
Licensing Models and Technical Requirements ) GN Docket 12-354  
In the 3550-3650 MHz Band )  
 )

---

**REPLY COMMENTS OF FEDERATED WIRELESS, LLC**  
**(Formerly known as Allied Communications, LLC)**

Dr. T. Charles Clancy  
Director of Strategy

Dr. Robert G. McGwier  
Technical Director

Dr. Joseph Mitola III  
Chief Scientist

Dr. Jeffrey H. Reed  
Advisory Board Chair

Dr. Ashwin Amanna  
Director of Engineering

Johanna L. Dwyer  
General Manager

---

Federated Wireless, LLC  
(Formerly Allied Communications, LLC)  
33 Arch Street, Suite 3201  
Boston, Massachusetts, 02110  
1-617-419-1833

---

Simon Law Offices  
2101 Corona Road, Suite 203  
Columbia, Missouri 65203  
Attorney for Federated Wireless, LLC

---

December 20, 2013

## Introduction and Executive Summary

Federated Wireless, LLC (formerly Allied Communications, LLC), a subsidiary of Allied Minds Federal Innovations, is headquartered in Boston, Massachusetts with offices in Reston, Virginia. Federated Wireless was founded in 2012 by globally recognized wireless and radio communication leaders to enable and commercialize technologies to unlock the enormous potential of dynamically shared spectrum resources. We would like to acknowledge the many contributors to the public record regarding the Commission's proposals for the Revised Framework, and appreciate this opportunity to reply to the comments put forth by other stakeholders in this evolving ecosystem. We were pleased to see the evolution of a number of congruent themes amongst the comments received, which will indeed serve to supplement the public record on the Commission's bold step towards innovative and progressive management of spectrum resources. As part of the rulemaking, Federated Wireless agrees with other stakeholders that the Commission should allow the market to unfold without placing undue restrictions on uses of the 3.5 GHz band, and rather should formulate rules that allow experimentation with multiple use cases.<sup>1</sup>

We support the view of Google that the Commission should quickly set foundational rules for commercial use of the 3.5 GHz band and should not delay while comprehensive solutions to all pending questions are finalized.<sup>2</sup> Although some technical requirements for the SAS must be

---

<sup>1</sup> Comments of the Telecommunications Industry Association ("TIA"), Page 7.

<sup>2</sup> Comments of Google Inc. on the Proposed Revised Framework ("Google"), Page 2.

mandated, minimizing these should permit ongoing, competitive development of SAS capabilities, subject to minimum interference protection criteria.<sup>3</sup>

We caution the Commission concerning rulemaking that commits the vast majority of the 3.5 GHz band to traditional licensing methods.<sup>4</sup> The PCAST recommendation for spectrum sharing highlighted the incongruity between concern of a “looming spectrum crises” and the reality that only a fraction of the Nation’s prime spectrum capacity is actually in use, and suggests the need for a new policy framework to unlock fallow bandwidth in all bands.<sup>5</sup> What is to be gained by delaying policy innovation? It is not predicted that spectrum usage will go down; nor are fundamental laws of propagation likely to change. The technology already exists to support experimentation and learning in this band. The Wireless Innovation Forum succinctly points out that it is important that the FCC realize the distinction between regulation of spectrum, and management of spectrum. To date, these things have been virtually one and the same. A light regulatory touch in supporting innovations related to spectral sharing management, taking

---

<sup>3</sup> Google, Page 2.

<sup>4</sup> Comments of Ericsson In Response to the Public Notice (“Ericsson”), Page 8.

<sup>5</sup> Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (“PCAST Report”), Executive Office of the President, President Council of Advisors on Science and Technology, July 2012.

advantage of the enormous technological advancements in frequency agile communications, will define the next revolution in spectral utility efficiency.<sup>6</sup>

We agree that the 3.5GHz band is an excellent candidate for experimenting with the regulatory, technological, and administrative innovations needed for future sharing arrangements.<sup>7</sup> The proposal made by Verizon and Verizon Wireless to devote part of this band to a Transitional Framework that would use only existing licensing models<sup>8</sup> may provide assurance for stakeholders that feel that innovation should wait. However the portion of the band licensed in this manner should be small, as such a restriction will not open up that portion of the band for significant experimentation and innovations for another ten years, at which point the United States will have forfeited an opportunity to be a leader in agile spectrum management. However if the FCC needs to consider a compromise, we would propose that a Transitional Framework be constrained to a small portion of the lower part of the band, and thereby contained entirely within LTE Band 42.

We challenge the assertion that the fastest way to implement the Commission's 2010 National Broadband Plan is to identify, clear, and auction additional spectrum below 3GHz for exclusive

---

<sup>6</sup> Comments of the Wireless Innovation Forum on the Federal Communications Commission Public Notice Seeking Comment on Licensing Models and Technical Requirements in the 3550-3650 Band ("Wireless Innovation Forum"), Page 3.

<sup>7</sup> Supplemental Comments of Verizon and Verizon Wireless ("Verizon"), Page 1.

<sup>8</sup> Verizon, Page 10.

licensed use.<sup>9</sup> The fastest way to enable greater broadband services is to increase the productivity of existing spectrum without costly and time consuming relocation requirements, while providing aligned financial incentives for all spectrum users to make the most efficient and productive use of this shared resource.

Innovation is mandatory in order to vastly increase the usability of the 3.5 GHz band for wireless broadband.<sup>10</sup> The demand for spectrum continues to grow, therefore the sooner the FCC moves to innovative spectrum access management to enable significantly higher spectrum utilization factors, the better positioned the United States will be for future economic growth. The FCC should therefore establish this band as a model for further spectrum sharing, and strive to do more, not less.

Federated Wireless offers the following reply to the submitted comments in the support of the Commission's rulemaking efforts.

---

<sup>9</sup> Comments of AT&T ("AT&T"), Page 2.

<sup>10</sup> Google, Page 1.

## Reply to Comments

### I. WHAT CONSTITUTES “USE”

The concept of the “use” of spectrum has been referred to extensively in the FCC Public Notice<sup>11</sup>, and also in many of the submitted comments. The Commission’s goals include “productive use of spectrum”, which implies that the use of the spectrum needs to provide a benefit to an end user, increasing productivity. We agree with comments of the Open Technology Institute at the New Americas Foundation and Public Knowledge, in that the Commission needs to reorient the Nation’s spectrum policy towards use rather than exclusively reserved non-use of capacity.<sup>12</sup> The Wall Street Journal recently wrote that since spectrum policy is currently geared towards reservation for use and not actual use, spectrum speculators are capitalizing on the steadily increasing demand for spectrum to support mobile broadband, by buying up spectrum licenses even though most have no network on which to offer wireless services.<sup>13</sup>

Federated Wireless further agrees with the Open Technology Institute at the New Americas Foundation and Public Knowledge that notification of intent to use the spectrum is not the same

---

<sup>11</sup> <sup>11</sup> See Commission Seeks Comment on Licensing Models and Technical Requirements in the 3550-3650 MHz Band, GN Docket No. 12-354, *Public Notice*, FCC Rcd \_\_\_ (2013) (“Revised Framework Public Notice”), ¶ III.B.29

<sup>12</sup> Comments of Open Technology Institute at the New Americas Foundation and Public Knowledge (“OTI/PK”), Page 3.

<sup>13</sup> The Wall Street Journal, Wednesday December 11, 2013 – “A Gold Rush Hits Spectrum”.

as actual use.<sup>14</sup> A declaration of use is similarly not the same as detected use, nor should equipment deployment be seen as equivalent to use<sup>15</sup>. While equipment deployment is clearly a necessary step towards spectrum use, the process of deploying equipment does not preclude the use of the spectrum by another entity that already has a network that can opportunistically use the resource, and therefore network deployments alone should not serve as the determination of “use”.<sup>16</sup>

To ensure the maximum productivity of the spectrum, we therefore must focus on actual spectrum use, and so measuring actual use is very important<sup>17</sup>. We encourage the Commission to consider the approach proposed by Federated Wireless whereby true productive spectrum use is analyzed by combining spectrum sensing with accounting records that indicate, for example, the number of established service data flows<sup>18</sup>. Such aggregated data poses no confidentiality risk to end users however it allows the SAS to confirm productive spectrum usage, protecting against a network’s ability to spoof use by simply occupying spectrum to avoid losing it, which must be guarded against as the Commission has required.

---

<sup>14</sup> OTI/PK, Page 12.

<sup>15</sup> AT&T, Page 5.

<sup>16</sup> Google, Page 15.

<sup>17</sup> OTI/PK, Page 15.

<sup>18</sup> COMMENTS OF Federated Wireless, LLC (“Federated Wireless”), Page 33.

An accurate and agreed definition of “use” that refers to productive use and that can be measured and determined in real time will enable the SAS to fulfill the Commission’s requirements of “use it or share it”<sup>19</sup> and will ensure the SAS only allows GAA access to PA spectrum when it is “affirmatively unused”.<sup>20</sup> As accurately noted in comments by the Telecommunications Industry Association<sup>21</sup>, the Commission’s goals are to enable the next generation of spectrum management systems, not to repeat what has been done in years past. By clarifying what comprises “use”, we can see that some proposals will not meet the Commission’s goals. For example, if a PA licensee can clear priority spectrum that they have not been using simply by informing the Commission and/or the SAS thirty days or more prior to commencing substantial service, then the spectrum in question automatically will lie fallow for thirty or more days, which is not making the best use of this scarce resource.<sup>22</sup> Furthermore, clearing a band on an announcement by a PAL licensee of intent to start “substantial” service in a band, which then may be postponed and delayed, unnecessarily creates further loss of productive use.<sup>23</sup> Federated Wireless has proposed a three-step approach to authorization<sup>24</sup>, whereby even when a Priority Access Licensee holds the rights to Priority Access for one or more PALs, the SAS determines

---

<sup>19</sup> Revised Framework Public Notice.

<sup>20</sup> COMMENTS OF T-Mobile USA, Inc. (“T-Mobile”), Page 3.

<sup>21</sup> TIA, Page 2.

<sup>22</sup> OTI/PK, Page 12.

<sup>23</sup> OTI/PK, Page 15.

<sup>24</sup> Federated Wireless, Page 12.

what spectrum is actually being used in short time durations (a deci-hour) and if the PAL Licensee is not using a particular spectrum resource, the SAS is able to offer it to other PA or GAA users. The PAL Licensee would have only to wait a deci-hour to have an opportunity to pay to use the spectrum with priority over GAA users; however, resources would not lie fallow due to deployment uncertainties.<sup>25</sup>

Based on analytics from sensing and real time accounting streams, the SAS can measure the efficiency of a Priority Access Licensee's use of the spectrum. Decisions as to who to grant priority to for the next Priority Application period can be based on more than just price maximization.<sup>26</sup> Google suggests that Priority Access License renewal expectancy should be limited to those portions of the spectrum that the licensee actually uses, as recorded by the SAS. Full use of the capabilities of the SAS would allow preferences (for example, who makes the most efficient use of the spectrum) to influence pure auction or bidding mechanisms to maximize productive use.<sup>27</sup> To avoid monopolistic behavior and to level the playing field, competition balancing can be done based on credits earned by a past history of efficient utilization.

If there is no disincentive to warehousing spectrum in prime areas because the license rules permit obtaining multiple census tracts for multiple year terms, there is the potential for Priority

---

<sup>25</sup> Federated Wireless, Page 32.

<sup>26</sup> Federated Wireless, Page 33.

<sup>27</sup> Google, Page 8.

Access spectrum to lay fallow.<sup>28</sup> Any mechanism that guarantees that spectrum can be held exclusively for long periods of time without renewal, demonstration of use, and with no periodic redress of fair market value will likely lead to hoarding, hedging on the future value of spectrum, and the loss of potential revenue opportunities for the Treasury.<sup>29</sup>

Permitting aggregation of consecutive future PALs, as the Commission proposes, would enable licensees to reserve and retain spectrum for a number of years without ever actually using it. Assuming renewal fees are paid, such reservations would exclude other Priority Access users, with no guarantee that the licensee would use its reserved spectrum.<sup>30</sup>

The three-step access approach which Federated Wireless has proposed<sup>31</sup> addresses this by providing any spectrum that isn't used to alternate users, ensuring that there is no way for a given Priority Access Licensee to hoard spectrum that they do not plan to use. This approach also means that there is no need to manage cumbersome build out requirements.

The Commission should not permit partial or intermittent use of PALs over the course of a license term before offering this fallow spectrum to another user. Waiting for the next PAL license cycle to offer spectrum to an entity that will make use of it is wasteful and inefficient.

---

<sup>28</sup> AT&T, Page 5.

<sup>29</sup> Comments of Spectrum Bridge, Inc. ("Spectrum Bridge"), Page 2.

<sup>30</sup> Google, Page 9.

<sup>31</sup> Federated Wireless, Page 12.

## II. MOBILITY VERSUS NOMADIC USE

A large and growing amount of the mobile broadband traffic is being carried, or will be carried by unlicensed networks, because such small cell opportunistic networks can appropriately meet the needs of the type of connectivity that users require.<sup>32</sup> Wi-Fi offloading is predicted to support nearly 80% of mobile device traffic by the end of 2016. This is because most “mobile broadband use” is not truly mobile, it is nomadic. If the 80% of nomadic data traffic on traditional cellular networks can be offloaded onto small cell opportunistic networks, then existing exclusive licensed spectrum holdings for cellular networks should be more than sufficient to be able to handle the truly mobile traffic or high QoS services.

While dedicated spectrum could be considered the lifeblood of today’s mobile revolution which supports QoS applications<sup>33</sup>, the fasted growing percentage of data traffic is being successfully offloaded onto unlicensed networks where there is no QoS guarantee. This trend of nomadic mobile broadband usage therefore does not imply a strong market need for the 3.5 GHz band to be heavily licensed, as proposed by traditional mobile network operators and infrastructure manufacturers<sup>34</sup>. If the 3.5 GHz band is to be split between Priority Access and General Authorized Access tiers, then this split should be aligned with the rough percentages of expected

---

<sup>32</sup> OTI/PK, Pages 7,8.

<sup>33</sup> COMMENTS OF Ericsson, Page 1.

<sup>34</sup> OTI/PK, Page 9.

data offloading to unlicensed networks. Comments proposed splits of 70% PA, 30% GAA<sup>35</sup>, or that 60-80% of the band nationwide should go to a single Priority Access licensee<sup>36</sup>. However a 20% PA, 80% GAA split would be reflective of the percentage of data offload that we are currently seeing and that which is expected between now and 2016.

Historically, the principal value of mobile telephony has always been the provisioning of services over a wide area to allow mobility, and larger license sizes have been proven to support investment under that business paradigm.<sup>37</sup> Using this band to support the supply of spectrum for unlicensed offload addresses what the ecosystem seems to need most,<sup>38</sup> and should free up exclusive licensed spectrum to support true mobility cases, which represent 10-15 percent of the mobile broadband use.

### **III. PROVIDING CERTAINTY OF INVESTMENT IN THE BAND**

We agree that it is a challenge for the Commission to balance providing enough certainty to attract investment with providing enough flexibility to allow potential use cases to evolve.

---

<sup>35</sup> AT&T, Page 6.

<sup>36</sup> Ericsson, Page 8.

<sup>37</sup> Verizon, Page 10.

<sup>38</sup> Comments of PCIA – The Wireless Infrastructure Association and the HetNet Forum, A Membership Section of PCIA (“PCIA”).

Comments to the public record have suggested that a one year term Priority Access License term is insufficient for companies to make investments in this band.<sup>39</sup>

However we caution the Commission to differentiate between certainty of use and having a locked in price over a decade or more as demand and therefore spectrum value continues to escalate, as these are not one and the same. Relying overly on carrier build-out to enable this band will foreclose the innovation and decentralized investment that has been a hallmark of the Wi-Fi explosion. Federated Wireless agrees that the Commission needs to allow enough flexibility for potential use cases to evolve in support of the Commission’s longstanding position in favor of technology neutrality.<sup>40</sup>

Alcatel-Lucent rightly points out that it takes several quarters to standardize a new frequency band and another year to develop infrastructure equipment and certify it, and over a year to deploy it, and as such it is unrealistic to expect networks to be deployed within three years of a frequency band coming online.<sup>41</sup> However, the 3550-3650 MHz band is already encompassed in TD-LTE Bands 42 and 43, which are standardized and in use elsewhere in the world, and equipment and chipset manufacturers already have equipment for these bands or plans to support them. If equipment deployment for a licensed network build out will take three years from when

---

<sup>39</sup> Comments of Nokia Solutions and Networks US, LLC (“NSN”), Page 1.

<sup>40</sup> TIA, Page 2,3.

<sup>41</sup> Comments of Alcatel-Lucent (“ALU”), Page 3,4.

the band comes online, then it is still possible that smaller networks may be able to deploy equipment and make use of the spectrum sooner.

With the three-step access approach put forth by Federated Wireless<sup>42</sup>, mobile network operators can purchase Priority Application rights for spectrum but if they are not actually using it, then they will not pay for use. This would allow mobile network operators the opportunity to continue to hold priority rights during the time needed to deploy their networks, while not preventing spectrum use by reserving spectrum for an unbuilt network, which does not serve the public interest. Overall, as suggested by Google, basing renewal rights on actual spectrum use will provide licensees with sufficient certainty to make longer-term network investments.<sup>43</sup> This similarly addresses concerns about an entity accumulating consecutive one-year licenses with no clear requirement to use the spectrum, and that 3.5 GHz band spectrum may remain fallow in the absence of construction or service requirements.<sup>44</sup>

#### **IV. GEOGRAPHIC GRANULARITY**

Several good points have been raised in the comments to the Public Notice concerning the geographic granularity of PALs, which is proposed in the Revised Framework to be census tracts.

---

<sup>42</sup> Federated Wireless, Page 12.

<sup>43</sup> Google, Page 9.

<sup>44</sup> T-Mobile, Page 5, 6.

Alcatel Lucent correctly notes that census tracts may change every ten years, which would necessitate a realignment of spectrum licensing that serves no good purpose if the base geographic unit for shared spectrum use is the census tract.<sup>45</sup> Google goes on to highlight that census tract boundaries are unlikely to correspond with a small cell's spectrum propagation. For example, the middle of a street is a realistic census tract boundary; however street areas are free of the obstructions that create natural signal boundaries.<sup>46</sup> The PCIA also agrees that tying a licensing framework to a fluid set of census tracts may prove challenging as populations shift.<sup>47</sup>

Allowing subsets of a PAL geographically is a necessity to minimize exclusion zones. Alcatel-Lucent asserts that preemption of PAL operations by the incumbent tier should be micro-targeted. That is, an exclusion zone touching a corner of a PAL should not result in broad preemption through the entirety of a PAL's geographic scope.<sup>48</sup> In order to enable this, geographic subdivision of a PAL must be possible, and if it is possible, then there is also no reason that the SAS cannot authorize and manage spectrum use for a subset of a PAL. We caution the Commission, however, about leaving such geographic subset management to secondary markets.<sup>49</sup> The development of secondary markets to manage geographical subsets of PALs takes the control of spectrum management and enforcement out of the hands of the SAS

---

<sup>45</sup> ALU, Page 5.

<sup>46</sup> COMMENTS OF Google Inc., Page 5.

<sup>47</sup> PCIA, Page 4.

<sup>48</sup> ALU, Page 6.

<sup>49</sup> AT&T, Page 4.

and the FCC. This outcome would have the potential to develop if the Commission does not take bold enough steps in spectrum policy innovation to support the public interest. We concur with Motorola Solutions that the path to the promotion of efficiency is through reducing the proposed size and term of licenses, not through increasing them.<sup>50</sup>

## V. SPECTRUM VALUE

Consumers don't demand spectrum, they demand services which are met by capacity.<sup>51</sup>

Increasing capacity can be achieved in different ways, for example by reducing the cell size (densification), utilizing a more efficient radio access technology, or adding more spectrum resources. The value of spectrum is limited by the incremental capital costs of increasing capacity on existing bands of spectrum.

As highlighted by The Brattle Group, radio spectrum on its own is not inherently valuable. The value of spectrum is derived from its use in producing services. Therefore as demand for wireless broadband services increases, so does the value of spectrum assets deployed for those services.<sup>52</sup>

Increasing the Priority Application Period (defined as the one year period in which an entity has the rights to bid on Priority Access to a given PAL<sup>53</sup>) to ten or fifteen years as with traditional

---

<sup>50</sup> Comments of Motorola Solutions, Inc. ("MSI"), Page 1.

<sup>51</sup> Comments of Commscope ("Commscope"), Page 2.

<sup>52</sup> "Spectrum Value", Coleman Bazelon and Giulia McHenry, The Brattle Group, August 28,2012, available at: <http://ssrn.com/abstract=2032213>

licensing schemes has been suggested in several of the comments. However this will not allow the spectrum value to track the demand. Flexibility should permit market forces, rather than archaic regulations or arbitrary timeframes, to determine how spectrum will be used and what its value is.<sup>54</sup>

On the other hand, we do not feel that Priority Application for any PAL should be cost-free, even when there is an absence of competing Applications. An entity that wishes to reserve the right of priority over the GAA tier for the Application Period does need to pay for this privilege.

However, by adopting a two-part tariff monetization scheme as we have proposed<sup>55</sup>, if the entity does not actually use the PAL, then they will not pay for its use. Therefore, an entity with a successful PAL Application does pay to hold the right of priority if they do intend to use the spectrum; however, if they don't use it, they don't pay a fee for use, and the SAS is free to make this spectrum available to another PAL licensee or to the GAA until such time as the entity does make use of it.<sup>56</sup>

Where there are competing or mutually exclusive Priority Applications, auctions may be used, which will allow the value of the spectrum to track actual market demand. In promoting the most productive spectrum use, when making decisions the SAS could take into account the past

---

<sup>53</sup> Federated Wireless, Page 16.

<sup>54</sup> TIA, Page 6.

<sup>55</sup> Federated Wireless, Page 10.

<sup>56</sup> Federated Wireless, Page 19.

performance of a licensee, for example giving more credit to the entity which is most likely to make the most productive use of the spectrum.

Speculators won't have anything to speculate with, because if they don't use their spectrum, it will be given to someone else to use, whether that is a different network that actually intends to use it, or the GAA. The treasury therefore stands to benefit from rent seekers in that it may collect rent several times in the process of ensuring that the spectrum is used. The Commission should be cautious about allowing a secondary market to develop because of lack of policy innovation, as this would fail to keep the profits in the hands of the treasury such that it can be used for the public interest. Allowing a secondary market do what the FCC is not bold enough to try doesn't reduce the risk, it just transfers the rewards<sup>57</sup>.

---

<sup>57</sup> OTI/PK, Page 14.

## VI. CONCLUSION

For the foregoing reasons, Federated Wireless encourages the FCC to continue making progress towards promoting and enabling innovative spectrum access management in the 3.5 GHz band, providing an example for a new future paradigm. We encourage the Commission to quickly set foundational rules for commercial use of the 3.5 GHz band, allowing early commercial access and the opportunity for experimentation to drive comprehensive solutions to challenges that arise.

Respectfully submitted,

Johanna Dwyer  
General Manager  
Federated Wireless, LLC  
33 Arch Street, Suite 3201  
Boston, MA, 02110  
617-505-6206  
[johanna.dwyer@federatedwireless.com](mailto:johanna.dwyer@federatedwireless.com)

December 20, 2013